

Radboud University Nijmegen

Master's Thesis

Cultivating Change: A Qualitative Comparative Analysis on Agrobiodiversity Success in the Netherlands

Discovering conditions for the successful implementation of biodiversity-based
measures in agri-environmental initiatives in the Netherlands

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Abstract

Post-war European agriculture has achieved higher yields and self-sufficiency but at the cost of environmental quality, human health, and biodiversity. Intensified agricultural practices have led to habitat loss, biodiversity decline, and soil degradation, necessitating the development of more sustainable agricultural systems. Suggestions for increasing sustainability include conserving existing biodiversity and adopting agri-environmental measures (AEMs) that minimize environmental harm. The Netherlands, with 70% of its land used for agriculture, faces significant biodiversity loss, due to intensive farming and nitrogen pollution. To address this, various agri-environmental programs aim to modify agricultural practices, though success varies and often depends on voluntary farmer participation. This research on agri-environmental initiatives has identified key conditions for success. Using Qualitative Comparative Analysis (QCA), this study investigates which combinations of conditions - such as professional involvement, organizing farm visits, demonstration of agronomic benefits, financial compensation, and tailored expertise - lead to successful implementation of AEMs. The findings suggest that demonstrating agronomic benefits and the presence of professionals within the initiative are highly valuable. However, the most important factor appears to be providing tailored expertise to farmers within an initiative. It is recommended that agri-environmental initiatives in the Netherlands prioritize hiring practically experienced professionals, and that policymakers consider offering incentives or even making the hiring of such professionals a requirement for obtaining financial support. Additionally, mechanisms should be implemented to regularly assess the impact of professional expertise on the success of agri-environmental measures, ensuring that policies and support structures are continually optimized based on practical experience.

Key words

Agricultural nature conservation, Agri-environmental measures (AEMs), Qualitative Comparative Analysis (QCA), success conditions, successful implementation, farmers

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Preface

This thesis is part of the master's program in Spatial Planning and focuses on the success conditions for the implementation of agri-environmental measures among farmers.

I have always been deeply interested in nature, and it felt meaningful to conduct research that could contribute to its potential restoration, especially in light of the increasing pressures on the environment today. Although my initial intention was not to conduct a Qualitative Comparative Analysis (QCA), I am glad I did. It was a challenging and lengthy process that made the journey more difficult at times, but I learned a lot from it. The enthusiasm of Bibi and Huub also gave me renewed energy to keep going.

I would like to express my gratitude to them. Bibi Witvliet, your dedication and enthusiasm on this subject have been really motivating. I really enjoyed getting a glimpse into the life of a PhD candidate. Huub Ploegmakers, among my friends now also known as “the coding man”, your patience, time, and enthusiasm for QCA always encouraged me. Thank you for the informative, but also fun, 'database' meetings.

Lastly, I want to thank my supervisor, Sander Meijerink, for your understanding, insightful suggestions, and always sharp observations.

Lotte Aarts

1. Introduction

Post-war European agriculture can be considered a success in that it has resulted in a rise in yields and improvement in self-sufficiency. However, it is generally acknowledged that higher agricultural productivity comes at a price in terms of the environmental quality, human health, and the maintenance of biodiversity (Kleijn & Sutherland, 2003). Agricultural intensification has caused significant homogenization of farming landscapes and a decline in natural and semi-natural habitats, this in turn has caused a decline in biodiversity as well as soil biodiversity (Duru et al., 2015). In the coming decades, a further intensification of agriculture will be needed as a result of population growth, rising food consumption, climate change and the globalization of agricultural markets (Jackson et al., 2007). Faced with these negative impacts, more sustainable agricultural systems need to be developed. There have been suggestions for ways to increase the sustainability of agricultural production by increasing reliance on ecological goods and services, thereby reducing negative impacts on environmental quality and biodiversity. These suggestions include conservation of the existing biodiversity in agricultural landscapes and the adoption of agri-environmental measures (Jackson et al., 2007).

Biodiversity encompasses the variety and abundance of life on Earth. It includes not only individual species but also the diversity of ecosystems and genes, as well as the relationships among them (United Nations, 1992). Biodiversity in agriculture comprises the “planned biodiversity”, in other words the livestock and/or crops the farmer wishes to produce. But also the “unplanned” biodiversity, which consists of all biota in, and entering the system. This biota may be viewed as either helpful - like healthy soils or insects that pollinate crops - or harmful - like infections, pests and weeds (Brussaard et al., 2007). This unplanned biodiversity may become planned, in the sense of being managed by biodiversity-based practices for agriculture. Such management aims to reduce or enhance species diversity and functional group diversity. In return agriculture can contribute to a more sustainable way of working through better use of agrobiodiversity (Erisman et al., 2016). A holistic approach to resilient systems can benefit both the environment and agriculture. This approach focuses on an optimal use of agro-biodiversity and a reduction of long-term risks by using ecosystem services rather than external inputs, such as pesticides and fertilizers (Erisman et al., 2016, p. 158). By doing so, it aims to achieve a sustainable balance between the quality of the agricultural product, the production process, and the production environment (Vosman et al., 2007). However, implementing such approaches is more challenging because they increase the context-dependency, add complexity to management and introduce greater uncertainty due to the involvement of natural processes (Duru et al., 2015).

Given the need for productive and sustainable forms of agriculture and the evidence that intensified systems are failing to conserve functions, future agricultural landscapes will likely need to be adapted to support biodiversity and ecosystem services (Landis, 2017). The decline in biodiversity is not a recent issue; rather, it is mostly the outcome of policies that placed too little importance on protecting nature in rural areas. Modern agriculture typically focuses on generating high food yields in a short amount of time at the lowest possible cost, which often leads to conflict with biodiversity conservation and management. However, farmers’ decisions regarding what to cultivate and how to grow it are equally important and have been influenced for millennia by the prevailing cultural and social perspectives within

the agricultural sector (Christenhusz, 2022).

Focusing on the situation of the Netherlands, approximately 70% of Dutch land is dedicated to agriculture, making it the primary habitat for a wide variety of animals and plants (Erisman et al., 2016, p.161). However, in recent years there has been a decline in several species for which the Netherlands is extremely important, for example meadow birds. The main reason for the decline in meadow bird populations is linked to their breeding areas in the Netherlands, often located in agricultural areas. Not only species found on farmland are declining, but agriculture also plays a significant role in the slow recovery of Dutch nature (Ministry of Economic Affairs, 2014). For instance, two thirds of semi-natural habitats have nitrogen loads exceeding the critical threshold. Thus, agriculture is putting pressure on these areas' quality, as it is the primary cause of nitrogen deposition after burning of fossil fuels (Erisman et al., 2016).

In order to respond to this loss of biodiversity, different programs have been introduced aimed at changing agricultural practices in both the public and private sector. In these agri-environmental programs or initiatives, farmers work on agri-environmental measures. These measures concern farm management measures and apply to private land areas that are either in production (e.g., field margins and hedgerows) or out of production (e.g., mixed cropping, conservation tillage, or habitat management for meadow birds) (Witvliet et al., 2024). Nevertheless, research on these programs has revealed that there is a variation in success, which is frequently linked to the farmers since participation is voluntary in most agri-environmental programs (Batary et al., 2015; Witvliet et al., 2024). Furthermore, farmers' practices are implemented differently depending on program-specific conditions (e.g. time horizon), which affects biodiversity results. Consequently, it might be valuable to gain deeper insights into which conditions may positively affect the participation rate in implementing measures aimed at agrobiodiversity. By assessing the influence of (combinations of) conditions, more insight will be created in which success conditions have to be present for farmers executing measures focused on agrobiodiversity.

1.1 Research problem statement

The Netherlands serves as a key example of a landscape dominated by highly intensive agriculture, with 54 percent (2.2 million hectares) of its total land area dedicated to agricultural use (CBS, 2020). This is often accompanied by maximizing productivity, which may jeopardize ecosystem services to the extent that farmers depend on external inputs, such as pesticides and fertilizers, to sustain productivity rises. These systems eventually collapse when they are out of balance or require further technology interventions to be productive, all at significant costs to the economy, society, and environment (Geiger et al., 2010; Buckwell et al., 2012). Since a healthy landscape may help biodiversity and vice versa, agricultural biodiversity, or agrobiodiversity, is extremely important. In addition to providing a unique environment for insects, birds, plants, and other creatures, landscape features like hedges and field borders help boost agricultural production (e.g. nutrition and biological plaque reduction) (Erisman et al., 2016, p. 160). Therefore, if a widespread transition to more environmentally friendly farming can be achieved, the agricultural sector also functions as one of the answers. The various programs and initiatives aimed at agrobiodiversity in the Netherlands are the instrument for achieving this. Given that involvement in most of these programs is optional, the farmer's participation relies on their

willingness to join the program and implement the necessary measures. The fundamental motivational factors that can influence farmers' adoption of agri-environmental practices are being studied, which helps in comprehending the reasons behind their participation. The conditions which are essential for participation according to Witvliet et al., (2024) are used in this research to discover which (combinations of) conditions seem important for farmers to implement and execute the measures of agri-environmental initiatives in the Netherlands.

1.2 Research objective

Numerous factors influencing the conditions for a successful transition towards agrobiodiversity have already been identified (see Witvliet et al., 2024). Therefore, instead of identifying new factors, this study focuses on exploring the significance of these different factors. Doing comparative research may offer deeper insights into the differing success conditions of agri-environmental initiatives in the Netherlands.

It is important to take in mind that there is no particular formula of specific success conditions that works for every case; instead, the most important factors can differ. For instance, the participation in an agri-environmental initiative may be dependent on financial compensation, but this may not be the case for all the initiatives. As stated by Berg-Schlosser et al., (2009), the concept of multiple conjunctural causation is supported by the fact that the influence of some conditions varies, and that more combinations can result in successful biodiversity restoration within agriculture. The theory of multiple conjunctural causation is followed in this study. Qualitative comparative analysis (QCA) is used in this research to achieve the study's objective. This is a suitable method since QCA takes the interdependency of conditions and their influence on the outcome in consideration.

By using measured indicators of success, this research aims to identify successful (combinations of) conditions that lead to the participation of farmers in agri-environmental initiatives in the Netherlands. In doing so, this research contributes to the knowledge on how this process takes place and is influenced by different conditions, but also how the conditions influence each other.

1.3 Research questions

Based on the research objective, the primary research question has been formulated as follows:

Which (combinations of) conditions are sufficient or necessary for the successful implementation of measures aimed at agrobiodiversity in Dutch agri-environmental initiatives?

The following sub-questions have been formulated to address the main question:

Subquestion 1:

- *What are the necessary conditions?*

Subquestion 2:

- *What are the sufficient conditions?*

Subquestion 3:

- *Which (combinations) of success conditions are present in the initiatives under examination, and to what extent does the success depend on these conditions?*

These questions are directly linked to the QCA method and correspond to the steps of the analysis. Combined, the sub-questions will provide an answer to the main question. The sub-questions and main question will be answered in chapter 6, the conclusion.

1.4 Relevance

1.4.1 Scientific relevance

Scientific substantiation on what motivates farmers to implement agri-environmental measures is crucial for the future of the agricultural sector. Increased understanding of this topic leads to more effective and efficient regulation, suitable measure formulation, and implementation. The new Agricultural Landscape Policy, which was introduced in 2023, is a prime illustration of how priorities in this industry are always shifting. Agri-environmental initiatives face numerous challenges, in which finding a balance between supporting farmers and engaging generically in improving climate and habitat are often central (Pancras, 2023). An assessment of the conditions under which the measures of initiatives are implemented by farmers is therefore useful.

In the existing literature it is indicated that a discrepancy between scientific knowledge in agricultural decision support systems and farmers' practical needs can hinder the adoption of new practices (McCown, 2002). Additionally, the decision of farmers to adopt agri-environmental measures (AEM) can be influenced by the level of regulations, farmers' attitudes and context factors associated with these measures and whether the farmers consider them acceptable (Bouma et al, 2020). There is plenty of literature on the ecological effectiveness of agri-environmental programs (Bartošová, 2015; Străteanu & Stan, 2018), as well as the variations in effectiveness (Galler et al., 2015; Batary et al., 2015). However, there is less known about which specific conditions are necessary to motivate farmers for the execution of agri-environmental measures. According to Witvliet et al., (2024), this is because scientific methodologies have largely concentrated on evaluating the impact of strategies without considering the specific details of what those strategies entailed, so no understanding is obtained of the specific resources that must be given to or taken away from farmers to inspire them to apply these AEM. Many studies have also been conducted on the role of contextual factors affecting the adoption of AEM (Blazy et al., 2011; Nyanga, 2012). As stated by de Graaf et al., (2010) further research is required on the large variance of contextual factors and how they influence the successful implementation of measures.

Additionally, this research contributes to the broader discussion on land use, particularly in the context of balancing agricultural production with biodiversity conservation. According to Fisher et al., (2014), this discussion is often framed within the "land sparing" and "land sharing" debate. Land sparing advocates for designating specific areas only for conservation, while other areas are intensively farmed. In contrast, land sharing involves integrating conservation efforts directly into agricultural landscapes through farming

practices that support biodiversity alongside crop production.

As the world deals with the dual challenges of feeding a growing population and preserving natural ecosystems, understanding how to effectively integrate conservation into agricultural practices is very important. This research, which looks at the conditions that lead to the successful implementation of agri-environmental measures, offers important insights into how biodiversity can be supported within active farming landscapes. By contributing to the understanding of what drives the adoption of such measures, this study provides valuable knowledge that can inform broader strategies in the debate, helping to identify practical solutions for sustainable land use that meet the needs for both agricultural and conservation goals.

Therefore, new scientific research should focus on assembling an effective mix of strategies rather than seeking one solution, as the success of agri-environmental measures is influenced by the interaction of various conditions rather than separate factors (Legewie, 2013). This study serves as an inventory testing these conditions and contributes valuable insights into the land sparing/land sharing debate by demonstrating that effective biodiversity conservation calls for a nuanced approach.

1.4.2 Societal relevance

Globally, biodiversity is under pressure. According to current trends, farmers, agricultural planners, and conservationists will need to reevaluate the connection between production agriculture and biodiversity conservation due to a persistent and increasing demand for agricultural and wild products as well as ecosystem services (Scherr & McNeely, 2007). Global trends are also evident in the Netherlands, particularly within the agricultural sector. In 2019, there were over 70,000 agricultural enterprises providing more than 240,000 jobs (CBS, 2020). Additionally, in 2017, these businesses collectively generated a net turnover of 29 billion euros (CBS, 2020). The agrocomplex is of significant importance to the Dutch economy. In recent years, the percentage of primary agriculture has increased and it has a profound relationship with other parts of the economy in the Netherlands (Van der Wal & Hoeksma, 2020). Changes in climate present many challenges for agricultural production; reducing greenhouse gas emissions is necessary, but agriculture also needs to be resilient to the impacts of climate change in order to guarantee food security.

In society, there are citizens, programs, and initiatives focused on environmental protection, who recognize the urgent need to preserve biodiversity in agricultural regions. However, taking part in certain actions focusing on biodiversity conservation still depends on voluntary participation. Farmers' behavior, as seen in how they adopt agri-environmental measures, often reflects consumer behavior and the urgent need for legislation to move towards a more environmentally friendly farming system. Insight into the conditions for the successful implementation of agri-environmental measures can lead to a better understanding of what motivates farmers to participate in such initiatives, independent of external factors, enabling a shift to more nature-inclusive agriculture.

This research can contribute to informing policy and legislative frameworks aimed at enhancing agrobiodiversity. By understanding the conditions for successful implementation, policymakers can design more effective interventions that support farmers. Stakeholders, including farmers, consumers, policymakers, and conservationists, will benefit from the

insights, which can lead to a more sustainable and resilient agricultural sector. Moreover, this aligns with broader environmental goals and international commitments, such as the UN Sustainable Development Goals (SDGs), ensuring long-term benefits for ecosystem health, economic sustainability, and food security (United Nations, z.d.).

2. Theoretical framework

In the scientific literature, many case-studies and analyses have been performed assessing the effectiveness of agri-environmental programs, trying to capture several essential conditions for the implementation of agri-environmental measures. Initially, the conditions used for this research are based on the framework by Witvliet et al., (2024), which identified over more than 60 programs aimed at agrobiodiversity and captured this into 10 Program Theories. In the following sections, various theories are discussed that underpin the framework by Witvliet et al., (2024) and the corresponding conditions. Furthermore, it will be discussed which conditions are used in this research.

2.1 Theoretical approaches for understanding farmer behavior

Comprehending the complex network of decision-making processes that influence farmer behavior is a fundamental effort in agricultural studies. The decisions farmers make in e.g. tillage, fertilizers, and grassland are crucial for the preservation of biodiversity and in shaping the agricultural landscape. To comprehend how these decisions are made, it is firstly important to understand how farmer behavior is formed. This research examines behavioral theories for a better comprehension of the rationale behind farmers' decisions to act in particular ways. These decisions can be defined as farmer behavior.

2.1.1 Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) from Azjen (1991) explains how people's attitudes, beliefs, and intentions influence their behavior. It relies on the idea that individuals are rational decision-makers who engage in behavior that they believe will lead to positive outcomes, while avoiding behavior that they believe will lead to negative outcomes. TPB is a well-established framework frequently used to explain environmental intentions and actions and can therefore be helpful in understanding farmer behavior towards biodiversity-based practices for agriculture. For example, Meijer et al., (2015) examined the tree-planting practices of Malawian smallholder farmers using this approach. They came to the conclusion that the most important factor influencing tree-planting behavior is attitude. Also, de Leeuw et al., (2015) assessed the fundamental assumptions underlying pro-environmental behavior among high-school students in Luxembourg. Their findings revealed an excellent fit for the TPB model. The theory is determined by three conceptually independent determinants (*attitude toward the behavior*, *subjective norm* and *perceived behavioral control*) which lead to *intention*. The outcome *behavior* is shaped directly by *intention*. This relationship is shown in figure 1. The Theory of Planned Behavior is based on the Theory of Reasoned Action (TRA) developed by Fishbein and Ajzen (1975). Figures of both models are provided below (figures 1 and 2). According to the TPB, *attitude towards the behavior* entails that a person's accessible beliefs about a behavior influence their attitude towards that behavior. A stronger positive attitude increases the likelihood of having positive intentions. *Subjective norms* can be seen as the perceived social pressures to perform or not perform a particular behavior. This includes both the individual's perception of what significant others think about the behavior and the individual's desire to conform to social norms. For example, if other farmers are viewed as important figures and their opinions are respected, they can positively influence changes in farmer behavior. Initiatives aimed at agrobiodiversity can also influence this subjective norm. If the majority of farmers cares about the opinions and ideas of these

initiatives, they can trigger a positive change in farmer behavior. In this way, subjective norms, and therefore biodiversity measures, can become embedded in what farmers perceive as good farming practices. The *perceived behavioral control* refers to the degree to which farmers feel they have control over the behavior they are considering. Factors that influence perceived behavioral control can be operationalized as resources, skills, opportunities, and constraints (De Snoo et al., 2013). Fishbein and Ajzen (2011) demonstrate how background factors - which can be classified as individual, social, or informational - have an impact on the three independent variables in their model of the TRA.

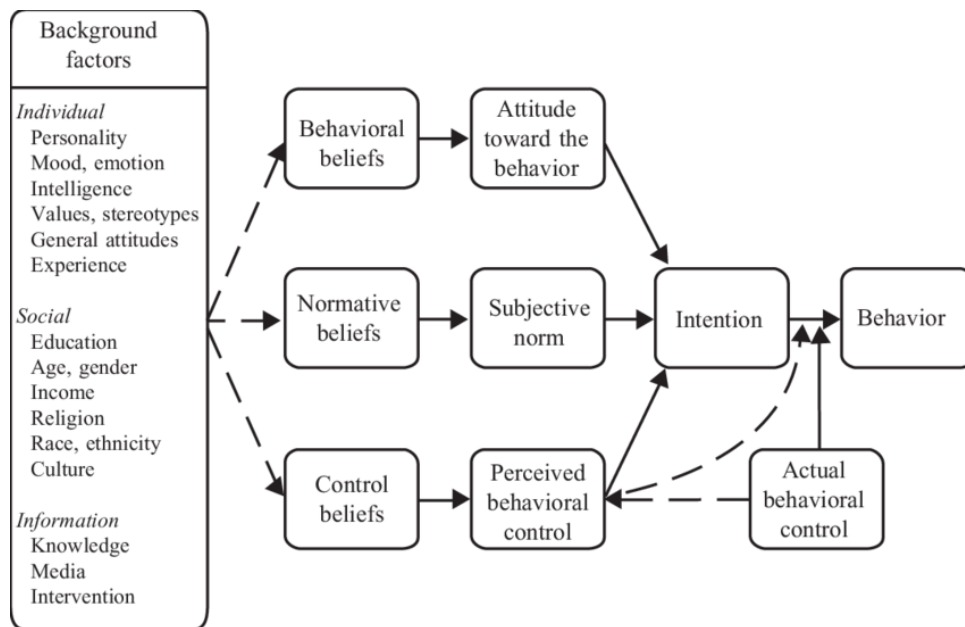


Figure 1. Theory of Reasoned Action model (Fishbein & Ajzen, 1975)

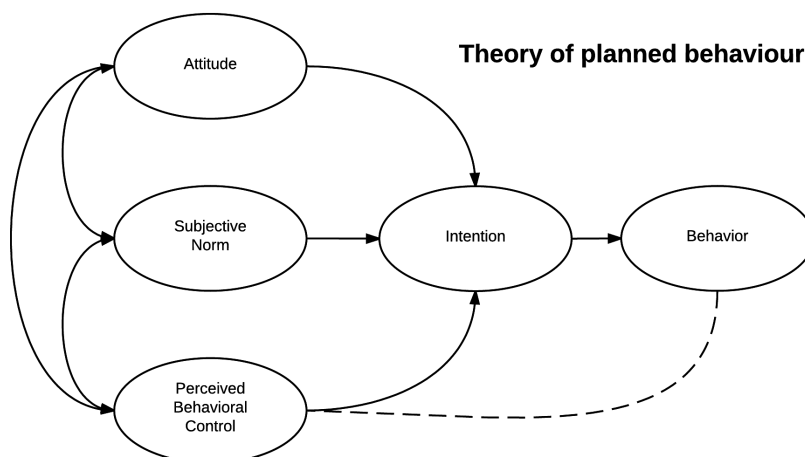


Figure 2. Theory of Planned Behavior (Ajzen, 1991)

A large number of environmental studies that apply TPB, incorporated additional constructs to the theory in order to enhance its predictive power. For instance, a construct that has been incorporated in many studies is the moral norm (Maleksaeidi & Keshavarz, 2019; Karimi en Saghaleini, 2021). Moral norm refers to the ethical obligation individuals feel

toward performing a particular behavior (Bamberg & Möser, 2007). Since farmer decisions are influenced by logical and emotional factors, moral norms are often added. Various studies also showed that knowledge can affect intention by enabling people to formulate strong arguments in supporting their intentions (Pieniak et al., 2010; Tama et al., 2021). Biodiversity knowledge includes farmers' knowledge regarding the concept of biodiversity, its value for humans and the environment, and the strategies for on-farm biodiversity conservation (Maleksaeidi & Keshavarz, 2019).

Although the Theory of Planned Behavior is typically useful for analyzing social behavior, it is essential to acknowledge that farmers might not consistently engage in biodiversity conservation or nature-inclusive farming simply because they hold favorable attitudes toward these practices. According to Fishbein & Ajzen (1975) and Ajzen (1991), a person's attitude affects the general pattern of responses to an object, but attitude alone cannot predict any action. Most of the background variables that Fishbein and Ajzen (1975) found as influencing factors on behavioral beliefs and attitudes toward behavior are determined and unchangeable. This suggests that farmer behavior can differ not only between individual farmers but also across regions with varying cultural and religious influences, which can affect personal attitudes to different extents.

2.1.2 Value-Belief-Norm Theory

Ecological behavior has been successfully predicted using a range of social-psychological models. In order to explain the specific action of public support for environmental movements, Stern et al., (1999) established the Value-Belief-Norm Theory (VBN). This is a theoretical framework that seeks to explain why people engage in pro-environmental behaviors and can therefore be used to study farmer behavior. The VBN-theory is derived from the Norm Activation Theory by Schwartz (1977). This theory seeks to explain how moral norms influence individual behavior. The theory suggests that individuals are more inclined to participate in prosocial behaviors (actions that benefit others) when they feel a moral duty to do so and believe that their actions will have a meaningful impact. Within the VBN framework, general environmental worldviews are illustrated by the New Ecological Paradigm (NEP) created by Dunlap and Van Liere (1978), which draws on a set of beliefs about the interaction between people and the natural environment. The NEP perspective depicts the contrast between the anthropocentric view, which holds that people have the right to use the natural environment, and the ecocentric view, which holds that people are only a part of the environment. The VBN theory suggests that people's behavior toward environmental issues is influenced by their values, beliefs, and social norms. This understanding of the negative consequences of inaction leads to a personal norm that supports pro-environmental actions, such as activism, civic participation, policy support, or eco-friendly habits in daily life (Stern et al., 1999). This is illustrated in figure 3, which shows the application of the theory to environmentalism. The VBN theory brings together the Norm-Activation Theory (Schwartz, 1977), the New Ecological Paradigm (Dunlap et al., 2000) and the Value Theory (Schwartz, 2012). This model can be visualized as a sequence where awareness leads to a sense of responsibility, which in turn develops personal norms and eventually drives changes in behavior.

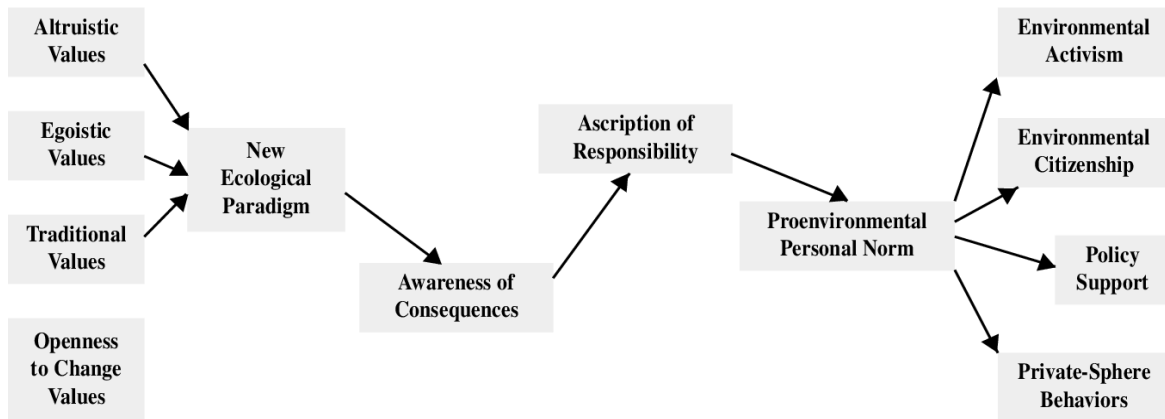


Figure 3. Schematic representation of the variables in the Value-Belief-Norm theory and how it relates to environmentalism (Stern et al., 1999)

Johansson and Lindström (2011) demonstrated the value of the personal norm for supporting biodiversity conservation. Many studies on environmentally significant behavior have confirmed the causal links suggested by the VBN theory. For instance, farmers who place a high value on biodiversity and see it as an essential component of sustainable agriculture are more likely to adopt conservation practices. Johansson, Rahm, and Gyllin (2013) modified the VBN theory to examine landowners' involvement in biodiversity conservation. Their adapted model illustrates how specific values, beliefs, and personal norms drive participation in biodiversity restoration initiatives. As shown in figure 4, the sequence begins with fundamental values that form the core of an individual's personality, then progresses through a more specific belief system - namely, the ecological worldview, which addresses the relationship between humans and nature, the impact of human actions, and the individual's duty to take responsibility. These factors then trigger a personal norm, which is a sense of moral obligation to act in a certain manner.

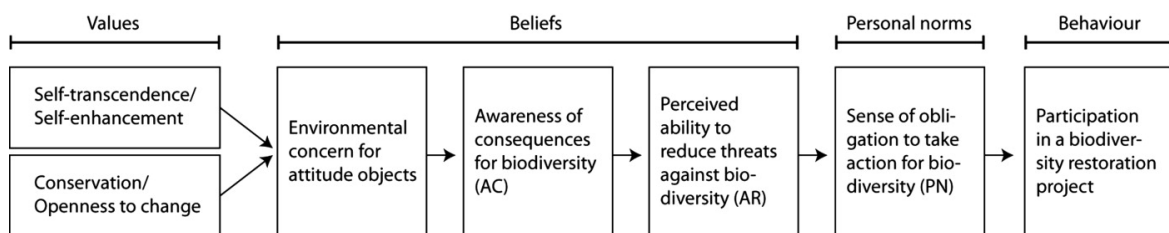


Figure 4. The Value-Belief-Norm theory as applied to participation in biodiversity conservation projects (Johansson, Rahm & Gyllin, 2013)

2.1.3 Theory of Capital

Social and cultural norms significantly influence farmer communities, serving as social standards that influence acceptable and unacceptable behavior based on shared beliefs within the farming culture. These norms are often passed down through generations (Burton et al., 2008). Cultural norms within farming communities concerning 'being a good farmer' influence farm management decisions in two ways. First, a farmer strives to be a 'good farmer' based on cultural norms. This way cultural norms have an impact on farm management decisions. Second, cultural norms affect farm management choices by

influencing decisions based on the opinion of colleagues. Self-identity is then influenced by feedback from the social environment (Westerink et al., 2021). These cultural norms regarding the 'good farmer' within farmer communities can be placed in the context of the Theory of Capital by Bourdieu (1986). Bourdieu identifies three forms of capital: *economic*, *social*, and *cultural capital*, each of which can be converted into one another through a fourth form known as *symbolic capital*. Burton and Paragahawewa (2012) and Burton (2011) argue that the social status of farmers within local communities, influenced by their cultural and social capital, is crucial for understanding their decisions regarding biodiversity conservation. Therefore, this research focuses on cultural capital, its connection to social capital, and the role of symbolic capital in converting cultural capital into social capital and vice versa. Symbolic capital represents the status or value attributed to other forms of capital - social, cultural, and economic - and facilitates the exchange between these different forms (Bourdieu, 1986). There are three types of cultural capital, the two that are most relevant to this research are *objectified* and *embodied cultural capital*.

Many farmers find the unpredictability and uncontrollability of nature hard to combine with their identity as a good farmer. In general, 'good landscape' is characterized by its neatness and orderliness, featuring a well-maintained crop, straight planting rows, healthy livestock, no soil erosion, and carefully tended landscape elements, all while being free from weeds (Westerink et al., 2021). The 'tidy landscape' can be seen as objectified cultural capital. The skills and knowledge one possesses that are in line with being a 'good farmer', can be seen as embodied cultural capital. The current cultural norm of a tidy and productive landscape is hard to combine with the 'untidy' character of biodiversity enhancing features and can lead to a loss of status of a farmer within the farmer community (Burton et al., 2008). This can be a restraining factor for farmers to engage in practices aimed at biodiversity restoration. A shift toward more biodiversity-friendly agriculture would include the creation of new forms of embodied cultural capital alongside new forms of objectified cultural capital. Adopting different cultural norms may need a new social environment where these alternative practices and associated skills are valued and recognized (Westerink et al., 2021). Many farmers would need to acquire new cultural capital in order to adopt nature-inclusive farming: the ability to farm successfully while also being able to recognize these abilities on other people's land.

2.1.4 Preconditions for farmers to adopt and implement nature conservation measures.

Westerink et al., (2021) pay attention to the fact that the decision-making of farmers to change their practices, is influenced by several preconditions of the farmer and other actors. To better understand the complexity of the farmer's choice, she uses a framework in which she builds on Runhaar et al., (2016). That assumes that four preconditions must be met before a farmer can choose for nature-inclusive farming.

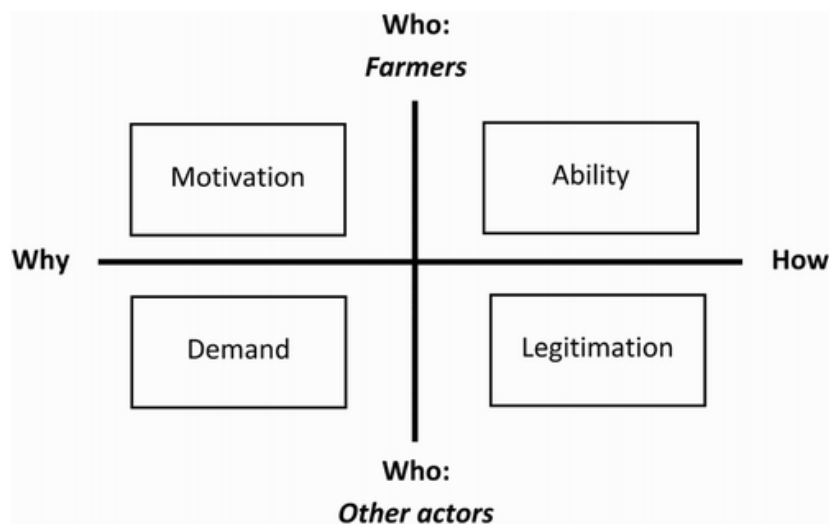


Figure 5. Preconditions for farmers to adopt and implement nature conservation measures (Runhaar et al., 2016)

Figure 5 visualizes this framework. Motivation and ability are mainly characteristics of the farmers themselves, whereas demand and legitimation stem from external actors. The *motivation* of the farmer is the first and most important prerequisite and is, according to Runhaar et al., (2017), referred to as the “extent to which farmers are motivated to participate in a nature conservation governance arrangement”. This concerns the farmer's self-image, what he or she thinks makes a good farmer and is closely connected to a feeling of ownership over nature conservation (Westerink et al, 2021; de Snoo, 2011). A person's motivation and the ability to change behavior are often discussed together. *Ability* refers to the extent to which farmers can effectively engage with a nature conservation governance arrangement and refers to being in possession of resources and skills needed for nature conservation, for instance business style, fit and knowledge (Termeer et al., 2013; Runhaar et al., 2016).

One specific type of resource frequently highlighted in literature on farmers' involvement in nature conservation is social capital. Social capital plays a significant role in understanding farmer behavior and is an important precondition for participation and collective action. It entails shared norms and relationships of trust among farmers and other actors. In the Netherlands, programs or initiatives aimed at agrobiodiversity are frequently regarded as crucial for creating social capital (Nieuwenhuizen et al., 2014). Social capital ensures farmers are able to implement biodiversity conservation measures but also might inspire them to engage in these practices. Because a farmer is not able to make the transition toward agri-environmental practices alone, there is a constant exchange with the environment. External actors representing parts of society, such as government agencies or NGOs, may call upon the farmer to move to different business operations. This is considered the condition of *demand*, which is “the extent to which farmers are requested or even obliged to participate in a nature conservation governance arrangement” (Runhaar et al., (2017, p. 268). Demand encompasses market demand, regulations, public opinion, subsidy schemes, etc. (Westerink et al., 2021).

Finally, *legitimation* pertains to the degree to which farmers are authorized to participate in and operate within a nature conservation governance framework. This includes permission to implement nature conservation measures and has both legal and normative components.

Governmental restrictions may legally prevent some types of conservation, while normatively, stakeholders can influence whether production standards are considered appropriate or acceptable (Buizer et al, 2016). This includes adapting rules or influencing cultural norms. However, the environment can also create a lack of space to move towards nature-inclusive agriculture. These restrictions may be due to regulations that hinder certain nature-inclusive measures and innovations, or cultural norms within the farming community which discourage farmers (Westerink et al., 2018). Motivation and demand offer the reasons for adopting nature conservation measures, while ability and legitimation serve as facilitating or supporting elements. The conditions ability and motivation are therefore influenced by the conditions demand and legitimation.

2.2 A theory-driven framework for the design and implementation of successful agri-environmental programs

In the scientific literature focused on biodiversity-based practices in agriculture, various theories aim to explain farmer behavior, similar to the previously mentioned theories. However, there are also studies that try to bring these theories together, trying to develop a comprehensive framework. An example of an integrative approach is the systematic literature review from Witvliet et al., (2024). This study highlights that programs aimed at changing agricultural practices in intensive agricultural countries have been extensively researched in their ecological effectiveness. It has become clear that some of these Agri-Environmental Programs (AEP) increase biodiversity, while others don't have the desired effects. The causes of the variations in effectiveness often lies with the farmers, since their role is of significant importance in determining the success of the AEPs. Furthermore, farmers' activities are implemented according to program-specific conditions, which influence biodiversity results. Given that most AEPs include voluntary engagement from farmers, it is important to know how, when and why farmers work on AEPs. However, limited research has been done on this, for example on gaining deeper insights on contextual factors or on what 'might cause change'. Witvliet et al., (2024) aim to address this gap by providing a theory-driven understanding of strategies that are effective under specific circumstances. Their work seeks to explain why these strategies are effective by examining the reasoning and motivation of farmers, integrating insights from multiple theoretical perspectives.

Witvliet et al., (2024) conducted a realist review to be able to produce one or more theories to explain particular phenomena, in this case how, when and why farmers work on AEPs. By questioning, "What makes this strategy effective in this context and why does it produce certain outcomes?" they attempt to comprehend causation by connecting strategies (S), contexts (C), mechanisms (M) and outcomes (O) (SCMO configurations). This is displayed in Table 1.

Realist concepts used in Witvliet et al., (2024) study	Definitions
Strategy (how)	The intended plan of action (Haynes et al., 2018; Steenkamer et al., 2020a). Strategies underlie the AEPs. Strategies aim to create change by offering or reducing resources (e.g. financial resources, information, skills, material resources) in a given context. Strategies are targeted at motivating farmers to change their behavior toward biodiversity conservation.
Context (when)	Refers to the 'backdrop' in which strategies are implemented and which can be understood as any condition that triggers mechanisms (Jagosh, 2019). Contexts refer to the multi-level socio-cultural, economic, political, historical or relational conditions that can inhibit or facilitate change as a result of the implemented programme strategies (Glasgow et al., 2012; Steenkamer et al., 2020a).
Mechanism (why)	Generative force that leads to outcomes (Jagosh, 2019). The mechanism refers to the reasoning and motivations of farmers as a response to the intended resources that the strategy offers or takes away in specific contexts.
Outcome	The outcome of AEP strategies, which are implemented within a certain context. Outcomes refer to farmers' behavioral change toward biodiversity conservation, i.e. ranging from thinking about biodiversity conservation, adopting biodiversity conservation measures, and sustained working on these measures (after programmes end). Successful AEPs succeed in motivating farmers to change their behavior toward biodiversity conservation. All outcomes are a result of interactions between the altered contexts and mechanisms (Jagosh, 2019). Outcomes could be intended or unintended, and can be proximal, intermediate or final (Jagosh et al., 2014).
SCMO configurations	Heuristics that portray the relationships between strategies, context, mechanism, and outcome (Haynes et al., 2018; Steenkamer et al., 2020a). The SCMO configuration is a basic framework for realist causal explanation and used for unpacking generative causation (Jagosh, 2019). The SCMO configurations in the current study present the strategies aimed at motivating farmers to change their behavior toward biodiversity conservation which, when implemented in a specific context, change this context and consequently trigger mechanisms to cause certain outcomes.
Program Theory	Hypotheses about how a strategy is expected to work, given contextual influences and underlying mechanisms, and what outcomes will be generated (Jagosh, 2019; Pawson, 2013). In contrast to programmes, 'programme theories' are transferable as they suggest that certain programmes are more or less likely to work in certain ways, for certain people, in certain situations (Jagosh, 2019; Pawson, 2013; Saul et al., 2013)

Generative Causation	Pertains to the idea that underlying, hidden mechanisms generate outcomes (Jagosh, 2019; Pawson, 2006)
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Table 1: Realist concepts used in the study of Witvliet et al., (2024)

The review identifies 10 Program Theories (PTs), that explain how, when and why farmers work on AEPs. Since, for this research, the conditions are determined on the basis of the Strategies (how) and Contexts (when) of the specific PTs, only these concepts are of relevance for this research. The 10 identified PTs are shown in table 2.

	Program Theory
1.	Facilitate that farmers can make sense of new, uncertain or ambiguous situations related to agri-environmental measures, in order for farmers to feel that they can get a better understanding of these measures and as a result, can make a socio-cognitive shift to transition towards new agricultural practices.
2.	Stimulate farmers to develop or demonstrate skilled role performance within strategies of agri-environmental programs, in order for farmers to feel that their new attitudes and behavior are appreciated by others based on the recognition of shared symbolic significance and as a result, the adoption of new agri-environmental measures will be stimulated.
3.	Facilitate farmers' understanding that the new norms and values associated with the new agri-environmental identity do not downplay or reduce their existing identity in order for farmers to feel that they can incorporate the new identity and adopt agri-environmental measures.
4.	Stimulate interaction within horizontal and vertical knowledge networks, in order for farmers to feel inspired and more confident in adopting agri-environmental measures.
5.	Stimulate engagement in experimentation with agri-environmental measures - leading to tangible results, in order for farmers to feel more ownership and empowered to adopt agri-environmental measures.
6.	Invest in pre-contractual trust-building in order for farmers to view the contracting partner as trustworthy, which will foster long-term cooperation around agri-environmental measures.
7.	Introduce financial arrangements that make farmers weigh out the risks and benefits in such a way that farmers feel confident enough to participate in agri-environmental programs
8.	Include all stakeholders of the supply and demand market within the programs, in order for farmers to feel a sense of fairness and reciprocity in light of new incentives that reward farmers to maximize positive impacts of agri-environmental programs.

9.	Create a program governance structure that reflects regional or local representation, in order for farmers to feel ownership and shared responsibility which as a result stimulates the legitimacy of the program.
10.	Align programs with agri-environmental policies and regulations at different levels of government, in order for farmers to gain trust in and a better understanding of the program, leading to clear expectations about what is expected of farmers concerning agri-environmental measures.

Table 2. The 10 different program theories by Witvliet et al., (2024)

The main focus of this research is identifying successful combinations of conditions that lead to the desired outcome. Understanding the differences between farmers, initiatives, and the specific conditions they face is crucial within this context. The Qualitative Comparative Analysis (QCA) approach is particularly well-suited to this task because it emphasizes understanding these differences by analyzing cases individually and in detail. Unlike traditional methods that often rely on a probabilistic scope, where the goal is to identify general patterns and predict outcomes based on statistical probabilities across large populations, the QCA approach seeks to uncover the specific configurations of conditions that lead to success in different contexts. The framework introduced by Witvliet et al., (2024) provides a comprehensive understanding of why certain AEP strategies work in certain contexts and why it leads to specific outcomes. In this framework, a realist approach is employed to gain insights into which programs are effective for farmers in specific contexts and to explain how and why they work (Witvliet et al., 2024). This approach is particularly suitable as it accounts for the differences among farmers, initiatives, and solutions, making it a strong foundation for this QCA. Given the broad nature of the research question, all ten Program Theories (PTs) could indeed be relevant. However, due to the limited timeframe for conducting this research, it is not feasible to fully analyze all ten PTs along with their associated strategies and contexts. As a result, a selection was necessary. The ten PTs were carefully reviewed, and those that align most closely with the dominant theory-models were chosen. This selection process led to the inclusion of PT1, PT3, PT4, and PT7. To gain a better understanding, the used PTs and what they entail will be discussed shortly below.

The first program theory by Witvliet et al., (2024) aims to facilitate farmers' understanding of new, uncertain, or ambiguous situations related to agri-environmental measures (AEM). This understanding is crucial for farmers to gain clarity and improve their comprehension of these measures. Consequently, they can experience a socio-cognitive shift towards adopting new agricultural practices. The theory emerged from the observation that farmers often struggle to capture the objectives and long-term perspectives of AEM, including indicators of effective agri-environmental management and methods to achieve them. Through a review process, three essential implementation strategies were identified. These strategies are designed to help farmers comprehend and navigate new or uncertain situations associated with AEM. Specifically, they assist farmers in understanding the productivity benefits of on-farm biodiversity restoration (agrobiodiversity). This newfound understanding stimulates socio-cognitive shifts, enhancing farmers' perceptions of what makes a 'good farm' and their recognition of the long-term agronomic benefits. It also helps them better tolerate temporary difficulties associated with these transitions.

The third program theory aims to help farmers understand that embracing new norms and values in agri-environmental practices does not reduce their existing identity. This understanding encourages farmers to incorporate these new practices and adopt agri-environmental measures. It highlights the significance of strategies that promote a new approach to farming, defining what makes a 'good farmer.' Program strategies should encourage farmers to identify with a group, learning together in groups, which can lead to changes in their underlying values, self-perception, and how they view the aesthetics of cultivated fields. This shift should help farmers recognize that they can incorporate the new norms and values of being a 'good farmer' into their identities without losing their original identity. For instance, visiting other farms demonstrates how agri-environmental measures are integral to being a 'good farmer.' However, the review identified a significant flaw in many European agri-environmental schemes (AES): they often fail to effectively integrate traditional productivist farming with new agri-environmental practices. These schemes frequently require managing certain conservation areas separately from farmers' traditional and productivity-focused fields.

The fourth program theory is about stimulating interaction within both horizontal and vertical knowledge networks, which enhances farmers' confidence and inspiration to adopt agri-environmental measures (AEM). Horizontal networks involve farmer-to-farmer interactions, which are highly effective for learning and sharing experiences. Farmers gain confidence and inspiration through relational trust, peer pressure, and social learning communities. Hosting visits and sharing success stories further encourage hesitant farmers. Vertical networks include interactions with extension professionals, advisors, scientists, and governmental actors. This builds trust and confidence, especially when these actors are locally embedded and have farming backgrounds. However, mistrust in government, reliance on commercial knowledge sources, and education focused on conventional farming can hinder these strategies. Thus, targeting both horizontal and vertical knowledge networks creates a supportive environment for adopting AEM.

Program Theory 7 involves implementing financial arrangements that help farmers assess the risks and benefits, thereby giving them the confidence to engage in agri-environmental programs. Key strategies include providing payments for following to programme conditions, rewarding biodiversity goals, and offering flexible contract lengths. While financial incentives are crucial, they must be complemented by additional support, such as advisory services and educational resources, to fully motivate farmers. Enabling factors include farmers' environmental values and the financial security provided by AEM payments, while inhibiting factors involve perceived external interference, inadequate cost coverage, and high transaction costs. Effective financial strategies, therefore, combine direct payments with broader support mechanisms to enhance the adoption and long-term engagement in agri-environmental practices.

In the operationalization, the conditions identified in these Program Theories that are utilized for this research will be outlined, along with explanations of their respective meanings.

3. Operationalization

3.1 The outcome

The earlier chapters discuss the theoretical foundations for the conditions that might lead to farmers adopting and implementing biodiversity conservation measures. This chapter will present how effective motivation of farmers to adopt biodiversity conservation practices results from the success conditions outlined in the theoretical framework. The level of success in agricultural nature conservation can be assessed through various factors. In this research, the outcome refers to changes in farmers' behaviors toward biodiversity conservation, encompassing stages such as considering biodiversity conservation, implementing conservation measures, and continuing these practices even after the programs conclude. These outcomes arise from the interactions between adjusted contexts and mechanisms (Jagosh, 2019). They can be either intended or unintended and are typically classified as proximal, intermediate, or final (Jagosh et al., 2014).

The indicators of success that are defined in this research can be regarded as a sliding scale: from non-observable behavior (i.e. thinking differently) to observable behavior (i.e. agrarians adopting the measure(s) or method(s), incorporating it into their operations, wanting to apply it on a larger scale, etc.). The two indicators of success will be defined and introduced in the next section of this chapter.

3.1.1 Non-observable behavior

In this research the non-observable behavior refers to farmers thinking differently, i.e. socio-cognitive or affective/normative shift. Thinking differently is a crucial indicator of success for implementing nature conservation practices among farmers because it shows a fundamental shift in mindset and approach toward agricultural practices (Michie, van Stralen, & West, 2011). When farmers begin to adopt new perspectives, they become more receptive to integrating sustainable and conservation-oriented methods into their routines. This cognitive shift is important for the long-term success of conservation efforts, as it ensures farmers are not only following guidelines but are genuinely committed to preserving biodiversity and the ecosystem (Kerselaers et al., 2007).

A change in thinking reflects an understanding and appreciation of the ecological, economic, and social benefits of nature conservation. It indicates that farmers recognize the importance of biodiversity for the health of their crops, soil, and the overall environment. Moreover, it shows that they are willing to innovate and adapt their practices to align with conservation goals, leading to more resilient and sustainable farming systems. Thus, promoting a change in mindset is a critical step toward achieving lasting and effective conservation outcomes. The questions in the survey seek to find out how many of the participants this relates to. The non-observable behavior scores in this research in percentages. Here, 0 to 9 percent represents a minimal presence in the sample, 10 to 49 percent suggests it is not widely prevalent but still noteworthy within the sample, 50 to 89 percent suggests it is prevalent or common within the sample and 90 to 100 percent indicates widespread agreement or consensus within the sample.

Question	Short description	Scale / answer categories
<i>How many participants are more aware of the added value of the measure(s) for agricultural operations?</i>	This question seeks to determine the number of participants who have increased their understanding of the benefits provided by certain measures in agricultural operations.	-Nobody or almost nobody (0-9) -Minority (10-49) -Majority (50-89) -Vast majority (90-100)
<i>How many participants are more aware of the fit of the measure(s) within their business operations?</i>	This question aims to find out how many participants have gained a better understanding of how well certain measures align with and benefit their business operations.	-Nobody or almost nobody (0-9) -Minority (10-49) -Majority (50-89) -Vast majority (90-100)
<i>How many participants came to consider the measure(s) as part of regular business operations?</i>	The question seeks to determine the number of participants who have begun to integrate the measures into their regular business operations.	-Nobody or almost nobody (0-9) -Minority (10-49) -Majority (50-89) -Vast majority (90-100)

Table 3. Questions used in the survey for the measurement of success (non-observable behavior), with corresponding answer categories.

3.1.2 Observable behavior

Observable behavior, such as farmers adopting conservation measures, integrating them into their operations, and expressing a desire to apply them more widely, serves as a crucial indicator of success for the implementation of nature conservation practices. This observable action reflects concrete changes in farmers' practices and attitudes toward conservation. When farmers actively engage in adopting and applying conservation measures, it demonstrates their commitment to sustainable land management and biodiversity preservation. Furthermore, observable behavior indicates the practical feasibility and effectiveness of the implemented practices, showing their potential for long-term environmental benefits (Jara-Rojas et al., 2020). Thus, monitoring and encouraging observable behavior among farmers provide valuable insights into the progress and effectiveness of nature conservation efforts within agricultural landscapes. In this research, the observable behavior, i.e. agrarians adopting the measure(s) or method(s), incorporating it into their operations, wanting to apply it on a larger scale, etc. is measured in the same way as the previously mentioned success indicator.

Question	Short description	Scale / answer categories
<i>How many participants continued the measure(s) after the initiative ended?</i>	The question aims to find out how many participants sustained the use of the measures after the initiative concluded.	-The initiative has not ended yet -Nobody or almost nobody (0-9) -Minority (10-49) -Majority (50-89) -Vast majority (90-100)
<i>How many participants are motivated to implement the measures or practices on a broader scale?</i>	This question aims to assess the extent of participants' motivation to expand the application of certain measures or practices beyond their current scope.	-Nobody or almost nobody (0-9) -Minority (10-49) -Majority (50-89) -Vast majority (90-100)
<i>How many participants want to make broader changes to their operations for biodiversity restoration, among other things?</i>	The question seeks to find out how many participants are interested in making broader changes to their operations, including efforts for biodiversity restoration.	-Nobody or almost nobody (0-9) -Minority (10-49) -Majority (50-89) -Vast majority (90-100)

Table 4. Questions used in the survey for the measurement of success (Observable behaviour), with corresponding answer categories.

It is important to note, that for the analysis, the two indicators of success, non-observable and observable behavior, were combined. The Cronbach's Alpha is often used to measure the internal consistency of a set of conditions, indicating how well the conditions together measure a construct. For the combination of two indicators, it is important that the Cronbach's Alpha has a sufficiently high value to indicate that the items form a reliable whole. In the social sciences, a Cronbach's Alpha value of 0.70 or above is typically considered acceptable for aggregating conditions. A value ranging from 0.70 to 0.80 is regarded as quite good, while a value exceeding 0.80 is considered very good (Tavakol & Dennick, 2011). An analysis was conducted to test the Cronbach's Alpha of the two indicators of success together, which is 0.8. This states the indicators can be combined, with the overall score being interpreted as good to very good.

3.2 The conditions

The conditions used in this study are selected based on the 10 Programme Theories of the theory-driven framework for the design and implementation of successful agri-environmental programmes by Witvliet et al., (2024). The framework consists of 10 PT's, with in total 83 underlying strategies and contextual factors, that explain how and when AEP outcomes are achieved. However, using all these strategies and contextual factors as conditions, would negatively affect the reliability of the results. With a large number of conditions, the complexity of the analysis increases. Moreover, the potential combinations of these conditions grow exponentially. For instance, with 5 conditions, there are $2^5 = 32$ possible combinations, but with 10 conditions, there are $2^{10} = 1024$ combinations. This complicates

the identification of clear and meaningful patterns and increases the chances of finding misleading relationships (Schneider & Wagemann, 2012). Therefore, in the analysis with 30 cases, a selection of 5 conditions was made. Firstly, by selecting the PTs to be included in the research. This choice is firstly based on the dominant theory models corresponding to the theories in the theoretical framework of this study. Those program theories are PT1, PT3 and PT4. These PT's emphasize the importance of norms, values, and identity. They provide networks, knowledge, and support, and encourage the creation of a common sense of purpose, focusing more on the softer aspects of capacity building. On the other hand, PT 7 was later incorporated, as it addresses the more tangible, financial aspects of support. This policy tool provides direct financial incentives, which complement the softer approaches by addressing immediate economic needs. This approach facilitates a more integrated and holistic perspective on agricultural practices, considering not only financial aspects but also social and cultural dimensions. Subsequently, from the corresponding strategies/contextual factors, five were chosen to use in this research as conditions (see Table 5).

PT1: Facilitate that farmers can make sense of new, uncertain or ambiguous situations related to agri-environmental measures, in order for farmers to feel that they can get a better understanding of these measures and as a result, can make a socio-cognitive shift to transition towards new agricultural practices.	
Communicate local monitoring data to farmers and frame issues in terms of personal relevance of biodiversity decline and ecosystem degradation.	Distribution of information regarding biodiversity decline and ecosystem degradation, specifically local monitoring data that enables farmers' identification with local landscapes.
Emphasize the benefits of AEM to society in terms of ecoservices.	Figure head farmers demonstrate and show their support for AEM and encourage other farmers to sign up for the program.
Practically demonstrate the agronomic benefits of AEM by using a functional agrobiodiversity approach.	Too few figurehead farms that can showcase their success to other farmers.
PT 3: Facilitate farmers' understanding that the new norms and values associated with the new agri-environmental identity do not downplay or reduce their existing identity in order for farmers to feel that they can incorporate the new identity and adopt agri-environmental measures.	
Organize farmers' study groups to facilitate group identification via social learning.	Programs play into the increasing value that society places on biodiversity and nature.
Organize farm visits to facilitate group identification via social learning	Productivist farmers, especially when they are not well networked or not part of any social grouping, are reluctant to compromise their ability to make a profit.
Lead farmers demonstrate and show their support for AEM and encourage other farmers to sign up for the program.	Farmers who view the protection of biodiversity restoration as societal issues that are outside their responsibility.
Productivist values have been dominant since World-War II and are exacerbated by narratives about threats to food security.	AES in Europe insufficiently integrate the old (i.e. productivist farming) and new AEM as schemes prescribe the management of specific conservation areas, separate from their conventional fields.

PT4: Stimulate interaction within horizontal and vertical knowledge networks, which makes farmers feel inspired and more confident in adopting agri-environmental measures.	
Develop horizontal knowledge networks. (target farmer peer-groups rather than individuals)	Extension professionals, advisors, intermediaries, (conservation) scientists and governmental actors being locally embedded.
Develop vertical knowledge networks.	Extension professionals, advisors, intermediaries, (conservation), scientists and governmental actors having farming backgrounds.
Peer pressure in farmers' networks	Implementation of the programme in an area with high levels of mistrust in the government.
Farmers not having access to independent extension services and highly depending on commercial actors.	Educational systems predominantly offer education according to the productivist model and lack sufficient teaching material on AEM.

PT 7: Introduce financial arrangements that make farmers weigh the risks and benefits in such a way that they feel confident enough to participate in agri-environmental programmes.	
Offer financial incentives as long as farmers respect programme conditions (action-oriented programme).	Farmers' high land costs, small margins, short lease contracts, lack of access to funds that cover transitions costs.
Provide farmers with a basic rate for establishing the programme, and reward farmers for achieving (biodiversity) goals (mixed action- and result oriented programme)	Farmers' negative attitudes towards biodiversity and nature conservation.
Offer farm advisory visits, educational support and material – in case no financial support is offered (unsubsidized programme)	Farmers having norms and values that pertain to environmental concerns and being intrinsically motivated to protect nature.
Large (efficient) farms, using AEM as subsidiary income.	Farmers are guaranteed an income.
Farmers who implement AEM for the first time or who perceive AEM as risky.	Farmers are provided with long-term financial security.
Farmers are not guaranteed an income.	High transaction costs for farms that have very specific and valuable assets (e.g. machinery)

Table 5. Strategies and context configurations are based on Witvliet et al., (2024). The blue-highlighted configurations indicate the condition 'Visits', the orange-highlighted configuration indicates the condition 'Professionals', the yellow-highlighted configuration indicates the condition 'Demonstrate Benefits', the green-highlighted configurations indicate the condition 'Type of Expertise' and the gray-highlighted configurations indicate the condition 'Financial Compensation'.

3.2.1 Condition *Visits*

The condition 'Visits' in this research refers to organizing farm visits to stimulate the adoption of AEM among farmers. Through visits, group identification via social learning is facilitated, which is an effective strategy to promote AEM. These visits allow farmers to see successful examples of AEM in practice, fostering a sense of community and shared purpose. In terms of horizontal knowledge networks, the review by Witvliet et al., (2024) found that farmer-to-farmer interactions are the most effective approach to learning. Agri-environmental program (AEP) strategies that facilitate these networks allow farmers to discuss and share knowledge, ideas and experiences, thereby fostering inspiration and confidence through relational trust. Moreover, AEP strategies that encourage farmers to experiment and observe long-term tangible results demonstrate the practicality of AEM, thereby motivating farmers to adopt these measures. The reason behind this motivation is that understanding the effectiveness of AEM, for instance provided through visits to agrarians who have been implementing the measures for an extended period and take pride in their systems, can boost confidence in hesitant farmers and promote new practices (Birge & Herzon, 2019; Borremans et al., 2018; Burton et al., 2008). In this study, the abbreviation for the condition 'Visits' will be referred to as *VIS*.

3.2.2 Condition *Professionals*

The condition 'Professionals' refers to professionals with specialized knowledge and expertise in the context of agri-environmental programs. From PT4, it is understood that an enabling context (C+) for the strategy 'create vertical knowledge networks' is: 'C+: Extension professionals, advisors, intermediaries, (conservation) scientists, and governmental actors with farming backgrounds'. Their knowledge and experience are essential for promoting environmental stewardship, enhancing agricultural productivity, and addressing challenges related to climate change and resource conservation in agriculture. Regarding vertical knowledge networks, the review by Witvliet et al., (2024) reveals that strategies encourage farmers to engage with extension professionals, advisors, intermediaries, conservation scientists, and governmental actors having a farming background within these networks. The process through which these strategies operate is similar to that of horizontal networks. The abbreviation for the condition 'Professionals' will be referred to as *PROF*.

3.2.3 Condition *Demonstrate Benefits*

The condition of demonstrating the agronomic benefits of AEM aims to practically demonstrate and communicate what (functional) agri-environmental management approaches farmers' businesses can take. It refers to the fact that it is crucial to understand the motivation behind different environmental activities, as this can guide the development of effective engagement strategies and message framing. Intrinsic motivations include a personal interest in wildlife and social concerns related to pollution and reputation. However, extrinsic motivations, especially agronomic benefits, play a significant role in driving these practices (Burton et al., 2008; Home et al., 2014). By showcasing the tangible agronomic benefits, such as improved soil health, increased biodiversity, and better crop yields, farmers can see the direct positive impact on their business. Practical demonstrations can provide clear examples of how integrating AEM practices leads to these benefits. This approach will help farmers understand that adopting AEM is not just beneficial for the environment but also

enhances farm productivity and long-term sustainability. The abbreviation for the condition 'Demonstrate Benefits' will be referred to as *DEM*.

3.2.4 Condition *Type of Expertise*

The condition 'Type of Expertise' in this study refers to the background and local engagement of key actors such as extension professionals, advisors, intermediaries, conservation scientists, and governmental actors involved in agri-environmental initiatives. Specifically, this expertise is characterized by two main attributes. First, these actors are locally embedded, meaning they have a deep understanding and connection to the local ecological, social, and agricultural context. Their local engagement allows them to adapt their advice and interventions to the specific needs and conditions of the area, fostering more effective and sustainable outcomes. Second, many of these actors have farming backgrounds, which provides them with practical experience and insights into the agricultural practices and challenges faced by farmers. This combination of local knowledge and practical farming experience equips these professionals with a unique and valuable perspective, enhancing their ability to support and guide farmers in implementing agri-environmental measures successfully. The abbreviation for the condition 'Type of Expertise' will be referred to as *EXP*.

3.2.5 Condition *Financial compensation*

The condition 'Financial Compensation' refers to monetary incentives or payments provided to farmers and landowners in exchange for adopting and implementing practices that contribute to environmental conservation and sustainability. The review by Witvliet et al., (2024) indicates financial compensation is a significant factor in encouraging farmer participation in agri-environmental programs. Financial support helps farmers balance the financial benefits and risks involved. In the review several strategies providing financial compensation have been identified. These include action-oriented programs offering payments for adhering to specific practices, result-oriented programs that reward the achievement of biodiversity goals, mixed programs combining both elements, and even unsubsidized programs that provide advisory support instead of direct financial aid. The abbreviation for the condition 'Financial compensation' will be referred to as *FIN*.

3.3 Measuring the conditions

The questions that were used to measure the conditions are shown in the table below (table 6). The survey used for this research included more questions than displayed here. However, since only a portion of the PTs and conditions were utilized, not all were included in the research and analysis.

Question	Short description	Condition type	Scale / answer categories
<i>Are visits organized for participating farmers to each other's agricultural enterprises</i>	This question explores whether participating farmers visit each other's farms to share knowledge and experiences in agricultural practices.	Visits	-No. -Yes, <i>once</i> . -Yes, <i>several times</i> . -Other, <i>namely....</i>
<i>Are visits organized for participating farmers to agricultural enterprises that have been implementing the measure(s) for a longer period?</i>	This question asks if participating farmers visit experienced agricultural businesses to learn from their practices.	Visits	-No. -Yes, <i>once</i> . -Yes, <i>several times</i> . -Other, <i>namely....</i>
<i>Are meetings organized for participating farmers with experts at the intersection of agriculture and biodiversity?</i>	This question explores if farmers meet with biodiversity experts as part of the program, focusing on learning opportunities for integrating biodiversity into agriculture.	Professionals	-No. -Yes, <i>once</i> . -Yes, <i>several times</i> . -Other, <i>namely....</i>
<i>Is one-on-one support provided within the initiative by experts at the intersection of agriculture and biodiversity?</i>	This question seeks to determine if the initiative offers personalized support from experts specializing in both agriculture and biodiversity.	Professionals	-No. -Yes, <i>once</i> . -Yes, <i>several times</i> . -Other, <i>namely....</i>
<i>Are the benefits of the measure(s) or practice(s) for agricultural management communicated to participants?</i>	This question asks if the benefits of specific measures or practices for agricultural operations are communicated to participants	Demonstrate Benefits	-No. -Yes, <i>once</i> . -Yes, <i>several times</i> . -Other, <i>namely....</i>

<p><i>Would you please indicate which experts are involved?</i></p>	<p>This question asks about the experts participating in the initiative and aims to provide a brief overview of their roles and expertise within the program.</p>	<p>Type of Expertise</p>	<p><i>Open box</i></p>
<p><i>Is financial compensation offered</i></p>	<p>This question asks whether financial compensation is provided as part of the initiative or program being studied.</p>	<p>Financial Compensation</p>	<p>-No, financial compensation is not offered -Yes, if specific measure(s) are implemented (effort obligation). -Yes, if specific biodiversity restoration goals are achieved (e.g., KPIs) or results for particular animal and/or plant species are attained. -Other, namely...</p>

Table 6. The questions used to measure the conditions.

4. Research design

This chapter details the research approach, highlighting the decisions related to research philosophy and methodologies. To identify effective combinations for implementing agri-environmental measures (AEM) among farmers, it is essential to analyze and compare these conditions across a significant number of cases. The study employs qualitative comparative analysis (QCA), which will be explored in the sections ahead.

4.1 Research strategy

This research is comparative as well as explanatory, as it seeks to clarify the conditions necessary for the successful implementation of agri-environmental measures (AEM) in various initiatives. To achieve this, Qualitative Comparative Analysis (QCA) will be applied. QCA is a scientific method introduced by Ragin (1987). QCA has among its foundations the standards of Mill's *A System of Logic* (1846), specifically his methods of agreement and of difference, which are based on the idea of comparing case data to determine causal relationships through eliminating and simplifying processes (Livne-Tarandach et al., 2015). In the method of agreement a single cause present in all cases of a phenomenon is, thus, the cause of that phenomenon; the method of difference states that where the presence or absence of a phenomenon can likewise be connected to a single difference between cases (Mill, 1846). The QCA method by Ragin (1987) takes this approach and further arranges it, while also reducing some of the limitations of Mill's original formula, to be able to identify combinations of necessary conditions. A variety of agri-environmental initiatives will be compared as cases to distinguish successful (combinations of) conditions for the implementation of AEM within these initiatives.

The basic principle of QCA is that social phenomena are characterized by “complex causality” (Legewie, 2013). Complex causality entails the following:

- A combination of causal factors leads to the occurrence of a phenomenon or event.
- Different combinations of causal factors can ultimately result in the occurrence of a specific phenomenon or event.
- Causal factors may have varying effects based on how they interact with other factors in different combinations.

QCA is most appropriate for certain types of research questions and data since it focuses on explaining specific phenomena where complex causality is assumed. According to Schneider & Wagemann (2012), “The application of QCA is most effective when examining social phenomena of “complex causality”, that can be defined in set-theoretic terms, i.e., asking about necessary and sufficient conditions. Due to its sensitivity to causal complexity, QCA offers an analytical advantage over many statistical data analysis techniques for such research questions” (p. 400).

It is crucial to note that formalized QCA analysis outcomes do not establish causation. This approach works best for identifying the variables that are present in various cases that result in particular outcomes; in this way, some causal relationships can be suggested but not proved (Berg-Schlosser et al., 2009).

QCA is suited to identify factors necessary for accomplishing a higher degree of participation in initiatives aimed at agrobiodiversity. Since the aim of this research is to identify successful (combinations of) conditions that lead to the implementation of AEM among farmers in agri-environmental initiatives in the Netherlands, this methodology is in line with the research aim. The aim of this study is not to develop statistically validated success conditions that should consistently have the same result.

4.2 Research philosophy

One may say that QCA techniques aim to combine the strengths of both "qualitative" (case-oriented) and "quantitative" (variable-oriented) approaches (Berg-Schlusser et al., 2009, p.5). Due to its dual nature, QCA research can include elements from constructivist as well as positivist research methodologies. In constructivism, the idea that individuals actively construct their understanding of the world based on their experiences, interactions, and interpretations is emphasized (Fosnot, 1996). Here, knowledge is not considered an objective reality, but rather a subjective and evolving construction. Positivism however, holds that knowledge can and should be acquired through systematic and rigorous observation and experimentation, with an emphasis on empirical evidence and facts (Ryan, 2018).

The method's foundational logic was further articulated in J.S. Mill's (1846) "canons." The two most significant methods, the "method of difference" and the "method of agreement," focus on systematically comparing and contrasting cases to identify common causal relationships by excluding all other potential explanations (Berg-Schlusser et al., 2009, p.2). These "canons" don't truly imply strict causal linkages; instead, they make rather positivist assumptions about causes and effects. One key distinction they aim to make is between variables that may affect a particular outcome and those that have no impact, which they exclude. In this sense they correspond to Popper's (1959) famous principle of "falsification", which is a response to induction, which emphasizes theory formation and verification as the primary concepts. Van Thiel (2014) explains that induction involves examining every case to form conclusions. Nonetheless, in this research approach, there is a potential risk that the researcher may focus on cases that align with the hypothesis in an effort to validate the expected results. However, studying all cases is nearly impossible in most research. Popper (1959) critiques the inductive approach by proposing falsification, a method that involves looking for evidence that can contradict the null hypothesis. In this sense, conclusions can be made with a degree of confidence even if not all scenarios are explored; the null hypothesis is rejected by even one contrary result. In the QCA used in this research, rejecting the null hypothesis indicates that a specific set of conditions does not consistently lead to the desired outcome, demonstrating that the presence or absence of conditions causing an expected result is not an absolute fact.

In QCA, a holistic approach is employed, treating the technique as "case-oriented." This means they focus on a limited number of complex cases in a "configurational" way, ensuring that each case is seen as a unique combination of characteristics that should not be lost or obscured during analysis (Berg-Schlusser et al., 2009, p.6). To be able to choose relevant variables (conditions and outcome) for the analysis, theoretical considerations need to be made. In this context, QCA has a deductive component (Berg-Schlusser et al., 2009, p.7). However, QCA methods can also be applied in a more inductive manner, deriving conclusions from case data to identify the essential elements to consider (Rihoux & Lobe,

2009). In this research, the deductive method is used. Using scientific literature, hypotheses are created regarding the conditions for success of the initiatives.

4.3 Research methods

Qualitative Comparative Analysis (QCA) is suited for studies involving a moderate number of cases, usually ranging from 10 to 50. This method is ideal for scenarios where conventional statistical techniques, which demand larger sample sizes, are not applicable, and where a purely qualitative case-study approach might be too limited (Simister & Scholz, 2017). Given that this research intends to systematically analyze a moderate number of cases, QCA is well-suited for this purpose. Due to the timeframe in which this research has to be carried out, a set of 30 cases will be used.

4.3.1 Method for data collection

Prior to the data collection, desk research was the main method used to develop the theoretical framework and assess the current state and research issues concerning the adoption and implementation of agrobiodiversity. This involved analyzing secondary data from policy documents, reports, scientific articles, and online sources. The first step in gathering cases (initiatives), was creating a database to provide an overview of relevant cases that were found during the desk research. A case in this research is an initiative or program that seeks to conserve, enhance and/or manage the biological diversity found in farming landscapes in the Netherlands. The cases were essentially chosen based on shared characteristics and theoretical grounds. Agri-environmental initiatives can vary widely in terms of goals, strategies, and the contexts in which they operate. Because of these differences, it is important to carefully select cases for this research that align with certain criteria. This ensures that the cases are comparable and relevant to the research objective. Table 7 displays the criteria used for selecting the cases.

Criterion	Description/definition criteria
Criteria 1	Farmers are offered certain resources such as financial compensation or certain knowledge and/or opportunities to enable them to implement agrobiodiversity measures.
Criteria 2	The measures that agrarians should implement focus on agrobiodiversity, corresponding to the Erisman et al., (2016) framework.
Criteria 3	Phase of the program/initiative, i.e.: - implementation phase (distinguish with respect to just started or towards the end ongoing) - ex-post (completed)
Criteria 4	Agrarians in a certain defined geographical area can participate in the program/initiative (e.g. nationwide or regional).

Table 7. Criteria that an initiative must meet to be considered as a case

Besides the 4 points of criteria a case must meet, it is also crucial to gain in-depth information about the cases. Detailed case knowledge provides the necessary context for understanding how and why certain conditions lead to specific outcomes. Understanding these contextual factors helps in interpreting the results more meaningfully. QCA compares different cases to find patterns (Schneider & Wagenmann, 2012). Detailed knowledge on each case ensures that these comparisons make sense and are accurate. Furthermore, without detailed information, the calibration might be too simplistic or erroneous, leading to inaccurate or misleading results (Ragin, 2008). Therefore, a database has been established to give a complete overview of the different characteristics of the initiatives. Section 5.1.1 discusses this in more detail.

In the 30 cases (agri-environmental initiatives) utilized in this research, a set of conditions will be used to attempt to explain the social phenomenon. In this research this is the successfulness of the participation of farmers in these initiatives. The conditions used are:

1. Visits
2. Professionals
3. Demonstrate Benefits
4. Type of Expertise
5. Financial Compensation

Secondly, as outlined in the operationalization section, a survey was conducted to collect primary data from the participants involved in the initiatives. For the retrieval of this primary data I carefully mapped the initiatives suitable for this research into a database, categorized and filtered them in order to then conduct a survey among them. Co-production has been used, since this data was collected through a questionnaire developed as part of the study by Witvliet et al., (z.d.) as a follow-up study for the theory-driven framework by Witvliet et al., (2024). The conditions are measured using indicators in the survey. The questions in the survey are a direct translation of the Strategies and Contexts of the theoretical framework. However, some contexts and strategies have not been translated into survey questions. This was done on the basis of the following criteria. 1. Because it involves a macro context: because all the initiatives we include in the Netherlands deal with the same macro context (+/-), we can assume they are the same/similar. The theoretical framework includes 17 intensive agriculture countries. 2. Strategy/Context: we can infer from other characteristics of the initiative whether or not this is the case, and to what extent. E.g., "Participants have the ability to exercise the measure(s) in addition to continuing their daily business operations." Looking at the measure, an assessment can be made as to whether far-reaching changes in business operations are required. Or 3. A Context concerns that experts (survey respondents) cannot (adequately) assess or fill in. E.g. "How many farmers in the area face short leases?" or "What proportion of farmers are risk averse?"

After the survey was completed, Bibi Witvliet and I conducted a pilot among 5 experts working at an initiative focused on agrobiodiversity. This refers to a small-scale implementation of the survey to demonstrate viability. The purpose is to assess whether the survey could be successful in a large-scale implementation. Through the pilot, the survey can be adjusted and improved before being administered to a larger population. During the pilots, Bibi Witvliet took the lead and I had a supporting role, taking notes and asking additional questions. During the pilots, the expert was also asked if he/she knew of any other initiatives aimed at agrobiodiversity, so more initiatives could be gathered and added to the

database. The survey was created and distributed using Qualtrics XM. The distribution of the survey among the respondents has been done via email. The email included a brief description of the survey and a link to access it.

After conducting the survey, qualitative comparative analysis will be used to examine the data. The results of this analysis will be used to answer the subquestions. With the insights gained in the subquestions, the main question will be answered.

4.3.2 Method for data analysis

QCA aims to achieve two goals that might seem contradictory: thoroughly understanding individual cases and their complexity, while also enabling some degree of generalization (Ragin, 1987). Additionally, QCA introduces a framework for causality that accommodates complexity. In many natural sciences, complexity is often simplified, a practice that is not typically feasible in social sciences. QCA addresses this challenge through the concept of multiple conjunctural causation (Ragin, 1987; Berg-Schlosser et al., 2009). This concept implies that: (1) an outcome (dependent variable) is often the result of a combination of conditions (independent variables); (2) several different combinations of conditions can lead to the same outcome; and (3) the effect of a condition on the outcome may vary depending on the context (Rihoux & Lobe, 2009).

As mentioned before, QCA considers conditions and outcomes as sets to which cases belong or not. It is necessary to determine, for each case, the extent to which it belongs to these different sets (Oana et al., 2021). Measurement is the first step in doing this; we must consider how we can observe the concept that this set represents in the real world. The following step is known as calibration, where raw data is converted into set membership scores to assess whether, and to what extent, cases belong to a specific set (Adcock and Collier, 2001). In QCA there are two types: crisp set QCA (csQCA) and fuzzy set QCA (fsQCA). Crisp set QCA involves cases that either fully meet a condition or do not meet at all. Each case is assigned a binary value (1 or 0) to indicate whether it possesses the condition being considered or not. Here, the conditions are treated as strictly dichotomous (Legewie, 2013). In contrast, a fuzzy set allows for partial membership to a condition. Each case is assigned a membership value ranging from 0 to 1, indicating the degree to which it possesses the condition. Here, conditions are not strictly dichotomous (Legewie, 2013). In the data collection (survey) the respondents could respond by frequency of occurrence (see table 6) or assign a score between 0 and 100 (see table 3 and 4), making it a fuzzy data set. However, in the data analysis these scores have been made crisp, meaning that they either score 0 or 1. Moving from fsQCA to csQCA has been implemented to enhance simplicity and clarity. Using binary values (0 or 1) to indicate the presence or absence of a condition makes the analysis and interpretation more straightforward. This binary approach simplifies categorization, which can be advantageous for both researchers and audiences unfamiliar with more complex methods (Rihoux & Ragin, 2009). Additionally, reducing ambiguity facilitates clearer analyses and conclusions. CsQCA also benefits consistency and reliability because binary categorization minimizes subjective interpretation, thereby improving the reliability of the data coding process (Ragin, 2008). Moving from fuzzy to crisp is done using threshold values that determine whether a score of 0 or 1 is assigned.

Before engaging in fsQCA, it is important to understand some conventions that are used in Boolean algebra, since the QCA and Boolean algebra are linked through their use of set-theoretic principles to analyze complex social phenomena (Rihoux & De Meur, 2009). The primary rules of Boolean algebra are as follows:

1. An uppercase letter indicates a [1] value for a binary variable, indicating, for instance, "variable A is present."
2. A lowercase letter indicates a [0] value for a binary variable, such as "variable a is absent."
3. A dash symbol means [-] means "don't care" for a binary variable, meaning the value can either be 1 or 0. This can also indicate that the value is unknown, possibly because it is not relevant or the data is missing.

In addition, three fundamental set operations are commonly applied to the data: intersection, union, and negation. These operations are used to manipulate and analyze the binary data to draw meaningful insights about the relationships between different conditions and outcomes.

Intersection (AND operation)

The intersection operation identifies cases where multiple conditions are at the same time present. In csQCA, this is equal to taking the logical AND of the binary values for each condition. For instance, if a case has a value of 1 for both Condition A and Condition B, the intersection of these conditions for that case would also be 1. Otherwise, it would be 0.

Mathematically, the intersection $C=A \cap B$ can be expressed as $C=\min(A, B)$, where A and B are binary variables representing different conditions.

Union (OR operation)

The union operation identifies cases where at least one of the conditions is present. In csQCA, this is equivalent to taking the logical OR of the binary values for each condition. For example, if a case has a value of 1 for Condition A or Condition B (or both), the union of these conditions for that case would be 1. If both are 0, the union would be 0.

Mathematically, the union $C=A \cup B$ can be expressed as $C=\max(A, B)$.

Negation (NOT operation)

The negation operation identifies the absence of a condition. In csQCA, this is equivalent to taking the logical NOT of the binary value for a condition. If a case has a value of 1 for a condition, its negation would be 0, and vice versa.

Mathematically, the negation $\neg A$ can be expressed as $\neg A=1-A$.

QCA is primarily a case-oriented method, and its approach to generalization differs from traditional statistical methods. QCA is not designed for statistical generalization to a broader population in the same way that quantitative methods such as regression analysis are. In addition to explaining the similarities and differences among the cases involved, QCA allows for some degree of generalization of the results. That is why a well-done QCA needs to take into account "modest generalizations" in addition to simple description: It allows us to formulate conclusions that can be cautiously applied to other similar cases (Berg-Schlusser et al., 2009).

4.3.2.1 Necessity and sufficiency

The aim of QCA is to identify conditions or combinations of conditions that are necessary or sufficient for the outcome (Legewie, 2013). The relationships between these conditions and outcomes in QCA are established as necessary and sufficient conditions (Sallan, 2021). This research will use the principles of necessity and sufficiency as the foundation to reveal the important conditions. A necessary condition alone may not be enough to produce the outcome, but it is crucial to include in the causal mix. Regardless of the specific combination of causes, this mix will always include those necessary conditions (Duşa, 2022; Schneider and Wagemann, 2012). For example, if we say that having oxygen is a necessary condition for fire, it means that fire cannot occur without oxygen. However, the presence of oxygen alone does not guarantee that there will be a fire. A sufficient condition is a (set of) condition(s) that can generate the outcome but is not the only way leading to the outcome (Duşa, 2022; Schneider and Wagemann, 2012). Necessity and sufficiency can be graphically represented, as shown in figure 6. By measuring the necessity and sufficiency, successful (combinations) of conditions for the participation in agri-environmental initiatives can be identified.

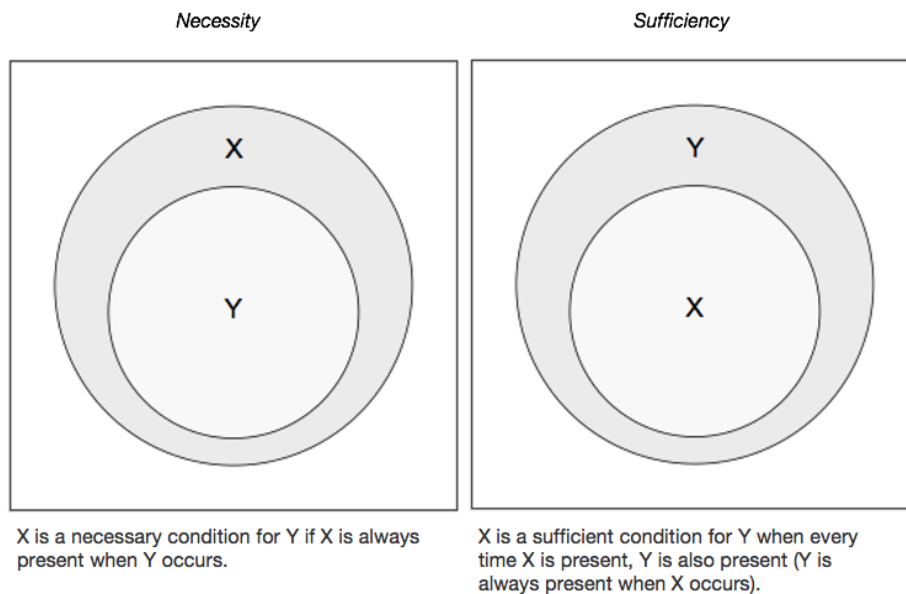


Figure 6. Conceptual description of the concepts necessity and sufficiency (Duşa, 2022).

4.3.2.2 Consistency and coverage

It is unlikely that every case will show a relation of necessity or sufficiency within the data; at least a few cases will usually differ from the typical pattern (Legewie, 2013). Therefore, assessing how well the cases in a data set align with a relationship of necessity or sufficiency is essential. In QCA, the two primary indicators used to evaluate this alignment are consistency and coverage. "Consistency" measures how closely a relationship of necessity or sufficiency between causal conditions (or their combinations) and an outcome is satisfied within a given data set (Ragin, 2006). This concept is similar to the idea of significance in statistical models (Thiem, 2016, p.6). Although some cases may deviate from the expected pattern, conditions or combinations of conditions in QCA research are frequently "quasi-necessary" or "quasi-sufficient" because the causal relationship is observed in a substantial number of cases. To determine consistency scores, Ragin's (2006) consistency test is employed. These consistency values range from "0" to "1," where "0" represents no consistency and "1" represents perfect consistency.

Once a condition or combination of conditions is consistent with necessity or sufficiency, a mathematical test to determine the coverage of the model will be conducted. The coverage will explain the variance contribution of a variable, in other statistical models this would be R^2 (Thiem, 2016, p.6). Coverage is calculated by measuring "the size of the overlap of two sets relative to the size of the larger set", again with scores between "0" and "1" (Ragin, 2008).

4.3.2.3 Truth table

To present the data in a systematic manner, a truth table will be used. This table displays the number of cases that are present per set of conditions, different combinations of conditions that are sufficient for the outcome, and the consistency of this set of conditions (Legewie, 2013). This is a way of representing the cases in a data set as configurations of conditions.

Case	VIS	PROF	EXP	DEM	FIN	Outcome
Initiative 32, Initiative 8, Initiative 27, Initiative 38, Initiative 24, Initiative 33, Initiative 29, Initiative 11	1	1	1	1	1	1
Initiative 36, Initiative 30, Initiative 25, Initiative 37, Initiative 28, Initiative 21, Initiative 18	1	1	1	1	0	1
Initiative 35	0	1	1	1	0	1
Initiative 39	1	0	0	0	1	1
Initiative 22, Initiative 31	0	1	0	1	1	1

Initiative 16, Initiative 2, Initiative 10, Initiative 12	0	1	0	1	0	0
Initiative 4, Initiative 20	1	1	0	1	1	0
Initiative 23	1	1	0	0	0	0
Initiative 7	1	0	0	1	0	0
Initiative 3	1	1	0	1	0	0
Initiative 5	1	1	0	0	1	0
Initiative 14	0	0	0	1	1	0

Table 8. Truth table with 5 conditions.

In the truth table presented above (table 8), all logically possible combinations of a given set of conditions become visible. The truth table displays columns with each different conditions, as well as the corresponding outcome. Each horizontal row presents a different combination of conditions where the 0's and 1's present the absence or presence of a condition. For example, in Initiative 22 and 31, the conditions professionals, demonstrating the benefits and financial compensation are present in the initiative, and organizing visits and specific type of expertise are absent. The initiatives have a score of 1 on the outcome meaning that this specific set of conditions can be perceived as successful for the implementation of AEM in agri-environmental initiatives. A truth table has 2^k rows, with k being the number of causal conditions included in the model (Duşa, 2022b).

4.4 Validity and reliability

4.4.1 Internal validity

In this research a number of research approaches are combined, all of which have validity-related implications that must be addressed. Internal validity refers to the causal interpretability of empirical findings. In other words, it deals with the interpretation of statements about consistently observed phenomena in empirical research (epistemology) into causal mechanisms (ontology) (Rutten, 2020). From an analytical standpoint, this relates to concentrating on “causal” conditions instead of “context” factors and limiting the number of conditions in a QCA study to prevent empirical findings that can be difficult to interpret (Schneider and Wagemann, 2012). From an empirical standpoint, internal validity relates to measurement error because it might raise doubt on the validity of observed constant conjunctions (Rutten, 2020). The internal validity of the research is questioned because a researcher can affect the outcome by assigning values to the conditions. Several approaches are provided by scientific literature to resolve internal validity difficulties. In order to be able to measure the specific things a researcher wants to measure; specific and

accurate collection of the variables is important. To ensure that the survey questions are properly interpreted by the respondents, a clear description of the variables is necessary. Five pilot tests were conducted to ensure the questions were clear and understandable for the respondents. Internal validity concerns can also be limited by carefully examining the truth table and the results. For instance, if the truth table contains contradictions or the minimal formula is too complicated, it is best to reevaluate the conditions chosen (De Meur, Rihoux & Yamasaki, 2009). Secondly, gathering extensive qualitative data about the cases can help minimize measurement errors (Schneider and Wagemann, 2012). Enhancing internal validity, this research employed data triangulation, in this research this has been done by for example conducting in-depth research on the cases through desk research.

4.4.2 External validity

External validity is the degree to which the results of the research can be generalized (Van Thiel, 2014, p.49). From an analytical perspective, this relates to the comparability of cases and the study's scope conditions. These elements define the characteristics of the cases under observation, suggesting that similar causal mechanisms are operating within them (Rutten, 2020). Empirically, the sensitivity of the solution to the cases and the empirical similarity of cases in terms of complicating conditions are aspects of external validity. These factors may indicate that the observed outcome resulted from different processes across different cases. (Magetti & Levi-Faur, 2013). As mentioned earlier, effective QCA should not only provide descriptive insights but also allow for some degree of limited generalization (Ragin, 1987; Berg-Schlosser et al., 2009). This generalization can be applied to cases that are similar and share many characteristics with those studied. A challenge in case study research related to external validity is the limited number of units examined (Van Thiel, 2014, p. 92). This research benefits from external validity due to its focus on a moderate to large number of cases. However, generalizability is not assured only by having a moderate sample size. QCA is a case-sensitive method, meaning it considers the internal complexity of each case by allowing complex causal relationships and counterfactual analysis (Sehring et al., 2013). QCAs case sensitivity presents challenges to external validity, in particular in the absence of a representative sample, as in this case since this research cannot be compared to real quantitative research.

4.4.3 Reliability

The accuracy and the consistency of the variables being measured are the two factors that determine a study's reliability. It is more likely that the results will give a systematic and representative picture rather than being coincidental when variables are being measured with more accuracy and consistency (Van Thiel, 2014, p.48). In this research, the focus on accuracy concerns particularly the measurement tools employed, which in this case is a survey. Accurately and precisely capturing the variables to be measured is essential. It is also important to clearly differentiate between the various values a variable can take (Van Thiel, 2014, p.48). Operationalization plays a key role here, as it should clearly explain how the collected responses are used to assess a particular variable. The measurement of the variables should be elaborated to the extent that when the research would be repeated, the researcher should get the same outcome with the same data. This relates directly to the other important pillar for the reliability of the research: consistency. Consistency is based on the principle of repeatability, meaning that the same measurement should produce identical

results under similar conditions (Van Thiel, 2014, p. 48). A study's reliability is increased by repeatability since it gives researchers the assurance that their findings are more accurate. This research provides this through a clear documentation of the procedures taken and by ensuring that the coding of conditions and outcomes is consistent across analyses. This way the research can be repeated correctly.

It is important to note that, due to the relatively recent advancement of QCA methods, ongoing methodological discussions are addressing concerns like the reliability of causal inferences (Seawright, 2014; Baumgärtner & Thiem, 2017). According to Thomas et al., (2014), QCA could benefit from further development in methods for sensitivity analysis related to calibration decisions. By varying conditions or excluding certain cases, the robustness of identified configurations is assessed. This process helps reduce the impact of potential outliers. Justifying the selection of cases, making the data set available, discussing and justifying the calibration of set membership, reporting truth tables, consistency and coverage are all good practices that conform to the standard requirements of transparency and credibility in methods (Thomas et al., 2014).

5. Results

5.1 Description database and pilots

In this chapter, an overview is provided of the data used in this study prior to the analysis. Understanding the data generation process is crucial before analyzing and interpreting the data. First, the sources of the data will be described. A description of each characteristic used to classify the initiatives in the database will be given. Then, the notable aspects of the dataset will be described. Following, a more detailed description of the pilots, and what information has emerged from this will be provided.

5.1.1 Database

Before elaborating on the database, it is important to mention that in this research participant anonymity has been prioritized. All data gathered through the survey have been handled in a way that prevents the identification of individual respondents. Anonymizing the data was chosen to protect the privacy of the participants and to encourage them to provide honest responses. This approach adheres to ethical guidelines and best practices in social science research, ensuring that the data remain confidential and are used exclusively for the purposes of this master's thesis.

After finding initiatives that meet the criteria, it is important to identify certain characteristics of the initiatives. The amount of specific information available about the initiative started out small but eventually expanded to include 13 characteristics to be able to better specify the cases. For example, the cases had to meet certain criteria of theoretical models, or the completion date of an initiative could not be more than 5 years ago (2018). It is important to note that it was not possible to examine these characteristics for all programmes/initiatives, this depended on the information available. The characteristics that were identified are shown in table 9 below.

Number	Characteristics initiatives	Description
1	Location (specific area, national or international level)	Agri-environmental initiatives may operate at various levels, including specific areas (e.g., regions), national, or international levels, depending on the scope and objectives of the initiative.
2	Duration (including start and end date) + phase of initiative	Project must have been completed no more than 5 years ago. Initiative ended in 2018 will still be included as a threshold year.

3	Which type of farmer can participate in the initiative?	The initiative may be open to specific types of farmers, such as livestock farmers, arable farmers or gardeners, depending on the target audience and objectives of the initiative.
4	Short description (goal and measures)	The initiative's goal is to promote sustainable agricultural practices and enhance environmental conservation. Measures may include habitat restoration, soil conservation, water quality improvement, biodiversity enhancement, and reduction of chemical inputs.
5	If known: What resources (money, information, network) or opportunities are offered to farmers in the initiative?	Farmers participating in the initiative may receive financial incentives, technical assistance, access to information and training, networking opportunities, and support in implementing sustainable practices.
6A	Which measure(s) do farmers take corresponding to the Erisman et al. (2016) framework.	Farmers may implement measures aligned with the Erisman et al. (2016) framework, which categorizes actions into various environmental management strategies, such as functional (agro)biodiversity, landscape biodiversity, landscape management and source areas and connection zones.
6B	Do the measures take place on: A. Areas in production (on the fields); B. Non-productive/out of production parts of the fields (on the edges of the plots); C. Combination of A and B	Measures may take place on areas in production (fields), non-productive/out-of-production parts of fields (field margins), or a combination of both.
6C	Boonstra et al. (2021): Where do the measure(s) fall under in Boonstra et al., (2021). Specify if possible. <ul style="list-style-type: none"> - Field management - Grassland management - Management of landscape elements - Ditch/pool management 	Measures may fall under different categories based on Boonstra et al. (2021)'s framework, including field management (e.g., herb-rich fields), grassland management (e.g. insect-rich grassland management, management of landscape elements (e.g. hedges), and ditch/pool management (e.g. nature-friendly bank).

7	Are any other stakeholders/landowners (e.g. individuals) - besides farmers - participating in the initiative?	Besides farmers, other stakeholders such as landowners, conservation organizations, government agencies, and community groups may participate in the initiative to support its objectives.
8	Voluntary participation?	Participation in the initiative may be voluntary, with farmers choosing to opt into the program based on their interest and willingness to adopt sustainable practices.
9	How many agrarians are participating?	The number of agrarians participating in the initiative may vary depending on the initiative's scale, scope, and capacity.
11.	If insight into: Must agrarians work together to implement the measures?	Agrarians may need to collaborate with each other to implement certain measures effectively, especially those requiring landscape-level interventions or coordinated efforts. However, it is also possible farmers implement the AEM on an individual level.
12	If insight into: Are there any conditions/criteria that a farmer must meet to participate in the initiative/programme?	Farmers may need to meet certain conditions or criteria to participate in the initiative, such as land eligibility requirements, compliance with environmental regulations, or commitment to implementing specific practices.
13	If available: Measures: are they targeted regarding implementation only at individual plot level? Or should a network of measures be implemented in a certain area (e.g. Ooijpolder with green-blue interlacing network of landscape elements)?	Measures may be targeted at individual plot levels or involve the implementation of a network of measures across a broader landscape area to achieve landscape-scale conservation objectives.

Table 9. The characteristics of the initiatives used in the database and its descriptions.

The following paragraph highlights key observations and differences among these initiatives. One notable aspect observed in the cases and the data collected is that the initiatives cover a wide range of locations. A large portion of the initiatives operate on a smaller scale, or in defined areas, enhancing the ability to adjust actions to the ecological and agricultural conditions of those regions. A comparatively limited number of initiatives function at the national level, with an even more limited presence at the international level. To account for differences in location, the survey required initiatives operating in multiple areas to complete it for a single, specified area. For initiatives allowing participation from agrarians across nearly all of the Netherlands, questions targeting a specific area could be excluded. Most of the initiatives started not very long ago, averaging about 5 years and are either ongoing or

recently completed. This recent beginning suggests a growing momentum and interest in agrobiodiversity.

A clear distinction can be made between the different types of initiatives, including those driven by European policy, government projects, collectives, and self-founded initiatives. Each type offers unique resources and opportunities to farmers:

- European policy initiatives: These are typically large-scale projects with substantial funding, aiming to implement broad strategies across multiple regions. They often focus on compliance with European Union regulations and standards, promoting practices that enhance biodiversity while meeting policy objectives.
- Government projects: Similar to European policy initiatives, government-driven projects often come with significant funding and support. These initiatives may focus on national priorities, such as reducing greenhouse gas emissions from agriculture, improving water management, and preserving native species.
- Collectives: These initiatives are usually smaller in scale and are driven by groups of farmers or local organizations. They emphasize peer-to-peer learning, information sharing, and collective action. The resources offered mainly include technical advice, workshops, and collaborative platforms rather than direct financial support.
- Self-founded initiatives: Often the smallest and most localized, these initiatives are founded by individual farmers or small groups. They focus on specific local issues and are highly tailored to the unique needs of their area. Resources provided may include personal coaching, access to local networks, and small grants.

Regarding the type of farmer who can participate in an initiative, it is notable that most initiatives are aimed at livestock farmers, arable farmers, gardeners, or a combination of these. However, there is a significant focus on livestock farming, particularly initiatives aimed at greening dairy farming. This focus is due to the more substantial environmental impact of livestock farming compared to the arable sector. Issues such as methane emissions from ruminants, manure management, and overgrazing lead to considerable environmental degradation. As noted by the European Commission for Agriculture and Rural Development (2020), these challenges demand targeted efforts to mitigate negative impacts, that is why the majority of initiatives are focused on livestock farming. The proportion of initiatives aimed specifically at greening the arable and gardening sectors is notably smaller. While also important, this discrepancy is caused by the generally less severe environmental challenges in the arable sector. Consequently, initiatives and policies prioritize the livestock sector to address the urgent need to mitigate its environmental footprint as stated by the EPA (2014).

Furthermore, the involvement of a wide range of stakeholders, including local citizens, landowners, and municipalities, plays a crucial role in the success of these initiatives. Their participation ensures broader community support and sustainability. The voluntary nature of participation and the intrinsic motivation of stakeholders are essential for the initiatives' success and sustainability. Collaboration among farmers and other stakeholders in creating networks of measures across multiple fields is also critical for achieving landscape-scale impacts.

5.1.2 Pilots

To test the comprehensibility, relevance, and usability of the survey, pilots have been conducted among key individuals within five organizations in which farmers work on measures to strengthen biodiversity. The purpose of this pilot was to identify any parts of the survey that might cause confusion and determine necessary improvements. In the pilot phase, the interviewees were invited to complete the survey during a brief 45-minute interview, conducted by Bibi Witvliet and myself, at a location of their preference. During the pilot phase, the questions will be optimized and the modified survey will then be distributed on a large scale in the Netherlands.

Diversity was taken into account for the selection of participants, several organizations were chosen: *Organization 1* focuses on the power of cooperation between nature, agriculture and culture as carriers of the landscape. The goal is to work with residents and organizations to develop the quality of the unique (regional) landscape and also make it accessible to residents, recreationists and nature lovers. *Organization 2* is committed to agricultural nature management and sustainability in agriculture on the national level. The organization works with farmers to integrate nature and landscape management into farm operations. *Organization 3* operates on the national level and focuses on promoting sustainable agricultural practices and supporting farmers in implementing innovations and environmentally friendly techniques. *Organization 4*, this research institute focuses on themes such as the role of biodiversity in agricultural systems and natural ecosystems. They aim to develop farming practices that support and enhance biodiversity on a national level. *Organization 5* promotes sustainable agricultural practices and environmental quality by advising and supporting farmers to improve soil health, reduce chemicals, optimize water management, and promote biodiversity.

The respondents provided valuable insights and suggestions on various aspects of the survey, indicating both content and technical improvements. The following is a brief overview of the findings: Several questions were considered unclear by respondents. Often, the terminology and phrasing did not sufficiently align with the respondents' experiences. Some questions were perceived as too lengthy or not directly relevant. In addition, the survey was generally considered long by many respondents, which caused respondents to lose focus and become less motivated to complete the survey. The survey contained complex branching that confused some respondents.

Based on the received feedback, several changes have been made. First of all, attention has been given to the rewording of the questions. To enhance clarity and simplicity, questions identified as complex were rewritten and, if necessary, split up. Furthermore, to enhance the clarity of the questions, explanations along with examples were added where necessary. To reduce the length of the survey and increase relevance, questions deemed redundant were removed or merged. This involved careful consideration of which questions were essential to the study. One question was not well understood by respondents, another question was not covered by a PT or SCMO, so these questions have been removed. Also, by adjusting the explanations, some questions could be merged.

5.2 Analysis

5.2.1 Calibration

In the chapter on 'operationalization,' the measurement of the concepts used in this study is indicated. This step serves as preparation for the actual calibration process. Set calibration entails determining set membership scores to cases. Membership of cases in sets is determined based on the raw data selected and gathered for measuring these sets. Sets can be conceptualized as 'boxes' to which cases are assigned (Oana et al., 2021). Set membership scores indicate whether a case belongs to a set and, in the case of fuzzy sets, the degree to which it fits within the set. This score is also referred to as the 'crossover' point (Ragin, 2008a; Schneider and Wagemann, 2012, chapter 1). In csQCA, the sets are binary, distinguishing only between members and nonmembers, with values of 0 (non-membership) or 1 (membership). As such, crisp sets align most closely with the basic concept of sorting cases into boxes.

Since the sets used in this research are not naturally dichotomous, it is necessary to calibrate the sets by recording the empirical indicators. The conditions must be dichotomized according to relevant thresholds. Defining thresholds is essential in csQCA because these thresholds establish whether a specific condition is present or absent in each case (Rihoux & Lobe, 2009). The conditions are considered present only when their score equals or exceeds the predefined threshold score.

The first determined threshold is the threshold for the outcome. For this study, data was collected through a survey where respondents were asked to indicate to what extent the questions relate to the thinking and actions of agrarians participating in the initiative. This was done on the basis of six questions that collectively determined the outcome variable. Determining a specific threshold for the outcome variable is very important; without it, the primary research question cannot be effectively answered in this analysis. Thus, identifying the minimum value that designates a case as an outcome 1 in this study is essential. Responses to the outcome questions were categorized as follows:

None or almost none (0-9%): 0
Minority (10-49%): 0.33
Majority (50-89%): 0.67
Overwhelming majority (90-100%): 1

As previously mentioned, in the data collection the respondents could assign a score between 0 and 100 on the outcome questions, making it initially a fuzzy dataset. This index was recoded into a 4-value fuzzy set (based on Oana et al., 2021). This is also called theory-guided calibration, which involves theorizing which values in the raw dataset translate into the set membership scores of cases (Schneider and Wagemann, 2012, chapter 1). The responses are recoded as follows:

0 = fully out
0.33 = more out than in
0.67 = more in than out
1 = fully in

Given the use of crisp-set QCA, where values are binary (0 or 1), it is essential to establish clear thresholds for categorizing the outcome. To identify the success conditions for achieving a high implementation rate, the study focuses on initiatives where the majority is involved. Consequently, the threshold for the outcome is set at 50% (0.67) to clearly differentiate between the majority and minority. The threshold is set as follows: a value of 0 is assigned to cases where the average score is below 0.67 (*fully out and more out than in*). A value of 1 is assigned to cases where the average score is equal to or above 0.67 (*more in than out and fully in*). The choice of these thresholds is based on the logic that an outcome is considered "present" (value 1) only when it is supported by a majority. This means that a score of 0.67 or higher (majority or overwhelming majority) is necessary to classify the outcome as present. This aligns with the objective of crisp-set QCA to draw clear and straightforward distinctions between the presence and absence of an outcome. The threshold of 0.67 was chosen because it marks the point where more than half of the respondents support the outcome, representing a clear majority.

The thresholds were determined based on the following rules:

- If both conditions are 0, the participation is coded as 0.
- If neither condition is fully met (i.e., both are not equal to 1), the participation is coded as 0.33.
- If one of the two conditions is fully met (i.e., one of the two is equal to 1), the participation is coded as 0.67.
- If both conditions are fully met (i.e., both are equal to 1), the participation is coded as 1.

Similar to the outcome, each condition in csQCA works with binary values of 0 and 1 to represent conditions. Where 0 indicates the condition is absent or not met, and 1 indicates that the condition is present or fulfilled. Below, all the thresholds for the conditions are discussed.

Threshold condition Visits

In this study, the condition 'Visits' is defined by two questions: "Are visits organized for participating farmers to each other's agricultural businesses?" and "Are visits organized for participating farmers to agricultural businesses that have been working with the measure(s) for a longer period?" Because the questions share the same response categories, the decision was made to merge these two questions into one condition. The similarity in response categories indicates that these questions capture similar dimensions of the phenomenon under study, allowing for their consolidation. Combining these questions simplifies the analysis and reduces potential repetition without reducing the integrity of the data. Merging was also done because this study does not include PT 5, where the emphasis is on farmers being able to witness the long-term results of the measures in practice (refers to the second survey question), as this study does not distinguish whether the farm visits also focus on witnessing concrete long-term results of the measure in practice/focus on farm visits to a farmer who has been experimenting with the measures for a longer period of time

To determine the threshold for this condition, the answer categories from the two questions need to be utilized. Both questions shared the same response option: "No" (0), "Yes, one time" (0,67), "Yes, several times" (1) and a fourth option, "Other, namely", where

respondents could provide an open-ended answer. After consideration, it was determined that the threshold for a case to be considered as meeting the condition should be set at 0.67. This means that any response indicating "Yes, one time" (0.67) or "Yes, several times" (1) would be coded as 1 (indicating the presence of the condition), while responses indicating "No" (0) would be coded as 0 (indicating the absence of the condition). The "Other, namely" option required further qualitative analysis to interpret the open-ended responses. These responses were carefully reviewed to determine if they described scenarios that were equivalent to the existing categories. If an open-ended response indicated participation that was similar in nature to "Yes, once" or "Yes, several times," it was coded accordingly as 1. If the response indicated no relevant participation, it was coded as 0. This approach ensured that the coding reflects meaningful participation in visits, whether described in predefined categories or through open-ended responses.

The threshold of 0.67 aligns with the theoretical understanding that both single and multiple instances of visits should be considered as meeting the condition, whereas the absence of visits clearly does not.

Threshold condition Professionals

The condition 'Professionals' is also derived from two survey questions: "Will meetings with experts on the intersection of agriculture and biodiversity be organized for participating farmers?" and "Is one-on-one support provided within the initiative by experts at the intersection of agriculture and biodiversity?" These questions were then merged and made into a single condition named 'Expert.' This approach ensured that both aspects of expert engagement - organized meetings and one-on-one support - were comprehensively captured under one condition. Because these questions also shared the same answer categories, it was allowed to merge them.

Similar to the condition "Visits", the questions used for this condition both use the same set of answer categories: "No" (0), "Yes, once" (0,67), "Yes, several times" (1) and "Other, namely". Again, "No" clearly represents the absence of the conditions and is therefore coded as 0. The category "Yes, once" suggests some level of engagement with experts, though limited to a single occurrence. In the context of crisp-set QCA, even a one-time engagement is considered significant enough to indicate the presence of the condition. Thus, responses of "Yes, once" were coded as 1. The category "Yes, several times" indicates ongoing or repeated engagement with experts, which clearly meets the criteria for the presence of the condition. Therefore, responses of "Yes, several times" were also coded as 1, indicating the presence of the condition.

The threshold for this condition is set at 0.67, because of this it will be ensured that any form of engagement with experts, whether it occurred once or multiple times, was considered sufficient to meet the condition.

Threshold condition Demonstrate Benefits

The condition 'Demonstrate Benefits' is derived from the survey question that asks whether the agricultural benefits of specific measures or practices are demonstrated and/or communicated to participants. This condition seeks to capture the extent to which the positive impacts and advantages of specific agricultural measures or practices are actively

shown and communicated to participants. Here, the same answer categories apply as with the previously discussed conditions. The answer category “No” is coded as 0. “Yes, once” suggests that the benefits were demonstrated, although only once. Even a single instance of communication is considered sufficient to indicate the presence of the condition, and it is therefore coded 1. “Yes, several times” is also coded as 1. Responses categorized as “Other, namely” underwent qualitative analysis to determine if they aligned with the predefined categories. A threshold of 0.67 was selected. This decision was made because it was recognized that even a single instance of communication about agricultural benefits could potentially influence participant perceptions and behaviors.

Threshold Type of Expertise

The 'Type of Expertise' condition refers to the extent to which professionals possess direct knowledge and experience in farming practices, which is crucial for effectively supporting farmers in their agricultural operations and implementing agri-environmental measures. This implies that these professionals not only possess theoretical knowledge but also practical experience and insight into farming practices. In contrast, professionals like ecologists, who lack an agricultural background and have less understanding of how agronomic measures can best be integrated into daily farming operations, are less effective in providing such support. This limitation in practical knowledge means their advice is less effective in assisting farmers with the implementation of new measures. Therefore, the threshold for meeting the 'Type of Expertise' condition lies in having direct, practical experience with farming practices. Professionals lacking this background, such as certain ecologists, fall outside this definition and are considered less suitable for effectively supporting farmers in implementing agri-environmental measures.

Threshold Financial Compensation

The threshold for the condition 'financial compensation' has been established on a binary basis, distinguishing between 'yes' and 'no' responses. Respondents could select from the following categories: (1) Yes, if certain measures or practices are implemented (effort-based requirement), (2) Yes, if specific biodiversity restoration goals (e.g., KPIs) or results for certain animal and/or plant species are achieved, (3) Other, namely..., and (4) No, no financial compensation is offered. When a response was provided under the category 'Other, namely...' and it implied financial compensation, it was also classified as 'yes'. A response of 'yes' indicates that financial compensation is present, meaning that the participants receive monetary support for implementing agri-environmental measures. Conversely, a response of 'no' indicates the absence of such financial compensation. This binary categorization allows for a clear and straightforward differentiation of cases based on the presence or absence of financial support

5.2.2 Configurations

This chapter details the configurations that led to the final set of five conditions. It outlines the process for selecting these configurations and describes how contradictory cases were filtered out to ensure the accuracy of the findings.

The selection of conditions for this study began with a focus on factors influencing farmers' awareness, attitudes toward agri-environmental measures (AEM), and changes in norms,

values, and identity associated with modern agricultural practices, to be classified under Program theory 1, 2 and 3. Initially, this set consisting of six conditions explored a combination of conditions aimed at understanding how these factors collectively shape farmers' perceptions of what constitutes successful participation in agri-environmental initiatives. After deciding on which conditions to use, a first 'synthesis' of a raw data table needs to be created. This synthesis produces a truth table, which comprises configurations that represent specific combinations of conditions associated with a particular outcome (Rihoux & De Meur, 2009). Different types of configurations exist, and each one may correspond to none, one, or multiple cases. In addition to the 0 configurations (outcome 0) and the 1 configurations (outcome 1), there are also contradictory configurations (outcome C). Such a configuration leads to a "0" outcome in some observed cases and a "1" outcome in others. This contradiction must be resolved before proceeding with csQCA. According to Rihoux and De Meur (2009), encountering contradictory configurations is a common phenomenon in QCA studies. These contradictions provide valuable insights into the cases under study. By resolving these contradictions, researchers engage in a process of dialogue with the cases, initiating re-evaluation of theoretical perspectives and resulting in more cohesive data. Whenever possible, it is crucial to resolve or reduce these contradictions (Ragin, Berg-Schlosser, & De Meur, 1996, p. 758). This is because cases with contradictory setups may end up being excluded from the analysis. This presents a challenge given the case-by-case nature of QCA.

In the initial analysis, six conditions were used. One notable observation that emerged right away was the large number of contradictory cases. Thus, some methodological adjustments were needed, as it is important to minimize contradictory cases as much as possible. According to Rihoux & Ragin (2009), there are several strategies to resolve contradictory cases. One of these strategies entails removing one or more condition(s) from the model and possibly replacing them by another condition. Given that the necessity and sufficiency scores of some of the conditions used were low, it can be argued that these conditions can be seen as weak, since they contribute little to explaining the outcome and may be contributing to contradictions. A low necessity score means that the given condition is not consistently present when the outcome occurs, whereas a low sufficiency score suggests that the condition alone isn't enough to explain the outcome. This is undesirable because it suggests that the conditions do not correlate strongly enough with the outcome, potentially risking the validity of the findings (Ragin, 2009). Furthermore, redundant conditions were assessed. These conditions are considered redundant or highly correlated with others, as they may not contribute unique explanatory power and can thus be eliminated. As a first step, certain conditions were replaced with potentially more informative ones. This was done because conditions related to three program theories were selected for the first analysis, resulting in substantial overlap among these conditions. Therefore, it was decided to substitute some with conditions aligned with other Program Theories. This led to that the condition from Program Theory 2 was no longer included in the analysis. This condition was replaced by a condition from Program Theory 4. Besides, conditions showing a low necessity and sufficiency could be replaced. This strategic adjustment was aimed at changing the outcome patterns. Although these replacements presented improved sufficiency and necessity values, the presence of contradictory cases continued. Given the computational complexity appearing from the use of six conditions ($2^6 = 64$ potential configurations), a strategy was adopted to explore the possibility of reducing the number of conditions. This was done because a large number of possible combinations leads to

complexity that is difficult to interpret and increases the risk of contradictory configurations. Whereas previously a separate question (corresponding to a strategy/context of a PT) from the survey was equivalent to a condition, the focus shifted to whether it was possible to merge questions (i.e., conditions) into a single condition, so less conditions were needed for the analysis. This was possible for the questions corresponding to PT 3 and PT 4. The merging of these conditions led to the creation of the conditions called 'Professionals' and 'Visits'. The merging of these conditions was possible because these conditions were strongly related to each other and together can provide a stronger explanation for the outcome. By combining them, the number of separate conditions is now reduced to three (including the condition 'Demonstrate Benefits', this condition is equivalent to a Strategy from PT 1 and is measured by one survey question) and the truth table is made less complicated, while at the same time maintaining relevant information. The truth table, which includes all Boolean data and the selected conditions, along with the outcomes, is shown in Table 10.

Case	VIS	PROF	DEM	Outcome
Initiative 4, Initiative 13, Initiative 17	0	0	0	0
Initiative 7, Initiative 12, Initiative 14, Initiative 31	0	0	1	C
Initiative 6, Initiative 8, Initiative 10, Initiative 11, Initiative 20, Initiative 29, Initiative 33	0	1	1	C
Initiative 37	1	0	0	1
Initiative 5, Initiative 15	1	0	1	0
Initiative 3, Initiative 21	1	1	0	0
Initiative 1, Initiative 2, Initiative 9, Initiative 16, Initiative 18, Initiative 19, Initiative 22, Initiative 23, Initiative 24, Initiative 25, Initiative 26, Initiative 27, Initiative 28, Initiative 30, Initiative 32	1	1	1	C

Table 10. Truth table with 3 conditions.

Even with high scores for sufficiency and necessity, selecting the three conditions of 'Visits', 'Professionals' and 'Demonstrate Benefits', results in a considerable number of contradictory cases. The truth table shows three outcome 0 configurations, implying 'failure', one outcome 1 configuration implying 'success' and three contradictory configurations. Another effective strategy to resolve contradictions according to Rihoux & Ragin (2009) is by adding new conditions to the model. Adding conditions enhances the model's complexity, resulting in

greater detail and differentiation among cases. Each additional condition introduces a new dimension for comparing cases. However, it is important to note that including too many conditions can complicate the QCA process, which can lead to individualized explanations rather than generalized insights. This problem can be referred to as limited diversity, as stated by Rihoux & Ragin (2009). Therefore, maintaining a proper balance between the number of cases and conditions is essential for a strong analysis. According to Berg-Schlusser and De Meur (2009), in an intermediate-N analysis, characterized by having 10-40 cases, it is recommended to use between 4 and 7 conditions. Since the analysis currently includes three variables, adding a fourth or fifth condition would be reasonable if these additional conditions demonstrate strong sufficiency and necessity scores, as well as variability across the cases examined. Relying on the current three conditions is insufficient for a study that uses 30 cases. However, with this amount of cases, contradictory configurations were expected. In the following step of the analysis, two additional conditions will be added and the contradictory configurations will be resolved.

The additional condition 'Type of Expertise' has been introduced. Specifically, this expertise focuses on ecology, biodiversity, and landscape management, where the nature of expertise and the source of knowledge are crucial determinants of outcomes. This condition can be seen as a ramification of the 'Professionals' condition, where respondents could indicate which professionals were involved in the initiative. However, it is important to make a clear indication of which professionals actually contribute to improved implementation and which do not. This will be made clear through the following example: Consider two farmers participating in an agri-environmental program. Farmer A consults with an extension professional who has a farming background and direct knowledge of farming practices. This professional provides advice that is both agronomically valid and well-integrated into the farm's operations, resulting in enhanced biodiversity on Farmer A's land. On the other hand, Farmer B consults with an ecologist who, although knowledgeable about ecological principles, lacks an understanding of practical farming operations. As a result, the advice given to Farmer B is less practical and harder to implement, leading to less effective biodiversity outcomes compared to Farmer A, despite both farmers' participation in the same agri-environmental initiative. This observation emphasizes the role of expertise and the specific nature of knowledge in influencing outcomes within agri-environmental initiatives.

Despite the inclusion of an extra condition, some cases remain unresolved. If, after following the strategies stated by Rihoux & Ragin (2009), there are still contradictory configurations, one could choose to remove the contradictory cases from the key minimization procedure. However, removing these cases also significantly reduces the size of the dataset. Valuable information about variability and complexity may be lost. However, to ensure the reliability of the findings, it has been chosen to exclude cases with durations of less than three years and those starting after 2022. This decision is made by the need to focus on cases that provide enough time for the observed outcomes to develop and stabilize. By concentrating on longer-term cases, more reliable insights are captured into the effect of farmers' participation in the initiatives. In total six cases have been deleted.

In the following paragraph, an effort is made to evaluate the remaining contradictory configuration based on its conditions or outcomes and make adjustments if possible by recoding them. This involves indicating that a condition is either present rather than absent,

or the reverse, which results in the formation of new configurations. These adjustments will be justified in the following paragraph.

Configuration VIS*PROF*dem*EXP

In this set of conditions, VIS, PROF, and EXP are present, while DEM is absent. The cases with this configuration and contradictory outcomes are Initiative 3, Initiative 8, Initiative 4 and Initiative 7.

Case	VIS	PROF	DEM	EXP	Outcome
Initiative 3	1	1	0	1	1
Initiative 8	1	1	0	1	0
Initiative 4	1	1	0	1	1
Initiative 7	1	1	0	1	1

Table 11. Cases with the configuration VIS*PROF*dem*EXP.

For Initiatives 3, 4, and 7, it appears that the condition of expertise (EXP) is not met. Therefore, the configuration could be adjusted to reflect the absence of expertise in these cases. In the survey question pertaining to what kind of expertise is offered within the initiative, respondents were offered an open-answer question. However, many respondents indicated that expertise is offered within the initiative, although this type of expertise does not fall within the scope of the type of expertise used in this study. There may be some form of expertise within an initiative, however, if they do not encompass that particular experience and agronomic part, it contributes very little to success. To determine if certain conditions are absent rather than present, it is necessary to conduct an in-depth study into the cases. In response to the question ‘What kind of expertise is offered?’, Initiative 7 answered, “Two employees of Natuurmonumenten.” This does not fall within the framework of agricultural expertise as defined in this study because Natuurmonumenten's main focus is solely on the conservation and management of nature and biodiversity, not on the production and optimization of agricultural activities. So, it can be argued the condition ‘Expertise’ is absent for this case. For Initiative 4, an agricultural consultant is offered within the initiative as a form of expertise. While it can be argued that an agricultural consultant does fit within the framework of expertise, the use of a single consultant should also be taken into account, this is often not enough. In addition, agricultural consultants often do not work independently. This can have a significant influence on the quality and reliability of the advice provided, think for example of influence by interests. As this is a doubtful case, the considered choice was made to put the condition on absent. By choosing to classify the condition as "absent," the goal is to maintain the accuracy of the analysis. This decision recognizes the intricate complexity and uncertainty that is part of the data. Initiative 3 does involve one-to-one expert support within the initiative; however, the initiative did not specify the type of expertise involved. So, also for this case the choice was made to set the condition to absent.

Since the type of expertise in the mentioned cases does not align with the condition of expertise defined in this study, the configurations for these cases have been recoded. The three cases now align with the new configuration VIS*PROF*dem*exp, where expertise is absent, resulting in an outcome 0 configuration.

Configuration VIS*PROF*DEM*EXP

The configuration VIS*PROF*DEM*EXP includes in total 14 cases, in which 13 cases have outcome 1 and one case has outcome 0. In this combination of conditions, the conditions 'Visits', 'Professionals', 'Demonstrate Benefits' and 'Expertise' are present. The contradictory cases with this configuration are listed down below.

Case	VIS	PROF	DEM	EXP	Outcome
Initiative 33	1	1	1	1	1
Initiative 38	1	1	1	1	1
Initiative 29	1	1	1	1	1
Initiative 37	1	1	1	1	1
Initiative 32	1	1	1	1	1
Initiative 20	1	1	1	1	0
Initiative 27	1	1	1	1	1
Initiative 24	1	1	1	1	1
Initiative 18	1	1	1	1	1
Initiative 36	1	1	1	1	1
Initiative 25	1	1	1	1	1
Initiative 30	1	1	1	1	1
Initiative 21	1	1	1	1	1
Initiative 28	1	1	1	1	1

Table 12. Cases with the configuration VIS*PROF*DEM*EXP.

Out of the 14 contradictory cases identified, 13 have an outcome of 1, indicating success,

while 1 case has an outcome of 0, indicating failure. Upon closer examination, the case with the outcome of 0 requires reclassification due to its actual success. Although the survey response indicated that the implementation of measures was not viewed as part of regular business operations, it also revealed that a majority of the participants continued the measures after the initiative concluded. Additionally, most participants were motivated to apply these measures on a larger scale. This contradiction suggests that, based on the survey data, the initiative should be considered successful. Consequently, this case has been reclassified as successful to accurately reflect its true outcome, and hereby the configuration is resolved.

*Configuration vis*PROF*dem*EXP*

In this set of conditions, 'Visits' and 'Demonstrate Benefits' are absent, while 'Professionals' and 'Expertise' are present. The six contradictory cases are listed down below. Here, two cases have the outcome 1, and four cases have the outcome 0.

Case	VIS	PROF	DEM	EXP	Outcome
Initiative 2	0	1	0	1	0
Initiative 22	0	1	0	1	1
Initiative 10	0	1	0	1	0
Initiative 26	0	1	0	1	1
Initiative 12	0	1	0	1	0
Initiative 13	0	1	0	1	0

Table 13. *vis*PROF*dem*EXP*.

Rihoux & Ragin (2009) suggest that it is also possible to revisit the cases within each specific contradictory configuration in a more qualitative and detailed way. What might have been overlooked? What potential differentiators exist between these cases that have not been addressed, either in the model or in the operationalization of the conditions and outcomes? After analyzing the survey data, it was clear that there was significant variation in the financial compensation offered to participating farmers across the contradictory cases. This variation, and a literature review provided a significant justification for adding the condition 'Financial Compensation' to the analysis. The survey indicated significant differences in the provision of financial incentives across cases, suggesting that financial compensation could be a crucial factor influencing the successful adoption of AEM. The literature supports this view, highlighting that financial support helps farmers to weigh the financial risks and benefits associated with these measures, thereby motivating them to participate in agri-environmental programs (Barghusen et al., 2021; Fleury et al., 2015; Witvliet et al., 2024). The review revealed that while financial incentives are necessary, they are not sufficient on their own to ensure the adoption of AEM. Farmers' decisions to

participate are influenced by a combination of financial support and other contextual factors (Witvliet et al., 2024). In this study those other factors can be seen as the set of conditions. Therefore, financial compensation will be added as a fifth condition.

By adding the fifth condition, several contradictory cases are resolved. Initiative 12, Initiative 2 and Initiative 10 received outcome 0 and can be considered not successful. However, three contradictory cases remained. The last contradictory configuration will be discussed below.

*Configuration vis*PROF*dem*EXP*FIN*

The last contradictory configuration includes the three cases Initiative 22, Initiative 13 and Initiative 31. Here, the conditions ‘Professionals’, ‘Expertise’ and ‘Financial Compensation’ are present and ‘Visits’ and ‘Demonstrate Benefits’ are absent. For the cases Initiative 22 and Initiative 31 this gives a successful outcome, whereas Initiative 13 has an unsuccessful outcome.

Case	VIS	PROF	DEM	EXP	FIN	Outcome
Initiative 22	0	1	0	1	1	1
Initiative 13	0	1	0	1	1	0
Initiative 31	0	1	0	1	1	1

Table 14. Cases with the configuration *vis*PROF*dem*EXP*FIN*.

The three cases were carefully reviewed to explore possible solutions, but no effective resolution was found. According to Rihoux and Ragin (2008), in such an event, a researcher has the option to remove the contradictory cases from the data table or keep them. Those cases still involved in the contradictory configurations can then be interpreted separately, using a more qualitative-historical, case-specific approach, distinct from the standard csQCA procedures. It has been decided to keep the case Initiative 13 in the data table. In other words, we accept this contradictory case.

5.2.3 Boolean minimization

Data from 30 agri-environmental initiatives was analyzed to determine which combinations of five selected conditions are necessary and/or sufficient for achieving implementation of AEM among farmers. The analysis began with a necessity check to identify any essential conditions. Following this, a sufficiency analysis was conducted using Boolean minimization, and the parsimonious solution was interpreted. The analysis was carried out using the programs fsQCA and Tosmana.

First, the analysis of necessity was conducted. A condition is considered necessary if it is consistently present whenever the outcome is achieved, meaning that the outcome cannot occur without this condition (Schneider and Wagemann, 2012; Oana et al., 2021). The conditions and its necessity scores are displayed in table 15.

$$\text{RoN} = \frac{(\text{Coverage} - \text{Consistency})}{(1 - \text{Consistency})}$$

Condition	Necessity	Sufficiency
VIS	0.842	0.727
PROF	0.947	0.643
EXP	0.842	1.000
DEM	0.947	0.642
FIN	0.579	0.689

Table 15. Necessity and sufficiency scores.

In the analysis of necessity, the empirical evidence was examined to determine the presence of a necessary condition. Necessity is determined through two metrics: consistency, which evaluates the strength of the relationship, and coverage, which measures how relevant the relationship is to the cases under study. A condition is considered necessary for explaining an outcome when the consistency of necessity is 0.9 or higher and the coverage exceeds 0.6 (Schneider and Wagemann, 2012, p. 143). However, for necessary conditions, the Relevance of Necessity (RoN) also needs to be considered, which measures the trivialness of the findings. Conditions that pass the consistency test for being a necessary condition should not be considered relevant necessary conditions unless they also achieve a high value in the relevance measure (Schneider and Wagemann, 2012, p. 147). Scores closer to 0 indicate higher trivialness, while scores closer to 1 indicate higher relevance (Dik et al., 2023). The RoN should ideally be greater than 0,5. Below, the formula to help better understand how empirically relevant a condition is when it is necessary for the outcome (table 16), with its calculations is given.

Condition	RoN
VIS	-0.727273
PROF	-5.785714
EXP	1.000000
DEM	-5.785714

FIN	0.257353
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Table 16. Relevance of Necessity scores.

A negative RoN value suggests that the condition might not be practically necessary despite having high consistency scores. RoN helps in distinguishing between purely logical necessity and empirical relevance. Based on the calculations, the condition 'Expertise' has the highest relevance with a RoN of 1, indicating it is relevant as a necessary condition.

Then, the analysis of sufficiency was conducted to determine whether specific combinations of conditions are sufficient to produce a particular outcome (see table 15). A condition is deemed sufficient if, in every instance where it is present, the outcome also occurs. In other words, there should be no cases where the condition is observed without the accompanying outcome (Schneider and Wagemann, 2012). So, it can be said that providing tailored, agronomic expertise within an initiative (EXP) is a sufficient condition for the successful implementation of AEM among farmers (outcome 1). This claim can be considered reliable, because all initiatives providing this tailored expertise are also successful in implementing AEM; no initiatives providing this, can be unsuccessful in implementing AEM. This can be expressed as "if X, then Y".

The results were evaluated using measures of consistency and coverage. Setting a consistency threshold is essential for determining which configurations of conditions are sufficient. Because consistency values vary significantly depending on the dataset, truth table, and distribution of cases, there are no standard, universally applicable thresholds. In this study, the consistency threshold was set at 0.66 to evaluate the accuracy of the explanatory model, following the guidelines of Schneider and Wagemann (2012). This decision is based on the fact that a contradictory case is still included, therefore the threshold needs to be set on 0.66. In the next paragraph, the configurations towards participation in successful agri-environmental initiatives, using the complex and parsimonious solution will be discussed.

In the context of csQCA, Boolean minimization represents the next crucial step aimed at simplifying and condensing the complex configurations derived from the truth table. This step entails identifying the minimal combinations of conditions that are both necessary and sufficient to explain each outcome configuration (Rihoux & Ragin, 2008). By reducing the truth table to its essential combinations, Boolean minimization helps in identifying the core conditions or sets of conditions that consistently lead to a particular outcome. Boolean minimization is about simplifying complex expressions and creating shorter, clearer statements using Boolean logic. At the core of this lies: If two Boolean expressions provide the same outcome despite differing by only one causal condition, the distinguishing condition can be considered irrelevant and removed, allowing for a simpler, combined expression (Ragin et al., 2017). This process is essential for enhancing the interpretability and theoretical clarity of QCA results, as it focuses on the most parsimonious explanations without losing the essential causal relationships included within the configurations.

5.2.3.1 Outcome 1 minimization (without Logical Remainders)

Minimizing the configurations is important to identify the essential conditions that need to be present in cases where outcome 1 occurs. Using the fsQCA tool *specify analysis*, four minimized configurations for outcome 1 have been identified and are shown in Table 17 below.

Frequency cutoff: 1

Consistency cutoff: 0,670

Set	Raw Coverage	Unique Coverage	Solution Consistency
PROF*EXP*DEM*fin	0,421	0,050	1
VIS*PROF*EXP*DEM	0,790	0,421	1
VIS*prof*exp*dem*FIN	0,053	0,053	1
vis*PROF*exp*DEM*FIN	0,110	0,110	0,667

Solution coverage: 1,000

Solution consistency: 0,947

Table 17. Minimization for outcome 1 configuration (without Logical Remainders)

The analysis identified several key configurations with varying levels of explanatory power, as indicated by their raw coverage values. The configuration with the highest raw coverage is VIS*PROF*EXP*DEM. These four conditions also scored the highest in terms of necessity. The raw coverage value of this configuration demonstrates that in 79% of the cases with outcome 1, all four conditions are present, regardless of the other condition. The unique coverage of 0.421 for the combination indicates that 42,1% of the cases are uniquely explained by this specific combination of conditions. In other words, these cases are only covered by this particular combination and not by any other combination listed in the analysis. This means that in approximately 8 of the 19 cases with outcome 1, these four conditions are present while the condition FIN is absent. This suggests that in these cases, 1) organizing farm visits stimulates the adoption of AEM among farmers, 2) engagement with professionals with specialized knowledge in the program is essential in promoting AEM among farmers, 3) demonstrating the agronomic benefits of AEM to farmers has a positive influence on the implementation, and 4) the type of expertise that is offered to farmers in the program is of importance whether AEM are implemented or not. Even though this set has a high coverage, the set also includes four conditions, reflecting the intricate nature of this configuration.

The configuration PROF*EXP*DEM*fin shows a raw coverage of 0.421, meaning that this combination of conditions explains 42.1% of the cases with more than 0.5 membership in terms of the configuration, corresponding to 8 cases. This suggests that in just under half of the outcome 1 cases, financial compensation is not required for the successful implementation of AEM among farmers. Initially surprising, this finding suggests that

enabling conditions like financial compensation, which one might expect to facilitate AEM implementation, do not necessarily have the expected impact. However, in this configuration it is assumed the combination with the other conditions compensates for the absence. Additionally, the unique coverage of 0.05 shows that in 1 of the 19 outcome 1 cases, only the PROF, DEM, and EXP conditions are present. This suggests that demonstrating the agronomic benefits of AEM, combined with the involvement of professionals with specific expertise, can lead to successful implementation. However, only 1 case exhibits the presence of the three conditions along with the desired outcome.

The high necessity scores of PROF and DEM, in combination with the perfect sufficiency of EXP indicate that these conditions are almost always required for the outcome to occur, making them important components of successful configurations.

The next minimized set, $vis*PROF*exp*DEM*FIN$, has a raw coverage of 11%. This illustrates that the presence of professionals in the initiative, in combination with financial compensation and demonstration of the agronomic benefits, the outcome 1 occurs. The unique coverage of this set is the same as the raw coverage. This means that the combination of conditions in question exclusively explains the outcome without any overlap with other combinations. In other words, the combination of conditions is responsible for covering all the cases in the dataset that show the outcome, and no other combinations of conditions cover these cases. All cases covered by this combination are not included in the coverage of any other condition combination. With a unique coverage and raw coverage of 0,111, two of the 19 outcome 1 cases are explained by this configuration.

The last minimized set, $VIS*prof*exp*dem*FIN$, is present in just 5,3% of the outcome 1 configurations. Here, the combination of organizing farm visits and financial compensation lead to the desired successful implementation. The raw coverage and unique coverage are the same, this indicates that only the presence of the two relevant conditions is found in just one case. The solution consistency for this particular configuration is 0.67. This level of consistency can be attributed to the presence of a contradictory case, namely Initiative 13, in the dataset. Because Initiative 13 does not align with the other cases that meet the criteria, the overall consistency of the solution falls short of perfect. Consequently, the consistency score for the three cases affected by this contradiction is not 1.

5.2.3.2 Minimization of the outcome 1 cases (with Logical Remainders)

The formulas used for the execution of the outcome 1 minimization are complex and achieve limited parsimony. More parsimony can be achieved by allowing the software to incorporate non-observed cases that are theoretically plausible, known as "logical remainders" (Rihoux and Ragin, 2012). When logical remainders are excluded from the analysis, the resulting minimized sets tend to be more complex. This complexity is due to the fact that the minimization process can only consider observed configurations, leading to a higher number of conditions in each set. In the analysis, the inclusion of logical remainders as "do not care" configurations allows for the identification of simpler minimized sets. Figure 18 displays these minimized sets along with their raw and unique coverage scores. With five conditions that can each be present or absent, there are 32 possible unique configurations ($2^5 = 32$). By including the logical remainders in the analysis, the software can identify less complex minimized sets. This is achieved by choosing certain logical remainders and incorporating

them into the observed outcome 0 or 1 cases, while making simplifying assumptions (Rihoux & De Meur, 2009). The software operates on the assumption that logical remainders will produce results similar to those of the cases they are associated with. This principle is illustrated in the Venn diagram (Figure 7), where cases with matching configurations are grouped into a larger area that also encompasses logical remainders. This approach allows the broader area to be represented by a more straightforward set of combinations (Rihoux & De Meur, 2009). Each binary string in the diagram represents a unique combination of conditions, where '1' indicates the presence of a condition and '0' indicates its absence. Some key observations will be highlighted. Certain combinations such as '01111' (Initiatives 22, 32, 8, 7, 38, 5) and '11100' (Initiatives 36, 30, 25, 37) are densely populated with initiatives, indicating that these specific combinations of conditions are common among the successful initiatives. Some combinations like 00000, 00100, and 01000 are empty, indicating that no initiatives fall under these configurations. These empty spaces represent logical remainders. Certain initiatives, such as Initiative 14 '00011' and Initiative 35 '01110', are associated with unique configurations, which could suggest specific conditions that uniquely influence these initiatives.

Frequency cutoff: 1

Consistency cutoff: 0,670

Set	Raw Coverage	Unique Coverage	Solution Consistency
EXP	0,842	0,842	1
vis*DEM*FIN	0,111	0,111	0,667
prof*dem	0,523	0	1
VIS*prof*FIN	0,053	0	1

Solution coverage: 1,000

Solution consistency: 0,947

Table 18. Minimization for outcome 1 configuration (with Logical Remainders)

The Venn diagram illustrates all 32 potential condition combinations within the boxes and includes their respective cases. It effectively shows the distribution of outcome 0 cases, outcome 1 cases, and logical remainders. The 20 white boxes represent the logical remainders, indicating configurations that were not observed in any of the cases. This rather high number of logical remainders should be noted. This may be due to incomplete causal coverage or missing relevant conditions. Further on in this research this issue will be looked at.

Incorporating logical remainders into the analysis results in minimized sets that are less complex compared to those shown in Figure 18. The following example will help clarify this. The set EXP, can be read as "For all these initiatives, consulting with a professional with tailored agronomic expertise has led to the successful implementation of agri-environmental measures within an initiative." Comparing this set with the VIS*PROF*DEM*EXP set of the

outcome 1 minimization (without logical remainders), we observe that a more parsimonious solution has been obtained due to the software's simplifying assumptions about certain logical remainders. The set EXP, with a raw coverage score of 0.842, shows an increase in coverage, suggesting that including logical remainders has combined cases into this broader set, thus simplifying the formula. What stands out looking at the minimizations is that, as well as without the logical remainders, the condition EXP appears to be essential in the successful cases.

The set vis*DEM*FIN covers 11,1% of the outcome 1 cases, and uniquely covers the same percentage, which is equal to 2 cases. However, the consistency score of 66,7% is not as high as the other consistency scores. This indicates that there are cases where the configuration does not consistently produce the outcome, which could be due to variations in the conditions or the complexity of the relationships. The configuration prof*exp has a moderate raw coverage, indicating it explains a fair portion of the outcome. However, the unique coverage is zero, suggesting that this configuration does not uniquely contribute to the outcome by itself; all cases covered by this configuration are also covered by other configurations.

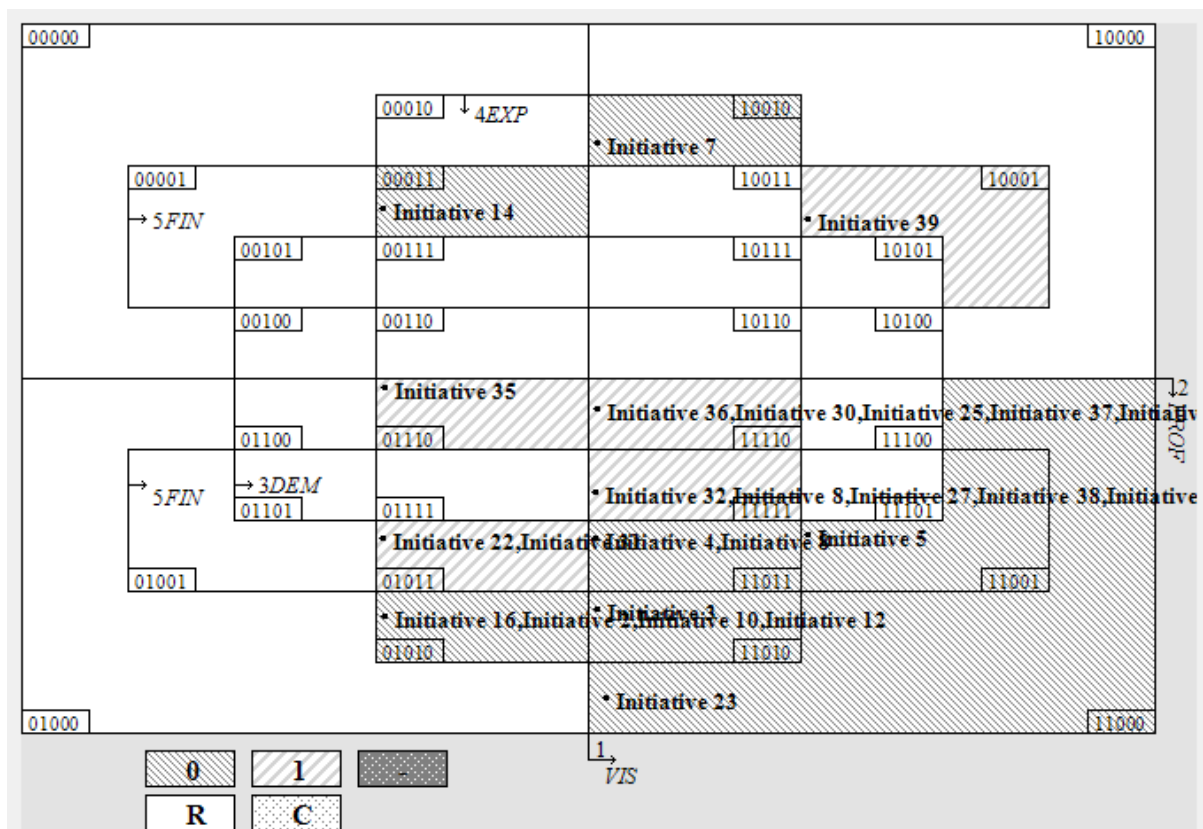


Figure 7. Venn diagram.

The inclusion of logical remainders has several notable effects on the minimization outcomes. The sets identified with logical remainders are less complex, containing fewer conditions. For example, EXP alone emerges as a significant set with high coverage and consistency, compared to more complex sets without logical remainders. The raw coverage of the minimized sets with logical remainders is generally higher. The set EXP covers 84.2% of cases, while the highest coverage without logical remainders is 79% for the set

VIS*PROF*DEM*EXP. This indicates that logical remainders help in identifying broader, more complete configurations. The solution consistency remains high in both scenarios, suggesting that the identified sets are reliable in predicting the outcome. However, the unique coverage values change, reflecting the different contributions of each set to explaining the outcome. The simple set prof*dem, has a moderate score on raw coverage, but scores 0 on unique coverage. In addition, vis*DEM*FIN also scores low on coverage, indicating that these two configurations provide limited insight into the conditions necessary for the successful implementation of AEM among farmers.

5.2.3.3 Outcome 0 minimization

Next, the exact same procedure was performed, this time for the outcome 0 configurations. This approach provides understanding not only into the conditions that contribute to successful implementation but also into the configurations that lead to unsuccessful implementation among farmers. Figures 19 and 20 below present the minimized sets for outcome 0 configurations, demonstrating both the scenarios with and without the logical remainders.

Frequency cutoff: 1

Consistency cutoff: 1

Set	Raw Coverage	Unique Coverage	Solution Consistency
VIS*PROF*exp	0,417	0,333	1
VIS*exp*DEM*fin	0,167	0,083	1
PROF*exp*DEM*fin	0,417	0,333	1
vis*prof*exp*DEM*FIN	0,083	0,083	1

Solution coverage: 0,917

Solution consistency: 1,000

Table 19. Minimization for outcome 0 configurations without Logical Remainders

Frequency cutoff: 1
 Consistency cutoff: 1

Set	Raw Coverage	Unique Coverage	Solution Consistency
exp*fin	0,583	0,333	1
VIS*PROF*exp	0,417	0,250	1
vis*prof	0,083	0	1
prof*DEM	0,167	0	1

Solution coverage: 0,917

Solution consistency: 1,000

Table 20. Minimization for outcome 0 with Logical Remainders

The sets VIS*PROF*exp and PROF*exp*DEM*fin both account for 41.7% of the cases where the outcome is 0, with 33.3% uniquely attributed to this configuration, showing a high degree of explanatory power of unsuccessful implementation. The unique coverage of these two configurations indicate that they explain a significant portion of the cases without overlapping with other configurations. What stands out in both sets is that the presence of conditions with high necessity scores is still not enough for an outcome 1 configuration. In both sets, the absence of the condition 'Expertise', results in an outcome 0 configuration. The other two sets have a lower raw coverage, where to set VIS*exp*DEM*fin and vis*prof*exp*DEM*FIN respectively explain 16,7% and 8,3% of the cases. Both sets have a unique coverage of just 8,3%, suggesting that the same cases are being explained by multiple causal configurations. It indicates that the combination of all condition - Visits (vis), Professionals (prof), Demonstration of the benefits (dem), Expertise (EXP), and Financial compensation (FIN) - is associated with the outcome 0. The high consistency suggests that when all conditions are present, it consistently leads to outcome 0. However, this only occurs in 1 case.

The inclusion of logical remainders simplifies the minimized sets. For example, exp*fin emerges as a significant set with high coverage (0.583) compared to the more complex combinations required without logical remainders. The high raw coverage indicates that the absence of tailored expertise in an initiative (exp) and the absence of financial compensation (fin) alone can explain a substantial proportion of unsuccessful outcomes. The Unique coverage is slightly reduced in some configurations when logical remainders are included, as seen in VIS*PROF*exp (from 0.333 to 0.250). It still accounts for a significant portion of cases but with some overlap with other configurations, indicating that Visits (VIS), Professionals (PROF), and Demonstrate Benefits (dem) remain important, though their explanatory power is somewhat reduced when logical remainders are included.

The configurations vis*prof and prof*DEM cover a small portion of cases and do not uniquely explain any outcomes, indicating their limited explanatory power.

6. Conclusion

In this concluding chapter, the research question and sub-questions are addressed, providing answers based on the findings of this study. The first two sub-questions addressed in this research are:

“What are the necessary conditions?”

And:

“What are the sufficient conditions?”

First, the necessary conditions for achieving the desired outcome in this study will be addressed. By evaluating the conditions of ‘Visits’ (VIS), ‘Professionals’ (PROF), ‘Demonstrate Benefits’ (DEM), ‘Expertise’ (EXP) and ‘Financial Compensation’ (FIN), it is aimed to understand their importance and interplay. A necessary condition for an outcome is a condition that must be present for the outcome to occur. If an outcome is observed, the necessary condition will always be present. However, the presence of the necessary condition does not guarantee the outcome; it only implies that the outcome cannot happen without this condition (Schneider and Wagemann, 2012). The necessity values range from 0 to 1, with values closer to 1 indicating a stronger necessity. In this analysis, the necessary conditions were determined by examining the consistency and coverage measures, with a threshold for consistency set at 0.9 or higher and coverage exceeding 0.6. Also, the RoN (relevance of necessity) has been considered, which helps to assess how strongly the presence of a condition is associated with the outcome, given that it is necessary. The analysis revealed the following:

The conditions PROF and DEM appear as the highest scores of necessity, each exhibiting a high necessity value of 0,947. This emphasizes their important roles in ensuring the desired outcome. The concurrent high necessity values for both PROF and DEM suggest a strong interdependence between these two conditions. This interplay indicates that having one without the other might not be sufficient; it is the combination of both that optimally drives successful outcomes. In practical terms, it suggests an interdependence where the presence of professionals in an initiative and demonstrating the agronomic benefits to farmers are crucial for success. The high necessity score of 0.947 suggests that in 18 out of the 19 cases with outcome 1, at least one of these conditions is present. However, looking at the RoN scores of these conditions, it suggests an inverse relationship, where the presence of the condition might be associated with a lower likelihood of the outcome occurring, or it might be less relevant in explaining the outcome despite being necessary. This can indicate that while the condition is present when the outcome occurs, its presence might not directly contribute to the outcome or might be associated with contexts where the outcome is less likely.

The conditions VIS and EXP both have a necessity value of 0,842. While slightly lower than PROF and EXP, these values are still significantly high, indicating that these conditions are present in a significant portion of the successful cases, but not in all of them. This accounts especially for the condition EXP, which has a very strong RoN score of 1. This means that

the condition is relevant in explaining the outcome beyond its necessity. However, if we adhere to the strict terms of Schneider and Wagemann (2012, p. 142), none of the conditions are considered strictly necessary for the outcome, as either they do not meet the necessary criteria for consistency and coverage or they fail to meet the relevance criterion (RoN).

A condition or a combination of conditions is considered sufficient if it can produce the outcome when present. The sufficiency analysis utilized a consistency threshold of 0.66, to accommodate the presence of contradictory cases in the dataset. The analysis identified the following sufficient conditions and their combinations:

The condition VIS shows high sufficiency, meaning that organizing farm visits to stimulate the adoption of AEM among farmers significantly contributes to achieving the desired outcome. While not always necessary, its presence enhances the likelihood of success. However, the sufficiency score of 1.0 for EXP is particularly noteworthy. It covers all cases of the outcome, meaning that providing tailored expertise alone can guarantee the desired outcome. This highlights its importance in the organizational context. While EXP shares the same necessity score as VIS (0.842), its sufficiency score (1.0) sets it apart. This indicates that even if other conditions vary, providing tailored expertise by professionals alone can ensure the desired result. EXP's necessity and sufficiency scores together highlight its dual role as both a critical and independently sufficient condition for success.

The final part of this research explores which conditions need to be present to achieve successful participation. These findings address the third sub-question:

“Which (combinations) of success conditions are present in the initiatives under examination, and to what extent does the success depend on these conditions?”

Resulting from a broad evaluation of different strategies and contexts originating from the 10 Program Theories by Witvliet et al., (2024), five key conditions have been identified as critical for success. These conditions assess how the involvement of *professionals* in an initiative and the organization of *farm visits* influence farmers' adoption of AEM, and how *demonstrating the agronomic benefits*, the *type of expertise* provided, and providing *financial compensation* has an influence on the participation of farmers in agri-environmental initiatives.

The 'Visits' condition is present when visits are organized for participating farmers, either to each other's farms or to agricultural businesses that have been working with the measures for a longer period. This highlights the value of experiential learning and peer interaction in promoting the adoption of sustainable agricultural practices. In more than 80% of the successful cases, farm visits for the adoption of AEM among farmers are organized. This suggests a strong correlation between the presence of farm visits and the successful implementation of AEM practices. This high percentage implies that farm visits are a common and effective component in achieving successful outcomes. The conditions most frequently observed in successful cases are the conditions 'Professionals' and 'Demonstrate Benefits'. The first condition is present if support and meetings with professionals with knowledge in the context of sustainable agriculture is provided in an initiative. The presence of this condition may be important because it can guide the necessary support, education,

and resources to successfully adopt and implement sustainable farming practices. The presence of the 'Demonstrate Benefits' condition indicates that demonstration of the agronomic benefits of implementing AEM within their businesses has a positive effect. In addition to the PROF and DEM conditions, the 'Expertise' condition is present in 16 of the 19 outcome 1 cases, highlighting the positive impact of providing tailored expertise on implementation. This indicates that the involved professionals have extensive and in-depth expertise of the agricultural sector, gained through their own background and experience in farming. By leveraging their experience and understanding of both farming and environmental sustainability, these professionals enhance the likelihood of successful implementation among farmers.

In fifteen of the in total 19 outcome 1 cases, farm visits are being organized, professionals are embedded in the initiative, agronomic expertise is being offered and the agronomic benefits are being demonstrated. When including some non-observed combinations of conditions, the configuration EXP appears in 84.2% of the successful cases, and its presence is uniquely and perfectly consistent with success. This high coverage and perfect consistency indicate that providing tailored agronomic expertise is a critical condition for success in the studied initiatives. It suggests that when tailored expertise is offered, the likelihood of achieving success significantly increases. This condition is present in 16 out of the 19 outcome 1 cases. The combination of vis*DEM*FIN appears in 11.1% of the successful cases. While it shows some degree of importance, the lower raw coverage and solution consistency suggest that this combination alone is not a strong predictor of success but still plays a role in certain scenarios.

To come back to the sub-question, the successful initiatives predominantly feature the conditions of farm visits, professional involvement, demonstration of benefits and expertise. Among these, providing tailored expertise emerges as a particularly crucial condition, with its presence showing a strong and consistent link to successful outcomes. If this condition is present, this leads to a successful outcome in 16 out of the 19 cases.

Answering the sub-questions leads to addressing the main question of this research:

“Which (combinations of) conditions are necessary or sufficient for the successful implementation of measures aimed at agrobiodiversity in Dutch agri-environmental initiatives?”

This research identified five key conditions that are important for achieving the successful implementation of agri-environmental measures. The research reveals that none of the five conditions derived from the 10 Program Theories for the design and implementation of successful AEPs (Witvliet et al., 2024) examined in this study are necessary to work towards the desired successful implementation. Nonetheless, some conditions are almost always found in successful cases. If engagement with professionals with specialized knowledge is being offered within the initiative, or the agronomic benefits are being demonstrated to the farmers, this means that in eighteen out of the nineteen cases, successful implementation of AEM within an initiative is being achieved. However, since the threshold of 0,5 of the relevance of necessity is not met, these conditions cannot be considered directly necessary. The condition 'Expertise', measuring the type of expertise that is provided within an initiative, is shown to be more necessary to reach successful implementation. With its high necessity

score and very strong RoN score of 1, it means that the condition is relevant in explaining the outcome beyond its necessity. Also, the sufficiency score of this condition is of great importance. With a sufficiency score of 1, it covers all cases of the outcome, meaning that providing tailored expertise alone can guarantee the desired outcome.

Considering the various combinations of conditions identified in this research, there are five specific combinations that lead to the desired outcome. Collectively, these combinations account for all successful cases. The minimal case combinations illustrate the complex interplay of conditions required for the successful implementation of AEM among farmers. The analysis discovered that agri-environmental initiatives use different pathways to enable the successful implementation of AEM among farmers. In 16 out of the 19 cases, offering tailored expertise within the initiative is crucial to enable the successful implementation of AEM. Furthermore, the research showed that successful implementation is facilitated by demonstrating the agronomic benefits of AEM to farmers, in combination with the presence of financial compensation and the absence of organizing farm visits

In general, it can be concluded that the successful implementation of agri-environmental measures (AEM) among farmers is heavily influenced by offering tailored expertise within the initiative. The presence of the EXP condition is highly significant and often sufficient on its own for achieving success. When combined with other conditions, it is demonstrated that these configurations can still lead to successful outcomes, although these are less common. The complexity of various conditions interacting to achieve success highlights the importance of adopting a diverse approach in agri-environmental initiatives.

As stated in the study's objective, the aim was not to identify a single set of conditions that always guarantees success. Rather, the research highlights that the significance of conditions can vary. Nevertheless, key conditions have been identified in various combinations, which appear essential for achieving higher AEM implementation rates among farmers in Dutch agri-environmental initiatives.

7. Discussion and recommendations

In this study, the impact of five selected conditions on the successful implementation of agri-environmental measures (AEM) among farmers has been evaluated. Below, the findings are discussed in relation to theoretical expectations and the study's objective: identifying successful (combinations of) conditions that lead to the implementation of AEM among farmers in agri-environmental initiatives in the Netherlands. Additionally, the limitations of the research are addressed, along with recommendations for future research to aid agri-environmental initiatives and policymakers.

7.1 Discussion

Firstly, it is important to highlight that this research primarily utilizes the cases to identify conditions for success, rather than to rank the initiatives. The characteristics of the cases are based on single surveys and in-depth case studies based on information provided by the internet, offering an indicative rather than a definitive picture. Consequently, this perspective may not fully align with reality or reflect guaranteed accuracy.

From the results of the Qualitative Comparative Analysis, it was found that offering tailored expertise in the agronomic context within agri-environmental initiatives leads to the successful implementation of agri-environmental measures among farmers. The findings of this research are consistent with existing knowledge on agricultural biodiversity conservation in the Netherlands, as well as with previous studies on topics such as approaches to agricultural nature conservation. A study in Bavaria found that targeted agricultural training and professional advice significantly enhance farmers' engagement in agri-environmental schemes (AES). Farmers who received specific training and advisory support were more likely to adopt environmentally friendly practices (Zindler et al., 2023). The systematic review conducted by Schaub et al. (2023) highlighted the significance of behavioral factors and opportunity costs in influencing farmers' involvement in agri-environmental schemes (AES). It found that involvement in agricultural training programs, receiving expert advice, and being part of knowledge exchange networks positively influence farmers' decisions to join AES. This emphasizes the important role of tailored expertise and knowledge exchange in driving participation.

The results revealed that financial compensation has a less significant impact on the successful implementation of AEM among farmers than was initially anticipated. As mentioned by several studies, farmers and agri-environmental initiatives frequently address subsidies, indicating the importance of compensating for productivity losses when adopting agri-environmental schemes (Defrancesco et al., 2008; Lastra-Bravo et al., 2015). A possible explanation for this finding could be the increasing recognition of non-financial factors that influence farmers' participation. Research by Kallas et al., (2010) suggests that social norms, environmental attitudes, and the perceived effectiveness of the measures can play a more significant role than financial incentives alone. Additionally, the work of Keeler et al., (2019) highlights that farmers' commitment to environmental support and personal values can sometimes outweigh the financial benefits provided by subsidies. This shift in focus towards intrinsic motivation and the perceived long-term benefits of sustainable practices may explain why financial compensation appears less important in the successful implementation of AEMs among farmers.

Looking at the cases used in this research, a clear distinction can be made between two groups. Those that primarily focus on functional agrobiodiversity and those that focus on nature and landscape biodiversity. The first group, which concentrates on functional agrobiodiversity, generally has a successful outcome in terms of the implementation of agri-environmental measures (AEM) among farmers. These cases show that farmers successfully implement AEM when the emphasis is on agrobiodiversity. Functional agrobiodiversity takes into account not only ecological aspects but also requires in-depth knowledge of farm management. Expertise in this area is essential because it is not just about promoting biodiversity but also about improving agronomic practices that directly impact the productivity and sustainability of farms. Farmers need to understand not only how to integrate biodiversity into their farming systems but also how this integration can contribute to improving their farm management and economic returns.

On the other hand, the analysis shows that the second group of cases, where there is no successful implementation of AEM, mainly focuses on nature and landscape biodiversity. While this form of biodiversity is also important, the focus on this aspect without linking to agronomic benefits seems less effective in motivating farmers to participate in and successfully implement AEM. Thus, for the successful implementation of agri-environmental measures, it is crucial to pay attention not only to ecological aspects but also to make a clear connection with the practical management of farms. Expertise in both ecology and agronomy appears to be essential to convince and support farmers in integrating biodiversity into their farming practices.

The present study complements the existing literature on agricultural nature conservation in the Netherlands, by shifting the focus from analyzing isolated factors to examining how various combinations of conditions contribute to successful outcomes. Unlike traditional research that often isolates individual factors, this study uses a Qualitative Comparative Analysis (QCA) approach to identify how different configurations of conditions work together to influence the implementation of AEM. This offers a more holistic understanding and can better explain complex interactions between conditions.

The collected data shows that the type of expertise offered within an initiative is not the only factor influencing farmers' motivation to implement AEM, aligning with the studies mentioned earlier. Organizing farm visits, professionals, demonstrating benefits, financial compensation, as identified by, for example Witvliet et al., (2024), Birge & Herzon (2019) and Home et al., (2015), were incorporated as conditions in the analysis. In doing so, previous research has been integrated by identifying important factors for successful implementation of AEM in Dutch agri-environmental initiatives, using QCA.

Although this research enhances the understanding of which conditions lead to the successful implementation of AEM, it does have limitations. The conditions used are based on the Strategies and Contexts of the 10 Program Theories developed by Witvliet et al., (2024). Only five out of the many conditions were examined in this research. It is expected that all the conditions will be interrelated. Using csQCA allowed for the analysis of the relationship between certain conditions and their contributions to successful implementation of AEM. However, performing csQCA with all conditions was not feasible due to the intermediate number of cases (30), as this resulted in too many condition combinations that cannot be matched to any case (Oana et al., 2021). Consequently, the number of conditions

was restricted to a maximum of 5. Moreover, while csQCA can provide valuable insights, it is more limited in handling complex relationships compared to fsQCA, which offers a more flexible approach to analyzing the conditions and their impact on the outcome (Oana et al., 2021).

Despite its limitations, the use of Qualitative Comparative Analysis provides valid insights into the relationships between the chosen conditions and the successful implementation of AEM in Dutch agri-environmental initiatives. These findings are expected to be valuable to other organizations across Europe that are employing a similar approach in their agri-environmental initiatives.

7.2 Recommendations

7.2.1 Recommendations for further research

In the years to come, finding a balance between biodiversity, agriculture and nature conservation will remain a significant challenge. The success of biodiversity efforts through agri-environmental initiatives largely depends on the participation of farmers. This places a significant responsibility on these actors, which highlights the importance of further research to identify the best approaches for nature conservation within the agricultural sector. This research on discovering success conditions for successful implementation of AEM in Dutch agri-environmental initiatives, provides a valuable resource for future research. The first recommendation for further research would be to use a bigger sample, so more conditions (for example from the 10 Program Theories by Witvliet et al., (2024)) can be included in the QCA. More research on the conditions that can enhance the implementation contributes to our understanding which specific conditions are necessary to improve the ecological effects of agri-environmental measures.

This study utilized crisp set QCA to analyze the data, while this method is valuable for its simplicity and therefore clarity in distinguishing between the presence and absence of conditions, it often oversimplifies complex situations by depending only on binary classifications. For future research, the use of a fuzzy set QCA is recommended, because it allows for different degrees of membership. This provides a more detailed analysis of how the different conditions contribute to the implementation of AEM in agri-environmental initiatives. This method produces thorough results by better capturing the complexity and diversity present in social phenomena (Legewie, 2013).

Furthermore, the case of Initiative 13 was kept in the dataset despite its contradictory nature within the configurations. While this decision was made to maintain the integrity of the dataset and maintain consistency in the analysis, further qualitative analysis into this case has not been done due to the limited scope of this research, focusing on patterns across multiple cases rather than individual abnormalities. It is recommended that further research should address such contradictory cases through a more detailed case-specific analysis. This could reveal contextual factors or unexpected variables that are not captured in the QCA framework. This could provide a better understanding of the complex factors affecting agri-environmental initiatives, offering insights that might improve QCA models and lead to better recommendations.

In the analysis, the cases have been evaluated based on underlying motivational mechanisms that can change farmers' behavior toward agri-environmental practices, like behavioral changes and socio-cognitive and normative shifts, as measures of the outcome. However, there might be other indicators that define successful implementation. For example ecological data, like soil health indicators, biodiversity indices and the number of species observed. This helps specify more clearly in which initiatives agri-environmental measures are well executed and lead to positive effects on agricultural biodiversity. Combining additional indicators into a single outcome could have provided a more comprehensive assessment of the success conditions in the initiatives. Future research might benefit from integrating a wider range of indicators.

Within the analysis, a significant number of logical remainders were encountered, which are combinations of conditions that are not represented by any empirical cases. The frequency of logical remainders highlights the necessity of a more comprehensive data collection approach in future research. Future research can reduce this issue, by ensuring a larger, more varied sample size that covers a wider range of condition combinations (Schneider & Wagemann, 2012). Additionally, using mixed-method approaches, such as combining QCA with qualitative case studies, can help close gaps by offering a better understanding of the underrepresented combinations. Furthermore, involving stakeholders in the design phase to identify and include relevant conditions can enhance the representativeness of the dataset (Ragin, 2008).

7.2.2 Recommendations for agri-environmental initiatives and policy makers

Out of the five conditions, demonstrating the agronomic benefits and the presence of professionals within the initiative appeared to be highly valuable for explaining successful implementation. However, based on the configurations (figure 18), it is most important to provide tailored, agronomic expertise to farmers within an initiative. Therefore, it is recommended that:

- The agri-environmental initiatives in the Netherlands prioritize hiring practically experienced professionals. When selecting professionals to function as an advisory body in the initiative, it is advised to prioritize those with practical expertise in farming. Their agronomic knowledge enables them to provide useful and relevant advice suitable for actual farming conditions.
- For policymakers, it is recommended to offer incentives such as grants, subsidies, or recognition programs to agri-environmental initiatives. Additionally, it may be beneficial to consider making the hiring of professionals with substantial farming experience a requirement for obtaining such financial support.
- For policy makers, implement mechanisms to regularly assess the impact of professional expertise on the success of agri-environmental measures. Use these evaluations to refine policies and ensure support structures are continually optimized based on practical experience.

References

- Adcock, R., & Collier, D. (2001). Measurement Validity: A Shared Standard for Qualitative and Quantitative Research. *American Political Science Review*, 95(3), 529–546. <https://doi.org/10.1017/s0003055401003100>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior And Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-t](https://doi.org/10.1016/0749-5978(91)90020-t)
- Bamberg, S., & Möser, G. (2007). Twenty years After Hines, Hungerford, and Tomera: A New Meta-analysis of Psycho-social Determinants of Pro-environmental Behaviour. *Journal of Environmental Psychology*, 27(1), 14–25. <https://doi.org/10.1016/j.jenvp.2006.12.002>
- Barghusen, R., Sattler, C., Deijl, L., Weebers, C., & Matzdorf, B. (2021). Motivations of farmers to participate in collective agri-environmental schemes: the case of Dutch agricultural collectives. *Ecosystems And People*, 17(1), 539–555. <https://doi.org/10.1080/26395916.2021.1979098>
- Bartošová, M.L., Buday, Š., & Bartošová, L.L. (2015). The influence of agri-environmental measures and indicators on the development of Slovak agriculture sustainability
- Batáry, P., Dicks, L. V., Kleijn, D., & Sutherland, W. J. (2015). The role of agri-environment schemes in conservation and environmental management. *Conservation Biology*, 29(4), 1006-1016.
- Baumgärtner, M., & Thiem, A. (2017). Often trusted but never (Properly) tested: Evaluating qualitative comparative analysis. *Sociological Methods & Research*, 49(2), 279–311. <https://doi.org/10.1177/0049124117701487>
- Berg-Schlosser, D., De Meur, G., Ragin, C. C., & Rihoux, B. (2009). Qualitative Comparative Analysis (QCA) as an approach. In *SAGE Publications, Inc. eBooks* (pp. 1–18). <https://doi.org/10.4135/9781452226569.n1>
- Birge, T., & Herzon, I. (2019). Exploring cultural acceptability of a hypothetical results-based agri-environment payment for grassland biodiversity. *Journal Of Rural Studies*, 67, 1–11. <https://doi.org/10.1016/j.jrurstud.2019.02.006>
- Blazy, J. M., Carpentier, A., & Thomas, A. (2011). The willingness to adopt agro-ecological innovations: Application of choice modeling to Caribbean banana planters. *Ecological Economics*, 72, 140-150.
- Borremans, L., Marchand, F., Visser, M., & Wauters, E. (2018). Nurturing agroforestry systems in Flanders: Analysis from an agricultural innovation systems perspective. *Agricultural Systems*, 162, 205–219. <https://doi.org/10.1016/j.agsy.2018.01.004>
- Bouma, J. (2020). Soil security as a roadmap focusing soil contributions on sustainable development agendas. *Soil Security*, 1, 100001. <https://doi.org/10.1016/j.soisec.2020.100001>

Bourdieu, P., 1986. The forms of capital. In: Richardson, J.E. (Ed.), *Handbook of Theory of Research for the Sociology of Education*. Greenwood Press, pp. 46–58.

Brussaard, L., de Ruiter, P. C., & Brown, G. G. (2007). Soil biodiversity for agricultural sustainability. *Agriculture, Ecosystems & Environment*, 121(3), 233–244.

<https://doi.org/10.1016/j.agee.2006.12.013>

Buckwell A, Uhre AN, Williams A, et al. (2012) Sustainable Intensification of European
Burton, R. J., Kuczera, C., & Schwarz, G. (2008). Exploring farmers' cultural resistance to voluntary agri-environmental schemes. *Sociologia Ruralis*, 48(1), 16–37.

<https://doi.org/10.1111/j.1467-9523.2008.00452.x>

Buizer, M., Elands, B., & Vierikko, K. (2016). Governing cities reflexively—The biocultural diversity concept as an alternative to ecosystem services. *Environmental Science & Policy*, 62, 7–13. <https://doi.org/10.1016/j.envsci.2016.03.003>

Burton, R. J., Kuczera, C., & Schwarz, G. (2008). Exploring Farmers' Cultural Resistance to Voluntary Agri-environmental Schemes. *Sociologia Ruralis*, 48(1), 16–37.

<https://doi.org/10.1111/j.1467-9523.2008.00452.x>

Burton, R.J.F., Paragahawewa, U.H., 2011. Creating culturally sustainable agri environmental schemes. *J. Rural Studies*. 27, 95–104. coverage. *Political Analysis*, 14 (3), 291-310

Christenhusz, M. (2022). *The transition towards nature inclusive agriculture: Perspectives of Dutch farmers and policymakers on the 'good agricultural landscape'* [Master's thesis, Wageningen University & Research]. Wageningen University & Research.

Defrancesco E, Gatto P, Runge F, Trestini S (2008) Factors affecting farmers' participation in agri-environmental measures: a Northern Italian perspective. *J Agric Econ* 59:114–131.

<https://doi.org/10.1111/j.1477-9552.2007.00134.x>

de Graaff, J., Aklilu, A., Ouessar, M., Asins-Velis, S., & Kessler, A. (2010). The development of soil and water conservation policies and practices in five selected countries from 1960 to 2010. *Land Use Policy*, 27(1), 1-15.

De Leeuw, A., Valois, P., Ajzen, I., & Schmidt, P. (2015). Using the theory of planned Behavior to identify key beliefs underlying pro-environmental behavior in high-school students: Implications for Educational Interventions. *Journal of Environmental Psychology*, 42, 128–138. <https://doi.org/10.1016/j.jenvp.2015.03.005>

Dik, L., Bazzan, G., Termeer, C., & Runhaar, H. (2023). How does the professionalisation of farmer collectives enable effective agri-environmental schemes? A fuzzy-set qualitative comparative analysis of 36 Dutch farmer collectives. *Earth System Governance*, 18, 100197. <https://doi.org/10.1016/j.esg.2023.100197>

Dunlap, R. E., & Van Liere, K. D. (1978). The “New Environmental Paradigm”. *The Journal of Environmental Education*, 9(4), 10–19. <https://doi.org/10.1080/00958964.1978.10801875>

Dunlap, R. E., Van Liere, K. D., Mertig, A. G. and Emmet Jones, R. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, 56: 425–442.

Duru, M., Therond, O., Martin, G., Martin-Clouaire, R., Magne, M., Justes, E., Journet, E., Aubertot, J. N., Savary, S., Bergez, J. E., & Sarthou, J. (2015). How to implement biodiversity-based agriculture to enhance ecosystem services: a review. *Agronomy for Sustainable Development*, 35(4), 1259–1281. <https://doi.org/10.1007/s13593-015-0306-1>

Duşa, A. (2022, 21 augustus). Chapter 5 Analysis of necessity | QCA with R. <https://bookdown.org/dusadrian/QCAbook/analysisofnecessity.html>

Duşa, A. (2022b, augustus 21). Chapter 7 The Truth Table | QCA with R. <https://bookdown.org/dusadrian/QCAbook/truthTable.html>

Erisman, J. W. (2016). Agriculture and biodiversity: a better balance benefits both. *AIMS Agriculture and Food*. <http://www.aimspress.com/article/10.3934/agrfood.2016.2.157>

European Commission for Agriculture and Rural Development. (2020, 14 oktober). Commission publishes external study on future of EU livestock. *Agriculture And Rural Development*. Geraadpleegd op 12 juni 2024, van https://agriculture.ec.europa.eu/news/commission-publishes-external-study-future-eu-livestock-2020-10-14_en

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Fosnot, C. T. (1996). *Constructivism: theory, perspectives, and practice*. <http://ci.nii.ac.jp/ncid/BA71902361>

Galler, C., von Haaren, C., & Albert, C. (2015). Optimizing environmental measures for landscape multifunctionality: Effectiveness, efficiency and recommendations for agri-environmental programs. *Journal of environmental management*, 151, 243-257.

Geiger F, Bengtsson J, Berendse F, et al. (2010) Persistent negative effects of pesticides and Hall, N., Lacey, J., Carr-Cornish, S., & Dowd, A. (2015). Social license to operate: understanding how a concept has been translated into practice in energy industries. *Journal of Cleaner Production*, 86, 301–310. <https://doi.org/10.1016/j.jclepro.2014.08.020>

Home, R., Balmer, O., Jahrl, I., Stolze, M., & Pfiffner, L. (2014). Motivations for implementation of ecological compensation areas on Swiss lowland farms. *Journal Of Rural Studies*, 34, 26–36. <https://doi.org/10.1016/j.jrurstud.2013.12.007>

Jackson, L., Pascual, U., & Hodgkin, T. (2007). Utilizing and conserving agrobiodiversity in agricultural landscapes. *Agriculture, Ecosystems & Environment*, 121(3), 196–210.

<https://doi.org/10.1016/j.agee.2006.12.017>

Jara-Rojas, R., Russy, S., Roco, L., Fleming-Muñoz, D., & Engler, A. (2020). Factors Affecting the Adoption of Agroforestry Practices: Insights from Silvopastoral Systems of Colombia. *Forests*, 11(6), 648. <https://doi.org/10.3390/f11060648>

Johansson, M., Rahm, J., & Gyllin, M. (2013). Landowners' Participation in Biodiversity Conservation Examined through the Value-Belief-Norm Theory. *Landscape Research*, 38(3), 295–311. <https://doi.org/10.1080/01426397.2012.673576>

Kallas, Z., & Gómez-Limón, J. A. (2010). "Factors Influencing Farmers' Participation in Agri-environmental Schemes: A Review." *Journal of Environmental Management*, 91(5), 1189-1198. DOI: 10.1016/j.jenvman.2010.01.007

Karimi, S., & Saghaleini, A. (2021). Factors influencing ranchers' intentions to conserve rangelands through an extended theory of planned behavior. *Global Ecology And Conservation*, 26, e01513. <https://doi.org/10.1016/j.gecco.2021.e01513>

Keeler, B. L., et al. (2019). "The Role of Farmer Attitudes and Beliefs in Agri-environmental Practices Adoption: A Case Study from the USA." *Ecological Economics*, 163, 235-247. DOI: 10.1016/j.ecolecon.2019.05.016

Kerselaers, E., De Cock, L., Lauwers, L., & Van Huylenbroeck, G. (2007). Modelling farm-level economic potential for conversion to organic farming. *Agricultural Systems*, 94(3), 671–682. <https://doi.org/10.1016/j.agsy.2007.02.007>

Kleijn, D., & Sutherland, W. J. (2003). How effective are European agri-environment schemes in conserving and promoting biodiversity? *Journal of Applied Ecology*, 40(6), 947–969. <https://doi.org/10.1111/j.1365-2664.2003.00868.x>

Landis, D. A. (2017). Designing agricultural landscapes for biodiversity-based ecosystem services. *Basic and Applied Ecology*, 18, 1–12. <https://doi.org/10.1016/j.baae.2016.07.005>

Lastra-Bravo XB, Hubbard C, Garrod G, Tolón-Becerra A (2015) What drives farmers' participation in EU agri-environmental schemes? Results from a qualitative meta-analysis. *Environ Sci Policy* 54:1–9. <https://doi.org/10.1016/j.envsci.2015.06.002>

Legewie, N. (2013). An introduction to applied data analysis with qualitative comparative analysis. *Forum Qualitative Social Research*, 14(3), 45. <https://doi.org/10.17169/fqs-14.3.1961>

Livne-Tarandach, R., Hawbaker, B., Boren, B. L., & Jones, C. (2015). *Qualitative comparative analysis*. Handbook of qualitative organizational research: Innovative pathways and methods, 156.

Maggetti, M., & Levi-Faur, D. (2013). Dealing with Errors in QCA. *Political Research Quarterly*, 66(1), 198. <https://www.jstor.org/stable/23563603>

Maleksaeidi, H., & Keshavarz, M. (2019). What influences farmers' intentions to conserve on-farm biodiversity? An application of the theory of planned behavior in Fars Province, Iran. *Global Ecology and Conservation*, 20, e00698. <https://doi.org/10.1016/j.gecco.2019.e00698>

McCown, R. (2002). Changing systems for supporting farmers' decisions: problems, paradigms, and prospects. *Agricultural Systems*, 74(1), 179–220. [https://doi.org/10.1016/s0308-521x\(02\)00026-4](https://doi.org/10.1016/s0308-521x(02)00026-4)

Meijer, S. S., Catacutan, D., Sileshi, G. W., & Nieuwenhuis, M. (2015). Tree planting by smallholder farmers in Malawi: Using the theory of planned behaviour to examine the relationship between attitudes and behaviour. *Journal of Environmental Psychology*, 43, 1–12. <https://doi.org/10.1016/j.jenvp.2015.05.008>

Meur, G. de., Rihoux, B. & Yamasaki, S. (2009). Addressing the Critiques of QCA. In B. Rihoux & C.C. Ragin (Eds.). *Configurational comparative methods: Qualitative comparative analysis (QCA) and related techniques* (pp. 1-18). *Thousand Oaks: SAGE Publications Inc.*

Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6(1). <https://doi.org/10.1186/1748-5908-6-42>

Mill, J. S. (1846). *A system of logic, ratiocinative and inductive, being a connected view of the principles of evidence and the methods of scientific investigation*. In *Harper & Brothers eBooks*. <https://doi.org/10.1037/11967-000>

Pieniak, Z., Verbeke, W., & Scholderer, J. (2010). Health-related beliefs and consumer knowledge as determinants of fish consumption. *Journal Of Human Nutrition And Dietetics*, 23(5), 480–488. <https://doi.org/10.1111/j.1365-277x.2010.01045.x>

Popper, K. R. (1959). The Propensity Interpretation of Probability. *The British Journal For The Philosophy Of Science*, 10(37), 247–265. https://doi.org/10.1007/978-94-017-1282-8_15

Ministry of Economic Affairs (2014) *Convention on Biological Diversity. Fifth National Report of the Kingdom of the Netherlands*. Den Haag, The Netherlands.

Nieuwenhuizen, W., Westerink, J., Gerritsen, A. L., Schrijver, R. A. M., & Salverda, I. E. (2014). *Wat je aan elkaar hebt - Sociaal kapitaal in het agrarisch natuur-en landschapsbeheer*.

Nyanga, P. H. (2012). Factors influencing adoption and area under conservation agriculture: A mixed methods approach. *Sustainable Agriculture Research*, 1(2).

Pancras, A. (2023). *De bedoeling van het GLB* [Presentatieslides; Rijksdienst voor ondernemend Nederland]. <https://anvhollandsnoorden.nl/>. <https://anvhollandsnoorden.nl/wp-content/uploads/20220626-Presentatie-ambassadeurs-nGLB-overall.pdf>

Ragin, C., Patros, T., Strand, S., & Rubinson, C. (2017). USER'S GUIDE TO Fuzzy-Set / Qualitative Comparative Analysis [Software]. In *fsQCA 3.0. Department of Sociology*.

<https://sites.socsci.uci.edu/~cragin/fsQCA/software.shtml>

Ragin, C. C. (1987). *The comparative method: moving beyond qualitative and quantitative strategies*. University of California Press.

Ragin, Charles C. (2006). *Set relations in social research: Evaluating their consistency and coverage*. University of Arizona Press.

Rihoux, B., & Lobe, B. (2009). The case for qualitative comparative analysis (QCA): Adding leverage for thick cross-case comparison. *The Sage handbook of case-based methods*, 222-242.

Rihoux, B., & Ragin, C. C. (2009). *Configurational comparative methods: Qualitative Comparative Analysis (QCA) and related techniques*.
<https://doi.org/10.4135/9781452226569>

Riley M, Sangster H, Smith H, Chiverrell R, Boyle J. 2018. Will farmers work together for conservation? The potential limits of farmers' cooperation in agri-environment measures. *Land Use Policy*. 70:635–646. doi:10.1016/j.landusepol.2017.10.049

Rutten, R. (2020). Applying and Assessing Large-N QCA: Causality and Robustness from a critical realist perspective. *Sociological Methods & Research*, 51(3), 1211–1243.
<https://doi.org/10.1177/0049124120914955>

Ryan, G. S. (2018). *Introduction to positivism, interpretivism and critical theory*. *Nurse Researcher*, 25(4), 14–20. <https://doi.org/10.7748/nr.2018.e1466>

Sallan, J. M. (2021, 10 november). *Necessary and sufficient conditions in QCA using R*. Jose M Sallan blog. Geraadpleegd op 22 januari 2024, van
<https://jmsallan.netlify.app/blog/necessary-and-sufficient-conditions-in-qca-using-r/>

Schaub, S., Ghazoul, J., Huber, R., Zhang, W., Sander, A., Rees, C., ... & Finger, R. (2023). The role of behavioural factors and opportunity costs in farmers' participation in voluntary agri-environmental schemes: A systematic review. *Journal of Agricultural Economics*.
<https://doi.org/10.1111/1477-9552.12538>

Scherr, S. J., & McNeely, J. A. (2007). Biodiversity conservation and agricultural sustainability: towards a new paradigm of 'ecoagriculture' landscapes. *Philosophical Transactions - Royal Society. Biological Sciences*, 363(1491), 477–494.
<https://doi.org/10.1098/rstb.2007.2165>

Schneider, C. Q., & Wagemann, C. (2012). *Set-Theoretic Methods for the Social Sciences: A Guide to Qualitative Comparative Analysis*. Cambridge University Press.

Schwartz, S. H. (1977). Normative influences on altruism. In *Advances in experimental social psychology* (Vol. 10, pp. 221-279). Academic Press.

- Schwartz, S. H. (2012). An Overview of the Schwartz Theory of Basic Values. *Online Readings in Psychology and Culture*, 2(1). <https://doi.org/10.9707/2307-0919.1116>
- Seawright, J. (2014). Comment. *Sociological Methodology*, 44(1), 118–121. <https://doi.org/10.1177/008117501454208>
- Sehring, J., Korhonen-Kurki, K., & Brockhaus, M. (2013). Qualitative Comparative Analysis (QCA): an application to compare national REDD+ policy processes. *CIFOR Working Paper*. <https://doi.org/10.17528/cifor/004278>
- Siebert, R., Toogood, M., & Knierim, A. (2006). Factors Affecting European Farmers' Participation in Biodiversity Policies. *Sociologia Ruralis*, 46(4), 318–340. <https://doi.org/10.1111/j.1467-9523.2006.00420.x>
- Runhaar, H., Melman, T., Boonstra, F., Erisman, J., Horlings, L., De Snoo, G., Termeer, C. J., Wassen, M. J., Westerink, J., & Arts, B. (2017). Promoting nature conservation by Dutch farmers: a governance perspective. *International Journal of Agricultural Sustainability*, 15(3), 264–281. <https://doi.org/10.1080/14735903.2016.1232015>
- Jagosh, J. (2019). Realist Synthesis for Public Health: Building an Ontologically Deep Understanding of How Programs Work, For Whom, and In Which Contexts. *Annual Review Of Public Health*, 40(1), 361–372. <https://doi.org/10.1146/annurev-publhealth-031816-044451>
- Simister, N., & Scholz, V. (2017). Qualitative comparative analysis (QCA). *M&E Universer*.
- Stern, P. C., Dietz, T., Abel, T. D., Guagnano, G. A., & Kalof, L. (1999). A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism. *Human Ecology Review*, 6(2), 81–97. <https://www.humanecologyreview.org/pastissues/her62/62sternetal.pdf>
- Străteanu, A., & Stan, S. (2018). Eco-Efficiency and Vulnerability of Agro-Ecosystems to Environmental Threats. *Annals Of "Valahia" University Of Târgoviște. Agriculture*, 12(2), 25–32. <https://doi.org/10.2478/agr-2018-0013>
- Tama, R. A. Z., Liu, Y., Yu, M., Hoque, M., Adnan, K. M. M., & Sarker, S. A. (2021). Assessing farmers' intention towards conservation agriculture by using the extended theory of planned behavior. *Journal of Environmental Management*, 280, 111654. <https://doi.org/10.1016/j.jenvman.2020.111654>
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal Of Medical Education*, 2, 53–55. <https://doi.org/10.5116/ijme.4dfb.8dfd>
- Termeer, C., Dewulf, A., Breeman, G., & Stiller, S. (2013). Governance capabilities for dealing wisely with wicked problems. *Administration & Society*, 47(6), 680–710. <https://doi.org/10.1177/0095399712469195>
- Thiem, A., & Baumgartner, M. (2016). Back to Square One: A Critical Assessment of the Use of Dichotomous Data in QCA. *Quality & Quantity*, 50(6), 2357-2376.

Thiem, Alrik (2010). Set-relational fit and the formulation of transformational rules in fsQCA. *COMPASSSS Working Paper Series*, 61

Thomas, J., O'Mara-Eves, A., & Brunton, G. (2014). Using qualitative comparative analysis (QCA) in systematic reviews of complex interventions: a worked example. *Systematic Reviews*, 3(1). <https://doi.org/10.1186/2046-4053-3-67>

United Nations. (z.d.). Transforming our world: the 2030 Agenda for Sustainable Development | Department of Economic and Social Affairs. Geraadpleegd op 28 november 2023, van <https://sdgs.un.org/2030agenda>

Van der Wal, L., & Hoeksma, K. A. R. (2020, 7 mei). De landbouw in de Nederlandse economie. *Centraal Bureau Voor de Statistiek*. <https://www.cbs.nl/nl-nl/longread/de-nederlandse-economie/2020/de-landbouw-in-de-nederlandse-economie?onepage=true>

Vosman, B., Baveco, H., den Belder, E., Bloem, J., Booij, K., Jagers op Akkerhuis, G., Lahr, J., Postma, J., Verloop, K., & Faber, J. (2007). *Agrobiodiversiteit, kansen voor een duurzame landbouw*. In Wur. Plant Research International. Geraadpleegd op 15 februari 2023, van <https://edepot.wur.nl/26632>

Westerink, J., Pleijte, M., Schrijver, R., Van Dam, R., De Krom, M., & De Boer, T. (2021). Can a 'good farmer' be nature-inclusive? Shifting cultural norms in farming in the Netherlands. *Journal of Rural Studies*, 88, 60–70. <https://doi.org/10.1016/j.jrurstud.2021.10.011>

Witvliet, B., Ploegmakers, H., & Meijerink, S. (2024). A theory-driven framework for the design and implementation of successful agri-environmental programmes: results of a realist review. *International Journal Of Agricultural Sustainability*, 22(1). <https://doi.org/10.1080/14735903.2024.2322251>

Zindler, M., Haensel, M., Fricke, U., Schmitt, T. M., Tobisch, C., & Koellner, T. (2023). Improving Agri-environmental Schemes: Suggestions from Farmers and Nature Managers in a Central European Region. *Environmental Management*, 73(4), 826–840. <https://doi.org/10.1007/s00267-023-01922-w>