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Drivers of Rural Development Strategies at the Farm Level:
a Case Study on Circular Agriculture in the Netherlands

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Agricultural Economics

by

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Abstract

The sustainability of the agricultural sector worldwide is increasingly being pressurized by ecological, economic, and social developments. The Dutch government is promoting enhancing circular agriculture as an important rural development strategy in response to the challenges the sector is facing. All farmers in the country will have to be involved in closed cycles by 2030, but many farmers do not want to or cannot make this transition. This study aims to identify the different factors that influence a farmer's decision to transition towards circular agriculture. Based on thirteen semi-structured interviews with already transitioned farmers, a policy officer, a consultant, and a coordinator of a circular farmers' network, it presents an updated framework through which the linkages between different drivers and circular agriculture as a rural development strategy can be studied. This study informs policy makers, and fills a gap in literature between studies on rural development, drivers of diversification, and circular agriculture. From the results, it becomes clear that the most important incentives for farmers to actively work on closing their cycles, are the presence of a learning network, subsidies, and the personal objectives related to gaining insights into the business. Circular agriculture should not be seen as a rural development strategy per se. Many farmers do not link circular agriculture to rural development strategies, but see their business as circular by nature. It fits many different farming styles, and has the potential to contribute to sustainability in the sector as it reduces the creation of waste and need for inputs, regardless of what strategies are pursued. Further research is needed to test the framework in different contexts, and to gain a deeper understanding of the factors that withhold farmers from actively transitioning towards closed cycles.

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1. Introduction

Farmers all over the world are under growing pressure from ecological, economic, and social developments, which form the ‘triple bottom line of sustainability’ (‘Landbouw, natuur en voedsel’, 2018; Hodbod et al., 2016). Weather patterns are changing, biodiversity is declining, farmers are squeezed between rising costs of inputs and relatively declining prices of outputs, and the rural flight, in which many farmers do not have a successor, has taken off. (Van der Ploeg et al., 2000; Oostindië et al., 2008). Rural development strategies, aimed at strengthening rural communities through economic growth built on the maintenance of endogenous resources, provide a way to counter these pressures (Van der Ploeg et al., 2008). Examples include finding off-farm employment, developing non-farming activities on the farm, and adding value per unit produced.

The need to stimulate rural development strategies is felt in the Netherlands, as became clear from the new agricultural vision the country’s Minister of Agriculture presented in July 2019. All farms in the country will have to be involved in closed cycles by 2030. She sees it as ‘*the unavoidable and conclusive response*’ to the challenges farmers and societies face today (‘Landbouw, natuur en voedsel’, 2018, p. 5). In circular farming, residuals of agriculture and food processing are to be kept within the food system as renewable resources, and the aim should be on limiting the use of external resources, reducing both purchasing costs and the pressure on the environment (ibid.; ‘Circular Agriculture’, 2018).

The foreseen sector-wide change towards circular farming is a sustainability transition, which is a complex and interdependent process, in which the structure, culture, and practices within a society need to be changed simultaneously (Loorbach and Rotmans, 2006). The government cannot manage this top-down or alone, but needs cooperation from all actors in society, including

farmers. Despite greening consumer demands and successes of farmers who have transitioned already, many farmers cannot or do not want to alter their production system in this way.

To understand what conditions stimulate farmers to take up circular agricultural practices is relevant for policymakers to find ways in which they can support farmers. One way for policymakers to assist farmers is to help eliminate the gaps of knowledge in science on circular agriculture. In a study on innovation in the countryside, Madureira and Susete (2018) have identified a gap between rural innovator dynamics and public policies of rural development, highlighting the need for a better understanding of the motivations of rural enterprises to build the knowledge needed to adjust public support and turn it into successful rural areas. In addition, Martin et al. (2018) have identified that agricultural sciences in general do not pay sufficient attention to sustainability transitions, and DeLonge et al. (2016) found that research towards sustainable agriculture is significantly less funded than research on conventional production methods. From an academic point of view, understanding how specific characteristics stimulate the initiation of a transition, will also allow to evaluate how we can use conceptual frameworks to study circular farming as a rural development strategy.

This research fills the gap in literature between studies on drivers of non-circular diversification strategies, rural development, and circular farming. Farm-level drivers of non-circular diversification strategies found in other studies are many, but can be divided into the changing conditions surrounding the farm, the goals of the farmer, and the attributes of both the farm and the farmer. The conditions enhancing diversification, as found in other studies, include price volatility, access to credit, adverse climatic conditions, changes in consumer demands, and changes in policy (Rooij et al., 2014). Van der Ploeg et al. (2000) found that what is hampering farmers to transition to rural development strategies, includes a limited stock of local resources, a

poorly functioning institutional environment, an imbalance in social capital, and the absence of rural markets. The personal goals of farmers include the maintenance of an income, the exploitation of under-utilized resources, risk reduction, and the creation of employment for family members (Barbieri and Mahoney, 2009; Bartolini et al., 2014). Hodbod et al. (2016) found that many farmers choose sustainable production systems not only to increase their incomes, but also to keep access to traditional customs, autonomy, their sense of place, and social cohesion. Farmers' attributes influencing these goals include age, the number of generations the family has been farming on the land, gross income levels, educational levels, and the strength of the social network (ibid.; Meert et al., 2005). Attributes of the farm that influence strategies include the amount of workers dependent on it, the location in terms of distance to an urbanized area and in terms of population density of the region (Mazzocchi et al., 2019).

Diversification is not circular farming per se. Van der Ploeg et al. (2019) come closest with a study on 'farming economically', which is a strategy of cost reduction. While circular farming has the potential to reduce costs, it goes further. Only one study related circular farming to rural development directly. Through a survey amongst Chinese conventional farmers, Yang and Pan (2014) found that lower ages, higher educational levels, and higher proportions of farm income relative to non-farm income are positively related to awareness of circular agricultural practices. The authors did not interview actual circular farmers.

This research explores the possibility of using the 'Value Triangle on Rural Development Strategies' by Van der Ploeg and Roep (2003), a widely used model on rural development strategies, to analyze the transition towards circular agriculture. With the model being dated from 2003, its accuracy will be tested to see how it can still be relevant for circular agriculture. The aim of the research is to identify the different farm level drivers that stimulate producers to progress

towards circular agricultural practices to contribute to rural development. This addresses the societal problem of farmers not able to convert in the current context, and the scientific gap in literature on the link between circular agriculture and rural development. The research will feed the discussion whether and how the triangle could be used in explaining the transition in the Netherlands, and whether the Conditions, Strategies, and Performance Model by Grando et al. (2016) provides enough insights to explain the strategies and choices made in this context. The empirical and conceptual research questions are the following:

- What are the main internal and external conditions, strategies, and performances that influence the strategic choices of farmers towards circular agriculture?
- What, if any, adjustments need to be made to the Value Triangle of Rural Development for it to be relevant in studies on the drivers of circular farming in the Netherlands?
- How can the Value Triangle of Rural Development be integrated with the Conditions, Strategies, and Performance Model to study the transition towards circular agriculture at the farm level?

This thesis is organized in the following way. Chapter 2 provides the theoretical framework linking the rural development paradigm to rural development strategies and its drivers. Chapter 3 includes an overview of the case study site, and describes the methodology used for the collection of data. Chapter 4 presents the results of the case study. In Chapter 5, these results and the frameworks used are discussed. The thesis concludes with an answer to the research questions, and recommendations for both policy and future research.

2. Literature Review

This chapter will introduce the theoretical framework of this study. The framework used to study circular agriculture as a rural development strategy, is the Value Triangle on Rural Development by Van der Ploeg and Roep (2003). Although dated, it remains to be a widely used model in studies on rural development and diversification, as it '*effectively summarizes the [different] strategies*' (Grando et al., 2019, p. 20). The framework used to study the drivers is the Conditions, Strategies and Performances model by Grando et al. (2016). Together, they will allow for analysis on why farmers choose to take up circular agricultural strategies in rural development, and how this can be facilitated by both policy-makers and researchers. Whether and how an integration of the two frameworks can be relevant to explain the transition at the farm level, will be studied as well. While drivers of rural development strategies have been researched before, this has never been done on the strategy of circular agriculture. The rural development paradigm will be introduced first, followed by an explanation of the two frameworks and their integration.

2.1 The Rural Development Paradigm

In the 1990s, the modernization and exogenous rural development paradigm was replaced throughout European societies, to counter the negative social environmental impacts and delegitimization of local knowledge it caused (Lowe et al., 2019). In this paradigm, the only role of farmers and rural regions was to produce food, and to do so at large-scale, specialized farms. (Van der Ploeg and Roep, 2003) It was a top-down approach of external planning, in which rural development policies were targeting the agricultural sector only, and were applied uniformly to different rural regions. (Lowe et al., 2019; OECD, 2006) At the farm-level, little attention was paid to the synergies between agricultural and other functions, or to the conditions farmers find themselves in (Brunori and Rossi, 2000; Rooij et al., 2014). The sectoral approaches to agriculture

failed to deliver wider benefits for rural territories, and undermined the importance of farming for environmental services (OECD, 2006; Lowe and Ward, 2007). As production continued, the negative externalities became worse, while simultaneously, farmers were facing rising costs and falling prices. Costs were rising due to the use of external inputs, and societal concerns about the environment and human- and animal welfare, while prices were falling due to increased global competition. (Belletti et al., 2002; Van der Ploeg and Roep, 2003) To Van der Ploeg et al. (2012), the only two possible responses to this ‘agricultural squeeze’ were to either close small farms, or to develop new rural development strategies.

The new paradigm in the 1990s was that of endogenous rural development, a bottom-up strategy with a strong focus on the local communities and their knowledge and skills exclusively. This was soon criticized for being too simplistic. (Lowe et al., 2019) The new neo-endogenous paradigm that followed proved to be a more accurate model for rural development. Despite having been explicitly described in an OECD report from 2006, characteristics of it have been visible throughout literature from around the 2000s onwards (Van der Ploeg, 2000; Belletti et al., 2002).

For the OECD, the new rural development paradigm was about taking into account different development trajectories of rural regions instead of applying policies uniformly across a country, and targeting territories and all stakeholders at all levels of government to improve competitiveness of rural areas. The neo-endogenous model is also called the networked model, which highlights its recognition of how rural areas are shaped by both internal and external forces, in which local knowledge and skills are valued, and enriched through interaction with external ones. (Lowe et al., 2019) A definition of rural development in which the neo-endogenous paradigm can be recognized, is provided by Belletti et al. (2002) to whom it is ‘a conservative change, not economic growth only, which draws upon endogenous resources to create economic activities able to

maintain those resources' (p. 5). The paradigm is about the reconstruction of the rural economy by strengthening the economy of the farm, nature, and the regional economy (Van der Ploeg and Roep, 2003). Rural development has no defined pathway, but what characterizes its strategies is the embeddedness into the local environment, in which farmers are capable of improving their relationships to external factors, such as the environment and community, while using them to develop further (Huttunen, 2019). The neo-endogenous rural development paradigm is about the valorization of regional specialties linked to their rural environment, the development of new networks across sectors and levels, and the creation of synergies. It involves a balance between different farming styles and regional eco-systems. (Wiskerke, 2009).

An example of how the first characteristic, the valorization of regional specialties, is provided by Oostindië et al. (2008). It is about raising a local breed of animals, and branding them as a regional specialty. It involves cooperation between different actors in the supply chain, such as farmers, shops, and slaughterhouses. This enhances the ecological landscape, and attracts tourists. The second characteristic, of the importance of broad networks, is highlighted in multiple studies. Lowe and Ward (2007) argue that networks need to form a bridge between actors from different sectors, regions and levels to create successful synergies, as the scope for diversification for farmers relies on the wider regional economy. Bock (2016) calls for a 'nexogenous' approach, in which rural regions are reconnected and bounded to the urban regions explicitly, not only to other rural regions, to address mutual dependencies and common concerns. '*Urbanization and rural marginalization are [...] two sides of the same coin*', she argues (Bock, 2016, p. 570). Brunori and Rossi (2000), as well as Martin et al. (2018), state that the success of the third characteristic, the development of synergies, depends on hybridization, economies of scope, and complementarity, which are the ability of actors to develop links, the variety of applications found for the same

resources, and the combination of different resources, respectively. Through cooperation, the strategies stimulate the development of a local framework in which economic, social, and environmental sustainability can be enhanced, with outputs becoming inputs for new activities. Autonomy and local control, in which producers exploit lower-input agriculture and develop new activities that benefit other rural dwellers too, enhance rural development (Martin et al., 2018; Van der Ploeg et al., 2000). Van der Ploeg (2000) has found that synergies stimulate further development, as farmers involved in one rural development activity, derive 38% of their farm income from that activity, while those involved in two already derive 57% of their farm income from these activities.

Transitioning from agro-industrial towards multifunctional agricultural activities comes at low costs for farmers, due to the slow development instead of jumps, and due to the presence of local networks for learning (Van der Ploeg et al., 2000). The multifunctional practices, dependent on internal and external resources, enable farmers to both build on and contribute to the social and environmental sustainability of areas, benefitting other rural dwellers, and enhancing rural development (Huttunen, 2019).

2.2 Rural Development Strategies

The stimulation of the multifunctional character of the farm, in which it provides more services to society than the production of food alone, is a central approach within the current rural development paradigm (Van der Ploeg and Roep, 2003; Madureira and Susete, 2018). The services form a combination of food security, environmental protection, and social services, and they are built on and maintain the local resources. Many services are public, which means that support is needed to provide economic incentives for farmers to start them. After an initial spur, farmers can internalize part of the positive externalities, such as landscapes for agritourism, to find synergies,

and to develop more strategies that enhance rural development and redesign their relationship with the external environment. (Mazzocchi et al., 2019; Rooij et al., 2014). Multifunctionality does not necessarily come at the expense of food production, and can even enhance it. Rooij et al. (2014) found that many producers use non-agricultural activities as a ‘life-jacket’ through which agricultural production can be sustained. Lowe and Ward (2007) confirm this, and highlight that a reorientation of business is needed now that public financial support to agricultural activities is declining. An example of a rural development strategy through which the agricultural production unit is strengthened, is the strategy of ‘farming economically’, or ‘low external input agriculture’ (Van der Ploeg, 2000). The objective is to contain costs, by enhancing technical efficiency, access to socio-technical networks for the mobilization of resources through non-commoditized relations, and the reproduction of internal resources. It can bring higher levels of income at given production levels. To Van der Ploeg (2000), farming economically provides the starting point for other diversification strategies.

Diversification strategies through which the farm becomes multifunctional, have been classified by different authors (Van der Ploeg and Roep, 2003; Meert et al., 2005; Grando et al., 2016). The different categories identified overlap, as they are based on the Value Triangle of Rural Development by Van der Ploeg and Roep. They have identified strategies of deepening, broadening, and re-grounding, that relate to the dimensions of the agro-food supply chain, the rural area, and the mobilization of on-farm resources, respectively. All activities in these dimensions provide the farmer with options to increase his income and widen his income base, as a response to the agricultural income squeeze (Belletti et al., 2002; Van der Ploeg and Roep, 2003).

The first strategy is deepening agricultural activities along the dimension of the agro-food supply chain. The activities herein are aimed at increasing the value added, by differentiating

products from bulk products. Examples are organic produce, and the creation of short supply chains. The second strategy is broadening along the dimension of the rural. The activities herein are aimed at providing non-agricultural services on-farm. These are based on the rural network, as they are made possible through the use of natural, social and cultural capital, while at the same time they maintain these capitals. Examples are agritourism and the production of energy. The third strategy is regrounding along the dimension of the mobilization of on-farm resources. It is about the ability of farmers to use existing resources to either earn an income off-farm, or to reduce costs of their farming practices. Examples are ploughing someone else's fields, or reducing costs by growing feed for the owned livestock. (Belletti et al., 2002)

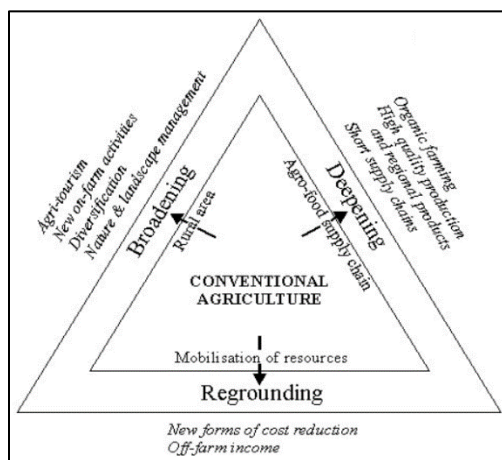


Figure 1 The Value Triangle of Rural Development. Source: Van der Ploeg and Roep (2003)

The three dimensions as described and pictured in Figure 1, provide farmers with different strategies through which they can enhance the multifunctional character of their farm. The diversification strategies in the triangle do not stand on themselves, and can form synergic strategies to increase a farmer's income. Changes made on one side often involve changes on all three sides. Through the development of agritourism, for example, selling patterns might change to on-farm selling, and internal resources become organized in a different way (Belletti et al., 2002). To Van der Ploeg and Roep (2003), farming economically, which is closely related to

circular agriculture and identified as a regrounding strategy by the authors, should be at the bottom of the triangle because it is the starting point from which other diversification strategies are made possible. *'The art of farming'*, as described by Van der Ploeg and Roep (2003), *'lies in the precision of the mutual coordination of the indicated sides'* (p. 6). The ideal strategy depends on the external and internal conditions, and on the farmer's objectives (Grando et al., 2016). They are not always aimed at increasing income exclusively and farmers facing the same external conditions often follow a different set of strategies (Shucksmith, 1993; Shucksmith and Herrmann, 2002).

2.3 Conditions, Strategies, and Performances

Multiple studies on drivers of diversification have been done, all with different objectives and categorizations (Mazzocchi et al., 2019; Barbieri and Mahoney, 2009; Rooij et al., 2014; Hodbod et al., 2016; Bartolini et al., 2014). Rooij et al. (2014) and Barbieri and Mahoney (2009) studied the link to diversification in general, while Mazzocchi et al. (2019) linked the drivers to the three dimensions of rural development strategies. Hodbod et al. (2016) categorized the drivers along the pillars of sustainability, and Bartolini et al. (2014) categorized them based on geographical level. Some studies found similar results, while others found contradictory ones.

One framework through which the different studies can be analyzed systematically, is the Conditions, Strategies, and Performances model by Grando et al. (2016). The strategies are studied *'through the creation of three inventories of the conditions in which they operate, of the possible strategies they can implement, and of the related performances'* (ibid., p. 1). Central in the framework are the interrelations between socio-economic, territorial and environmental factors within a region, and the feedback between the conditions, strategies and performances. Von Munchhausen et al. (2016a) bring forward two complicating factors for the framework. First, farmers often pursue multiple strategies, that can form a synergy or a clash, so performances cannot

always be linked to one strategy exclusively. Second, the performances depend on the performances of other farmers, and can therefore not always be steered through the farmer's own strategy. The model with its feedback loops is illustrated in Figure 2 below.

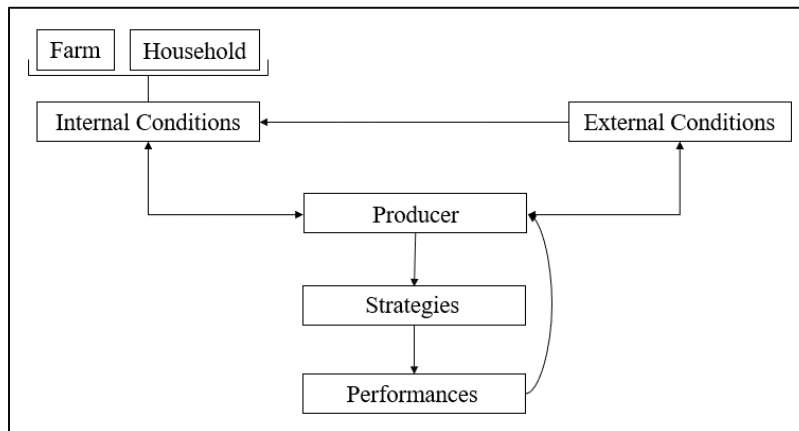


Figure 2 The Conditions, Strategies, and Performances Model. Adapted from Grando et al. (2016)

In the upcoming paragraphs, each component of the model as presented by Grando et al. (2016) will be described, and findings on the link between the component and rural development strategies as found by others, will be presented. The study does not include all conditions, the focus is on those that are seen as central drivers of rural development strategies by other researchers, which is in line with the approach of Von Munchhausen et al. (2016b). Conditions of influence on strategies other than regrounding and circular farming are described too, as synergies between different ones can be found amongst farmers.

2.3.1 External Conditions

External conditions can hardly be influenced by individual producers, but they influence the internal conditions, strategies and performances strongly. The external conditions influence each other as well, and not all are directly perceived by a producer. (Grando et al., 2016) Van der Ploeg (2000) called these conditions ‘structural forcers’, and has found that they are negotiable up to a limited amount, as farmers develop strategies and technologies that deal with them.

Grando et al. (2016) have categorized external conditions into eight categories, which are regulations when the context is not incentive compatible, consumer demand, availability of technology, socio-institutional factors such as traditional land use practices, ecological, socio-demographic such as new values and urbanization, finance and risk, and factors under which the producer can acquire assets needed for production. An overview of the external conditions explicitly linked to rural development in other studies, is provided now. The outcomes of the conditions are dependent on the locality and time, and to provide a successful external framework, the interactions between the conditions needs to be coordinated well (Mantino and Vanni, 2018).

The conditions related to demand, are geographical and macroeconomic developments. Mazzocchi et al. (2019), Bartolini et al. (2014) and Munoz-Rojas et al. (2018) have identified the importance of the distance of the farm to markets, the density of the municipality to measure urbanization, and the total population of a municipality. These drivers are positively correlated with diversification. Mazzocchi et al. (2019) found that high levels of urbanization stimulate deepening activities, but limit broadening activities. Broadening activities, such as agritourism, are more often situated outside of urban areas. High price levels and economic crises decrease consumer demand for quality produce from deepening strategies (Barbieri and Mahoney, 2009).

The conditions related to the socio-institutional category, are social capital and demographic conditions. Social networks, measured by counting memberships of organizations and number of contacts farmers have, and diversification are positively correlated (Meert et al., 2005; Oostindië et al., 2008; Shucksmith and Herrmann, 2002). Through horizontal networks, synergies in diversification can be found. Socio-demographic conditions related to diversification are the availability of off-farm employment, and the role of women in a society. Female labor is associated with higher levels of diversification (Huttunen, 2019; Barbieri and Mahoney, 2009).

On the conditions related to the regulations category, contradictory results have been found. Barbieri and Mahoney (2009) and Huttunen (2019) found that policies and subsidies make a substantial difference in the motivation of farmers to start diversification strategies. Arzeni and Sotte (2013) found that subsidies even form the main external driver to diversification in Italy. On the other hand, Rooij et al. (2014) found that government programs only play a minor role in Italy.

The last category explicitly linked to the strategy of rural development, is that of the availability of factors. Outmigration and a limited availability of labor and materials, limit the opportunities to diversify drastically (Oostindië et al., 2008; Huttunen, 2019).

2.3.2 *Internal Conditions*

Farmers faced with the same external conditions, can make different strategic choices. These depend on the internal conditions that are specific to the farm, household, and farmer. The unit of analysis is two-fold. The first is the production unit of the farm, which is formed by the assets, resources, and organization of the business. Characteristics identified by Grando et al. (2016) include labor, the financial situation, scale, and path dependency. The second is the household that influences decisions made in the business. Characteristics identified include resource allocation, interests, wealth, and gender composition, with women often doing the non-farming activities.

At the business level, studies have found size and labor to be the most important drivers of diversification. Small farms are found to have higher levels of diversification. If only a small amount of land is available, the farmers cannot benefit from economies of scale and thus need to find alternative strategies to react to the agricultural squeeze. (Mazzocchi et al., 2019) The amount of labor on the farm, measured through the amount of people that are dependent on it, is linked with high levels of diversification (Benjamin and Kimhi, 2006).

At the household level, the conditions identified are age, education, the number of generations on the farm, and gender. Education levels were found to be positively correlated to levels of diversification in all studies (Shucksmith and Herrmann, 2002; Barbieri and Mahoney, 2009; Mazzocchi et al., 2019; Meert et al., 2005). Meert et al. (2005) also found that those who read more professional journals, diversify more often. Negatively correlated to diversification, is the number of generations that have owned the farm. In Texas, the context of Barbieri and Mahoney's research (2009), most farmers who diversified had only started farming recently, after retiring from another job. Concerning the correlations between age and gender on the one hand, and diversification on the other, contradictory results were found. Mazzocchi et al. (2019) found that the presence of women did not influence diversification strategies, while Joo et al. (2016) found that it did so positively. And Barbieri and Mahoney (2009) found that young farmers are often more interested in diversification strategies, while Mazzocchi et al. (2019) found a negative correlation between age and diversification, arguing that most young farmers do not have the means to cover the adjustments costs. Mazzocchi et al. (2019) have linked the conditions of age, education level, labor-intensity and small size to deepening strategies, the small size and mixed production to broadening strategies, and labor-intensity to regrouping strategies.

The objectives and personal interests of the farmer influence the strategies, too (Oostindië et al., 2008). Martin et al. (2018) have categorized the objectives to social, ecological, and economic ones, in which autonomy and sense of place, profitability and the creation of regional economic vitality, and conservation of biodiversity and creation of pleasing landscapes, were often cited.

2.3.3 Strategies

To Grando et al. (2016), strategies are practices aimed at coping with the changing environment both on and off the farm, forming the output of the internal and external conditions,

but also influenced by the performances. They are aimed at different objectives, and multiple strategies can be followed at the same time. (Von Munchhausen et al., 2016a) Strategies are not only the practices of value creation, but also the organization on the allocation of resources through which these practices are done. The creation of conditions to enhance a particular strategy, forms a strategy in itself, for example.

Grando et al. (2016) have clustered strategies based on the development paths and objectives related to them. The clusters are the following: agro-industrial competitiveness, blurring farm borders, risk management, political support, coping with farming decline, and rural development. Agro-industrial competitiveness is about intensification and upscaling, blurring farm borders about externalization, political support about subsidies seeking and coping with farming decline about abandonment. The authors study rural development through the framework provided by Van der Ploeg and Roep (2003), but it has overlap with the clusters of risk management as it can decrease dependence on external actors, to blurring farm borders as new partnerships are established, and to political support as subsidies are needed to allow farmers to internalize public goods.

2.3.4 Performances

The last aspect that influences farming strategies through learning, are the performances. To Grando et al. (2016), these only include the intended outcomes of strategies. To Martin et al. (2018), it is important to include unintended outcomes as well, as these have the potential to change conditions and strategies through learning. Grando et al. (2016) have categorized the performances based on the benefits they bring. Business-oriented ones include costs reduction, access to markets, and productivity increase. Household welfare-oriented ones are good working conditions, differentiated income sources, and assets preservation. Outwards-oriented ones are contributions made to local communities and ecosystems. All three can be linked to rural development strategies.

Indicators for performances differ per strategy and objective of the farmer. Von Munchhausen et al. (2016b) have coupled indicators to objectives, based on three case studies with the Conditions, Strategies and Performances model. Returns, costs and assets are linked to the business, the number of farms surviving, the mean farm income and the number of persons living from farming are linked to the region, the assessment of environmental effects and communication of quality attributes are linked to sustainability, and the integration into the community and generational replacement are performance indicators of social objectives.

2.4 Integration

An integration of the two models is illustrated in Figure 3 below. The rural development strategies as brought forward by Van der Ploeg and Roep (2003) form the strategy studied within the wider framework provided by Grando et al. (2016). The relevance of this framework, and the ways in which it can grasp the importance of circular agriculture within the rural development paradigm adequately, will be studied and discussed in the following chapters.

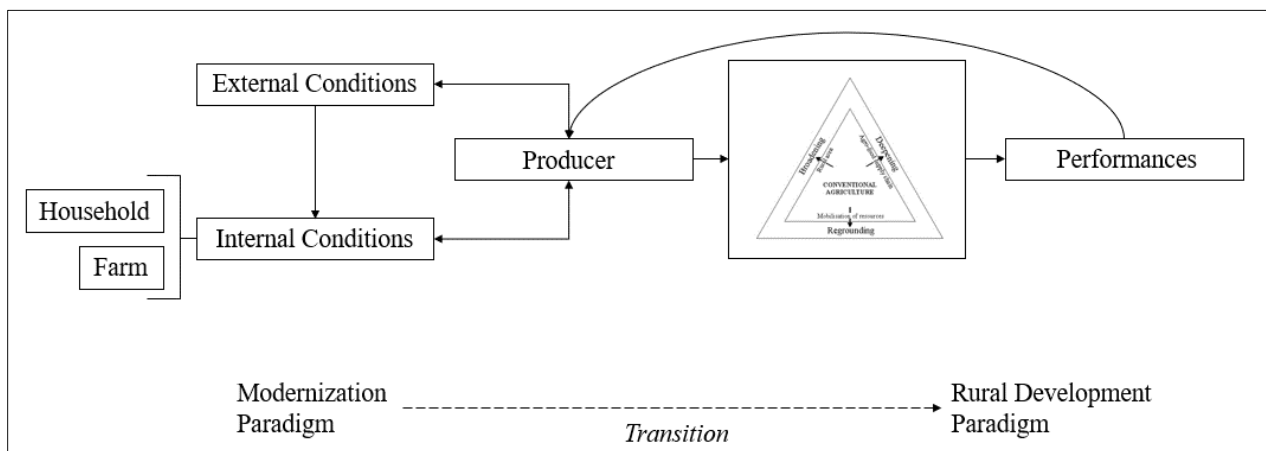


Figure 3 Integrated Theoretical Framework. Adapted from Van der Ploeg and Roep (2003) and Grando et al. (2006)

3. Methodology and Context

To be able to develop answers to the empirical and conceptual research questions, a case study amongst circular farmers in the Netherlands has been conducted. To gain an in-depth understanding of why and how the farmers have made the transition, thirteen semi-structured interviews with different stakeholders in the municipality of Midden-Delfland were conducted. With the interactions between external and internal conditions, strategies, and performances, being very region-specific, this study is on the situation of the municipality of Midden-Delfland only. Choosing respondents facing similar external conditions allowed for an in-depth understanding of the interactions between external conditions and circular agriculture, but makes that the empirical results cannot be generalized for other regions. Conceptual lessons can be drawn nevertheless.

3.1 Methodological Framework

Where some researchers, such as Mazzocchi et al. (2019), have analyzed the drivers of rural development through quantitative analyses, qualitative methods were used here as they better fit the explorative aim of the research (Yin, 2015). No other research on drivers of circular agriculture as a rural development strategy was available. To gain an understanding of the transition as experienced by farmers and other actors involved, semi-structured interviews with open-ended questions were conducted. This structure provided the subjects with the opportunity to explain their answers, while being guided through questions (Adams, 2015).

The respondents were found through the farmers' network website. Only farmers who have transitioned have been interviewed. Initially, these respondents had been chosen as the information on the positive drivers of the transition was seen as sufficient to identify what conditions and strategies need to be further stimulated to motivate farmers to transition. During the interviews, it became clear that instead of only taking this information, it would have been relevant to identify

the factors that withheld farmers from transitioning. This information would have allowed me to compare and contrast the farmers and identify the negative factors that need to be removed to get more farmers involved. Additional contacts of non-transitioned farmers were gained through snowball sampling, but due to the impact of the COVID-19 crisis, no more interviews could take place. The consultant and policy maker, who are involved in the community, have provided information on what they think are the limiting factors.

All interviews took place at the respondents' farms and offices in March 2020, lasted between one and two hours, and were audio-recorded. They were conducted in Dutch. Questions in the research guide were based on the drivers for rural development strategies identified by other researchers, such as Grando et al. (2016), Meert et al. (2005) and Mazzocchi et al. (2019). The interview guides can be found in Appendix I, and the approval of the research protocol by the Institutional Review Board in Appendix II.

All farmers interviewed are a member of the first Dutch group of farmers that actively works together on closing the cycles around their farms. They are all men, their ages range from 31 to 68, eight have the same formal agricultural degree, and nine have less cows than the Dutch average. The farmers work in close cooperation with each other, with research institutes, and with local policy makers of their municipality. Three additional interviews were held to gain more insights into the external conditions and performances of the farmers. These respondents have been involved with the farmers' group since the start. The first non-farmer respondent is a consultant in circular agriculture, who has founded the farmers' group in Midden-Delfland, and who works with both farmers and policy makers. The second non-farmer respondent is the coordinator who managed the first few years of the group. The last non-farmer is the policy officer responsible for the public space of the municipality.

All interviews were transcribed in Dutch, and the conditions, strategies and drivers were identified through an analysis in the qualitative data analysis software package of NVivo (Bazeley and Jackson, 2013). The interviews were coded based on the frameworks by Grando et al. (2016) and Van der Ploeg and Roep (2003). It was a process of open coding followed by axial coding, as described by Corbin and Strauss (1990). The transcripts were coded and then clustered based on the different components of the frameworks used. If responses were important for the analysis but outside of the scope of the frameworks, additional codes were developed. Through a thematic analysis of the data, especially by linking codes to attributes, patterns could be found.

3.2 Description of Case Study Site

The Dutch Minister of Agriculture wants all agricultural cycles in the country closed at the lowest level possible by 2030. A few months after this vision was published, her ministry published a strategic plan in which the preconditions that will need to be met and the ways in which the government will help society were published. (Realisatieplan Visie LNV, 2019) This plan will be explained to provide an understanding of the national policy framework Dutch farmers face. This will be complemented with an overview of the case-study site of Midden-Delfland specifically.

In 2020, 25 million euros out of the 135 million euro agricultural budget will be allocated towards the development of circular agriculture. The funds will be targeted towards achievement of six preconditions, amongst different societal actors, that need to be met to facilitate a circular agricultural system. The first one is the need to create income generating possibilities for transitioning farmers. The government contributes through, among others, strengthening farmers' negotiation position by legally forcing buyers to pay more for sustainable produce. Second, more money will be allocated towards the development of knowledge, technology, and the facilitation of cooperation between the private sector and universities. Third, the government will lobby for

more circular agricultural laws on the level of the EU. Most Dutch agricultural produce is exported, and the increased prices of production are not competitive if other countries do not change. If there is an oversupply of sustainably produced food, it often gets sold as bulk without the premium price. Fourth, the link between nature and agriculture will be strengthened. Land of the state will be made available for nature-inclusive agriculture, stricter rules on the emission of nitrogen will be implemented, and farmers protecting the landscape will be compensated. Fifth, consumers' value of sustainably produced food and rural-urban connections will be strengthened. This will be done through the taskforce *Circular Economy in Food*, that creates public awareness campaigns on the importance of circularity to prevent food waste and provides support for initiatives to stimulate short supply chains. Consumer awareness can increase the willingness to pay for produce. Finally, all agricultural laws will be updated. Laws on the use of food waste for animal feed and the use of animal instead of chemical fertilizer will be changed to facilitate circular agriculture.

The government has provided a national plan for the transition towards circular agriculture. The municipal government of Midden-Delfland has been supporting the transition towards circular agriculture as a rural development strategy since the 2010s, paying farmers per hour invested into circular activities, creating subsidy schemes, and facilitating and paying for the development of knowledge. In 2012, a subsidy of €2.4 million was provided for the establishment of a formalized network, 'Midden in Delfland', of knowledge institutes and farmers, through which they can exchange and build up knowledge, develop new profit models, and negotiate better milk prices. ('Economisch beleidskader', 2011) Since the farmers started, their sustainability outcomes have improved every year, producing more milk per hectare with lower losses of phosphate and nitrogen, and an average of 13% under the Dutch average of emissions of greenhouse gases per kilo milk (Van Wijk, 2018). Other outcomes are the founding of a new regional cooperative

producing certified regional produce (Ridder and Berger, 2013). In addition to these farming practices, the farmers are engaged in educational programs, on-farm care activities, innovative produce, shortened supply chains, and the exchange of resources. (Boks and Van Leeuwen, 2019)

For the municipality, the farmers are seen as the managers of the landscape, that can contribute to achieving the mandate of the municipality to keep the landscape open and green, with cows out in the fields (Gebiedsvisie Midden-Delfland, 2005). The municipality is the most sustainable one in the Netherlands, and certified Cittaslow. This means that it puts great effort into preserving the landscape, valorizing regional produce, protecting the environment, and conserving its cultural heritage, through the use of both new and old technologies (Cittaslow Nederland, 2020).

Midden-Delfland is a rural municipality, home to 19,000 people and 55 dairy farms spread over 5,000 hectares (Feiten & Cijfers, 2020). It is nicknamed the ‘Central Park’ of the metropole region of Rotterdam and The Hague, in which more than 2,500,000 people live within a cycling distance at a population density of over 5,000 people per square kilometer (12,900 per square mile) (Ridder and Berger, 2013). Almost all farmers in Midden-Delfland are smaller than the Dutch average of 97 dairy cows on 60 hectares of land, and, just like elsewhere in the country, the amount of dairy farms is in decline (Van der Peet et al., 2018). Due to its vicinity to cities and protected landscape, scaling up in response to the agricultural squeeze is not an option, and closing down farms would mean a disturbance of the cultural landscape. The two policy pillars for the municipality are to strengthen the rural landscape and the rural-urban relationships, and they have taken circular agriculture as a strategy to work on both, long before the Dutch government followed this plan (Ridder and Berger, 2013). In this way, the municipality has taken advantage of its unique position and created a stimulating external environment for circular agriculture as a rural development strategy.

4. Results

In this chapter, the results of the thirteen semi-structured interviews will be presented, following the order of Chapter 2. First, the results on the understanding of circular agriculture as a new paradigm will be presented. Second, the different rural development strategies followed and the synergies between them and circular agriculture will be shown. Third, the conditions, strategies and performances, and the feedback loops between them linked to circular agriculture, will be highlighted, providing an answer to the first research question.

4.1 The Rural Development Paradigm

The Dutch policy vision on circular agriculture is developed to serve as ‘a dot on the horizon’ to steer farmers in a more sustainable long-term direction (Visie Landbouw, Natuur en Voedsel, 2018). With the preconditions formulated in it, it fits into the neo-endogenous rural development paradigm as defined by the OECD (2006). It allows for differentiation among farmers and regions, stimulates the creation of networks and synergies, and is aimed towards building on local resources and strengthening them with external knowledge.

Nine out of the ten interviewed farmers indicated they do not value the new policy document, and not all see it as contributing to rural development. Critiques formulated included that circular agriculture is nothing new, with all farmers being involved in some regional cycle anyway, that it does not provide enough guidance, and that it is not possible for all farmers in the country to become involved in closed cycles. These will be explained in the following paragraphs.

The first reaction all farmers had to the question on the new policies, is that they think the Minister does not know what circular agriculture entails. For them, it is nothing new, and it should

be about closing cycles at the farm-level, not at ‘the lowest level possible’. All farmers’ responses were in line with the following:

“Circular agriculture is buying as little input as possible and getting as much as possible from your own land, and closing the cycle with as little losses as possible. [...] Every farmer is involved in circular agriculture, some are just more efficient than others. They are implying as if it is something new. It is only being improved, circular agriculture has always been there.” Respondent 4, farmer.

The consultant, who works with both politicians and farmers, and the coordinator acknowledged that is not new, but both highlighted the importance to create stimulants for farmers to start paying attention to closing their cycles to enhance sustainability. Precisely because all farmers are engaged in cycles already, makes it a useful strategy:

“I think the beautiful thing about circular agriculture, is that it is no fixed production system. Farmers feel recognized and feel that what they do, be it big or small, fits with circular agriculture.” (Respondent 1, coordinator)

A second critique that all who brought up the theme said, was that the vision is *“without content, it contains no guidelines”* (Respondent 3, farmer), because circular agriculture has become an umbrella term. One farmer mentioned that the lack of guidance hampers him from making large investments to enhance the sustainability of his farm:

“If only the government would have a vision and would work up to that vision... A vision of 10 years, then we can keep that in mind when making decisions. Now, we keep on going back and forth. When you finally come up with an idea, they turn it down again.” Respondent 6, farmer

While all farmers interviewed were recognized as being circular and experienced at least some benefits from it, their thoughts about the possibility of all Dutch farmers to be circular differed. Six farmers thought it would be beneficial and possible. Three farmers thought it is possible for all farmers directly, three others thought so too, but had the remarks that it would require less farmers, and that it would only be possible if waste streams are exchanged more efficiently. Two doubted that it would be the right direction for the country:

“If I look at it lightly, I think it is no problem, everyone is doing it already anyway. But if I look at it in a more extreme way, then it something pretty big. I can predict that the production of dairy will drop considerably throughout the Netherlands. I think that is a missed opportunity. The Netherlands is ideally suited to produce dairy, and we have done so throughout history. I think we should continue to do so.” Respondent 4, farmer

Three farmers thought it will not be possible for all farmers to transition. These are production oriented and implement circular practices to a lesser extent than the others. They argued that circular activities are not suitable for those farmers who have high constant costs, who have recently made large investments into the expansion of their business, or who export their produce. They foresee higher production costs and lower output levels, without higher consumer prices. One of the farmers whose farm is almost completely circular and who is one of the founders of the circular farmers’ network in Midden-Delfland, confirms that it brings in less money:

“If you are going to ask more energy from your cow, you will need to feed them very concentrated feed and you will need to buy this elsewhere.” Respondent 2, farmer

Only one farmer responded positive to the new vision. The only thing that set him apart from the other farming respondents, was that he produces certified organic milk. Age and educational background did not seem to matter, as he was close to the median age and has the same agricultural formal education as seven other farming respondents.

“You receive protection by doing good. The vision of Minister Schouten is good. Farmers should land back on their two feet again. Natural selection is needed, those who do not perform should stop, that is how business works.” Respondent 7, farmer

When asked how the policy vision should be implemented to benefit the farmers to enhance rural development, nine farmers replied that they would want to work with targets only. The regulations on national mowing dates and certain requirements were seen as limiting rural development, as they work against economic and environmental sustainability.

“Tell us what we need to achieve and we will work with that. But they prefer regulations to be able to control us. That is not how it works, one year is not the other: we are working with nature here.” Respondent 5, farmer

For these farmers, financial compensation or rewards for small steps would encourage them as well. Half of the farmers see circular agriculture as reducing revenue, be it through increased costs or lower productivity, and the other half sees it as increasing revenue due to reduced costs.

Overall, most farmers do not support the policy document but most do not disagree with the idea to enhance circularity in the Dutch agricultural sector. It has the potential to fit the neo-endogenous rural development paradigm as defined by the OECD (2006), but not all farmers experience it to strengthen rural development.

4.2 Rural Development Strategies

An important aspect of rural development is the stimulation of the multifunctional character of the farm, to build upon and maintain local resources. In Midden-Delfland, all interviewed farmers are involved in rural development strategies. Some are involved in the valorization of regional specialties, some are actively developing synergies, and all are involved in the network of circular farming that has been established. This network is very relevant for rural development in the neo-endogenous paradigm. The farmers come together around the topic of circular agriculture, and they follow classes, exchange ideas and business data, and advise local policy makers. The network forms a bridge between the farmers and external knowledge experts, and allows for the creation of synergies. The members are recruited through the local social network, in which all farmers in the small and tight municipality know each other. Many members indicated they became a member because someone else invited them. New members can join at any time, and direct benefits of the membership include access to knowledge, a financial compensation for the time invested, and access to subsidies. Respondent 13, the consultant, who developed the network, said that those who decided not to join, did so because of their own interests and the background of their family and farm, in which they do not want to change the business. He thinks educational levels are not

of influence, as the educational background of both groups of farmers is varied. Respondent 10, the policy maker, brought up that closing cycles just does not fit the strategies of all farmers. Two farmers in the municipality had a lack of land as they split their father's farm, for example.

Respondent 1, the coordinator, had a critique on the amount of contributions to rural development the circular farmers have: *"Now, 10 years later, it is still the same group of farmers. Nobody has quit, but no new ones have joined. That is not good."* The network is closely aligned with the characteristic of synergies of the neo-endogenous rural development paradigm. The farmers that are involved have enhanced their autonomy and local control through low-input agriculture, and have developed jobs and sustainable produce that benefit the wider region.

When looking at circular agriculture within the Value Triangle of Rural Development by Van der Ploeg and Roep (2003), the consultant, who has worked with professor Van der Ploeg, explained that circular agriculture is about regrounding the farm into its local environment, and that it forms the basis of rural development, at the bottom of the triangle.

"If the core business activity of the farm is not profitable, none of the other activities will be [...] Farmers cannot influence the price of milk directly, so reducing costs is the only way to increase the margins." Respondent 13, consultant

Together with the government and farmers, he tries to link regrounding strategies to broadening and deepening activities. To him, circular agricultural activities can easily be linked to the broadening activities, but it is more difficult to link it to deepening activities.

"If you use nitrogen and phosphate economically, it is also easier to provide services and receive compensation. On the other hand, towards a market, it is more difficult because it often concerns bulk products. Then you have to be different in another way. [...] Organic stands for sustainability for the consumer more than circular agriculture. If you put it in properly, you could make a good story for your company. But I think it has a less direct relationship." Respondent 13, consultant

Eight from the ten farmers are engaged with rural development activities other than cost reduction and subsidies for landscape management through circular practices and the off-farm jobs of their wife. Respondent 6, a farmer, explained that this is *“Because we have limited options to expand our farms.”* Many rural development strategies are not linked to circular agriculture however, and not all farmers communicate it to customers.

From the ten interviewed farmers, only one makes his full living from the production of milk. For eight farmers, milk production is the most important source of income, the other two, the eldest and youngest respectively, make more money through trade and agri-tourism activities. Five farmers are involved in off-farm jobs on the regrounding side, four are engaged in deepening activities through short supply chain and processing their own produce, and five are engaged in additional broadening activities. The two youngest farmers are the only ones who have not had an agricultural education, they have been trained in electrical engineering and business administration, and both have developed agri-tourism activities at their farm.

The regrounding strategies that farmers follow to earn an income, differ per farmer. Three farmers are involved in the local cooperative ‘Delflandshof’. These three only bring in their labor to process someone else’s milk, and share the profits. Other regrounding strategies found include mowing lawns and emptying glasshouses, a business in forage, and a shop in produce from other farmers. This last one, respondent 9, said: *“Actually, I am more a shop owner than a farmer right now. You can earn more money from that than from producing it yourself”*. Only the regrounding strategy of the cooperative is linked to circular agriculture, as only circular farmers could join.

A common deepening strategy identified by Van der Ploeg and Roep (2003), is that of organic farming. The added value can easily be communicated to consumers through a label, which allows it to stand out from bulk produce. There is no such recognized label for circular farming.

“If you produce organic food, you are always good because you have the certificate. A good circular farmer should receive more attention because he is producing in more efficient and better ways than organic farmers.” Respondent 3, farmer.

Some of the farmers interviewed have found the regional cooperative ‘Delflandshof’. They process milk into yoghurt, regular milk and buttermilk, and sell these through short chains to regional supermarkets and restaurants. They have decided not to produce artisanal cheese as they and the external consultant found that the Dutch cheese market is saturated. Circular farming contributes to the strategy as the farmers have developed a label of circular agriculture they put on the bottom of each package. Whether the higher price can be asked due to the fact that it is circular, or whether it being regional is more important to consumers, the farmers do not know.

“Consumers just want to know where their food comes from nowadays. There is a little label at the bottom of the package but whether consumers really read this... I do not know.” Respondent 2, farmer

Two other farmers involved in short chains, said they do not communicate their circularity to their consumers and that it does not create an added value. These farmers are active in informal on-farm sales of unprocessed milk to cheesemakers. These do not care about production methods, but about the fact that they can buy it as soon as it comes from the cow, one farmer explained.

“Many people ask me whether I sell organic produce, but then I tell them that I sell sustainable produce. And sometimes, this brings me to the story of circular farmers. But that is not direct. I have many foreign clients, they are not interested in that.” Respondent 11, farmer

All farmers are engaged in one of the broadening strategies that Van der Ploeg and Roep (2003) link to rural development. The protection of the landscape and biodiversity is the only one directly linked to circular agriculture. Respondent 13, the consultant, explained it brings in benefits directly through subsidies and indirectly through an enhanced attractiveness of the region for visitors and pollinators. Because circular farming is a sustainable production method, the farmers involved can relatively easily meet the targets set by the government to receive subsidies.

“You take it [the money], you bend over for what you see laying in the streets. And that is the same with nature management: if it fits, you have to pick it up.” Respondent 8, farmer.

Other activities found in the broadening dimension include education to school classes, cow adoptions, campgrounds, an escape-room, and renting out event locations. These broadening strategies are not directly linked to circular agriculture, no one explicitly communicates it to visitors. While none of the farmers has any employees, the two farmers who are most engaged in the broadening activities have their mothers involved in the business. One farmer who used to earn an additional income by breeding young animals, quit this as *“The circumstances do not allow to invest much time, energy and inputs into that business. [...] Producing dairy full-time brings in most money.”* Respondent 8, farmer.

Rural development strategies are an important way to earn an income in Midden-Delfland. With limited opportunities to expand, the only way to react to the agricultural squeeze is by generating an income from other activities than producing bulk milk. For eight farmers, the production of milk forms the main source of income, but they indicated that they need other activities that provide the ‘life-jacket’ for their business. Circular agriculture is one way that contributes, through the financial compensation for nature conservation as a broadening activity, and the added value created in deepening strategies. The lack of a clear label to communicate to consumers is a limiting factor here. Whether circular agriculture reduces production costs as a regrouping strategy, differs per farm. Two farmers indicated that it increases their production costs, and two others indicated it reduces their production costs, but also reduces their productivity.

4.3 Conditions, Strategies, and Performances

To Grando et al. (2016), the ideal strategy in which to incorporate circular agriculture on the farm depends on the interlinkages and feedback between external and internal conditions,

strategies, and performances. In the previous section, all strategies farmers pursue for rural development were included, despite not all being linked to circular agriculture. For an exploration of the possibility to link the Conditions, Strategies and Performances model to circular agriculture, only the activities linked to circular agriculture are included here. It is taken as the starting point, around which the conditions and performances, and the feedback between them, are explored.

4.3.1 External Conditions

Grando et al. (2016) have defined external conditions as those that can hardly be influenced by individual producers. They have categorized them into eight categories, and these categories are followed here as well, and presented in the order from most to least mentioned.

The most often cited category in the interviews, is ‘Regulations and Policies’. Most of the time, the respondents referred to the municipal’s regulations, rather than the national or European ones.

“The municipality Midden-Delfland has always said “cows in the field and farmers”. They have always prioritized dairy farmers and their role as landscape managers as their first priority. The municipality encouraged circular agriculture as they saw it as a way to keep the cow in the fields and to keep the landscape open.” Respondent 1, coordinator

The regulations to keep the landscape open directly influence the strategies of the farmers, and contribute to their attachment to the landscape. The municipality provides subsidies and facilitates the network by paying external consultants. All farmers asked said the subsidy of €1,000 motivates them, but to what extent differs per farmer.

“You receive a small financial reward, but that is not in proportion to what you try to earn with buying cheaper low protein food, less fertilizers and less pesticides, and reducing the consumption of energy.” Respondent 10, farmer

The municipality’s support for the network is perceived to be more important to motivate farmers to take up circular practices. Respondent 11, a farmer, felt that the municipality is doing everything they can do for the farmers. All farmers are positive about the work of the municipality,

but most feel limited by national regulations. The reasons vary from getting too low of a compensation for their actions or price for their produce, mentioned by five farmers, or rules that are too strict to efficiently be a circular farmer, mentioned by three:

“I think that we should be able to get way more from the manure. But the regulations have to be broadened then. We should be able to dump the manure on the field [instead of having to inject it]. That is very important for circular agriculture.” Respondent 12, farmer

In the working groups of the external consultant and farmers that the municipality finances, farmers can bring up the limitations they experience. While the working group has no direct influence on the national government, the consultant serves on advising boards to the government and can translate the practical experiences of farmers into suggestions for policy changes.

The second category is on the socio-institutional conditions. This includes the wider and local agricultural system, the administrative issues farmers face, and the social network. A problem for farmers to switch to circular agriculture, is the agricultural system they find themselves in:

“If you have been educated in a certain way, then it is very difficult to distance yourself from it. Especially if everything around you advises you in a certain way too, such as scaling up as a paradigm. We can develop an alternative program, [...] but still it is difficult to counterbalance the system.” Respondent 13, consultant.

For the farmers, the boundaries of the system they work in were felt at a lower level, within the system of circular agriculture and the formal evaluation of it. The subsidies are based on the scores farmers get on a ‘circular report card’. Many experienced that they had to make changes not in line with their circular agricultural values, such as managing nature landscapes, just to ‘fit’ in. Three farmers were worried the report card is taken too seriously and too detailed. For two farmers, this decreased their motivation. A very stimulating socio-institutional condition in Midden-Delfland is the existence of the network. Two farmers started circular farming because

many people around them were doing it. The network is there and people are free to join, without having to organize anything themselves.

“The motivation is starting to go down because it is always repetition within the study club. [...] On the other hand though, it can be surprising at times if you look at your data from another angle with different people.” Respondent 9, farmer

The third category is on the access to production factors. In relation to circular agriculture, this includes the high costs of production factors that stimulate looking for alternatives, the access to the land and alternative resources needed, and the access to knowledge from advisors. *“Circular agriculture can help. [...] The costs of production have continued to rise, while the prices of produce have remained the same.”* (Respondent 1, coordinator) Three farmers talked about the need to buy more land to be able to be certified as circular farmers. To be successful in circular agriculture, a large area of land is needed and in a region where land is scarce, this is difficult. Two farmers mentioned how they cannot make growing roughages for the animals economically viable due to the high land prices. The access to waste streams of other industries, what the Minister foresees in regional circularity, is limited too. Most producers in Midden-Delfland are dairy farmers, there is not enough waste of other agricultural producers available. Also, the waste streams are not constant, as the production differs per season. This was brought up by two farmers who are motivated to look for alternatives but cannot find them.

The fourth category is that of socio-demographic factors. The farmers interviewed experience the ageing of farmers in the region and the negative cultural context around agriculture as challenges, and urbanization and changing lifestyles as opportunities.

“A challenge is that the region becomes empty with not enough farmers. [...] We should not dive under a critical point at which supporting industries are leaving the region as well.” Respondent 9, farmer.

The cultural context they find themselves in, demotivates some farmers to practice agriculture

at all. Two farmers take it as a stimulant to include sustainable and more circular practices at their farm. Respondent 4, a farmer, said: *“We want to be appreciated so we try to farm in a way we think is acceptable to our environment.”* This closely aligns to the conditions of new lifestyles and urbanization. Five farmers mentioned they want to be in balance with nature, and three mentioned the importance of the health of the cows to be able to farm instead of nurse. Urbanization and the growing demand from consumers for regionally produced food are seen as an opportunity by all farmers engaged in deepening and broadening strategies. None of the farmers saw urbanization as a threat for his farm, because the land in Midden-Delfland has to stay grassland by law.

“If you judge this region purely financial, we will be done within 10 years. The agriculture in Friesland [a Dutch province] is more large-scale, there they have 150 cows each while we only have 60 or 70. We need to do it differently. We have 2 million potential customers within a 10 kilometer reach and we need to take the opportunity.” Respondent 3, farmer.

The urbanization overlaps with the fifth category of a growing demand from consumers. Not only do they ask for more sustainably produced food, but also for recreational functions. As respondent 2, a farmer who owns a campground, mentioned: *“We are the backyard of The Hague and Rotterdam [two large cities nearby].”* The demand for regionally produced food and multifunctionality go hand-in-hand for respondent 4, a farmer as well: *“The benefit is more sustainably produced food. That is more demanded by consumers and it lowers the environmental pressure, that is profit too.”* The growing demand motivated one farmer to completely alter his whole production system as soon as the city came as close as 2 meters from his farm because *“You have to find opportunities. Every opportunity through which I can earn money and maintain my position at the same time, is one I take.”* (Respondent 11, farmer)

The sixth category is that of the local ecosystem. To the farmers in the area, it reduces their ability to close their cycles fully. In Midden-Delfland, almost all farmers are dairy farmers because the soil is not suited to grow crops, this limits the availability of waste streams from other farmers.

Respondent 7, an organic farmer, indicated that the grass from his soil is not nutritious enough for his cows. He needs to buy feed elsewhere to keep them from getting panic attacks. Another example, in which the limitations of the soil become clear:

“We want to keep the principle that some part of the roughage needs to be bought outside. I would prefer not to grow my own corn because the certainty of a good harvest is not big enough. Let someone else take that risk on drier land.” Respondent 8, farmer.

The seventh category is that of finances and risk. A limited access to finance from banks does not influence the decisions to start circular farming activities. It does limit the possibility to buy land, which in turn can reduce the circularity of the business, as respondent 7, a farmer, brought up. His circular activities helped him in getting access to finance: *“A benefit of circular agriculture is the communication: it is appealing to investors.”* (Respondent 7, farmer). This also worked for respondent 4, who was able to buy a windmill for his farm after a crowdfunding campaign. In addition to access to finance, three farmers use circular agriculture to protect themselves from possible setbacks caused by the environment around them.

“I have enough land, so I am less dependent from buying feed. I grow everything on my own land and with healthy feed and animals, I have less risks. Also when prices of feed are rising. I have a safer company, less problems with large setbacks.” Respondent 4, farmer

The last category is that of technology. Internet is a tool used by many to expand their knowledge, but the network remains to be more important for this goal. Clients for all rural development activities are most often found through the network and by word of mouth. None of the farmers mentioned technology to be important for their circular practices directly.

4.3.2 Internal Conditions

All farmers in Midden-Delfland follow different strategies to earn a living from their farm, despite facing the same external conditions. Internal conditions are those specific to each farmer, his farm, and his household. The external regulations impact the internal conditions the most, with

access to land changing the size of the farm, subsidies for circular practices changing objectives of the farmer, and the network changing the farmer's knowledge base and ideas. Concerning the circular agricultural practices, the farmers follow similar pathways, with levels in commitment as the main difference between them.

The first level of analysis, is that of the farm as a business unit. The topics of influence on the decision to farm circular, include the size of the farm, the allocation of resources between different activities, and the long-term dependency. All farmers indicated the transition itself was easy to implement, and did not require high adjustment costs. The size in terms of hectares has often been cited as a negative influence on the possibility to farm circular, as a limited access makes it difficult to meet the regulations. All participating farmers have smaller farms than the Dutch average.

"I am big enough, I do not need to milk 200 cows. With 80 cows I can earn a decent income and I prove that. We have to further focus on creating added value on the produce, we need to start processing it ourselves." Respondent 11, farmer

A theme that plays at the business unit, but bridges towards the level of the household, is the path dependency of the farms. All farmers interviewed have inherited their farm, but regardless of being second or seventh generation, are implementing new practices. Where some continued in the way their father did, two others work together with their father to enhance the circularity of the farm, and one changed the whole business but did not discuss this with his father. *"We are from different generations and he does not understand it. He has different values."* (Respondent 7, farmer). For this respondent, his motivation to change the production system also works with generations the other way *"the business will be more attractive for my children to take over"*. He tried to make it attractive by producing certified organic milk with a higher added value to reduce the need for other rural development activities to earn an income. Other household conditions as

identified by Grando et al. (2016) and others, such as gender roles and values of the household, did not come up during the interviews.

The consultant mentioned that the largest challenge to switching towards circular farming, is not at the business or household level, but in the personality of farmers.

“The different farms are there with their backgrounds and interests and it is difficult to change it into something else. We can try to tempt them to choose for something else. Even the young and highly educated farmers choose for the old system and do not think ‘Let’s do something else’.” Respondent 13, consultant

Education and age seem to not be of influence on the strategies the farmers pursue. All farmers had a formal education, of which eight in agriculture. The ages ranged from 30 to 68, with two to three farmers per ten years. The two farmers who have not had an agricultural education have different foci from each other, and the oldest and youngest are both very committed to circular agriculture, more than some in between. Personal objectives proved to be more important.

The most cited objective of farmers to pursue circular agriculture, is to gain access to the network. Eight farmers cited that being able to discuss data and learn were most important to them.

“It [the network] was founded, and I wanted to learn more, to understand how things work. I joined from that perspective and I am still a member. Every time, people bring in more as they bring in more data. Even if you only take a little thing from each meeting, it contributes to the whole.” Respondent 9, farmer

The second most cited objective is economic. All ten farmers brought this up, both negatively and positively. Where eight farmers experienced positive economic results, two farmers, who are both more production-oriented, said they did not necessarily benefit from it financially.

“Costs go down. That is true. But I think it is important, if you want to make money, that the cow produces milk. Some costs will stay the same, your feed cost will rise, but because it leads to an increase in production, you earn more from it. [...] A good circular farmer has to accept that he will make less money and I have difficulties with that.” Respondent 4, farmer.

For some farmers, gaining knowledge, autonomy, or contributing to the environment are more important than the income made with it, thus, profit maximization is not their first strategy.

“I did not start circular agriculture to earn money from it, but if you think about it, you save money. You start thinking about in- and outputs so your costs-pattern changes. That should increase your income.” Respondent 11, farmer.

The third cited objective is ecological. Seven farmers mentioned they wanted to take up circular practices because they saw it as a way to contribute to the local biodiversity and nature conservation programs, and find that important. And lastly, the fourth objective cited by seven farmers, can be summarized in the following quote by respondent 3, who is a farmer:

“I just have fun in it. It is profitable and it brings in money. It is fun. You have a better understanding of the flows. More data. And I find it to be more challenging.”

4.3.3 Strategies

Grando et al. (2016) have clustered strategies based on the objectives related to them. The ones brought up during the interviews that are linked to circular agriculture, are discussed here. Circular agriculture is taken as a practice that fits into different strategies to achieve a varying set of goals.

“Everything is voluntary and you can find your own ways to reduce your losses as much as possible. You can choose how, there is no defined pathway.” Respondent 5, farmer

From the interviews, the linkages that can be made are those of coping with farming decline through survival, blurring farm borders through business-based networking, political support seeking by going an extra mile for subsidies, and rural development through strategies discussed earlier in this chapter. A last strategy is that of agro-industrial farming. Two farmers are slowly taking down their farms, as they have no successors. They are not making investments into the farms anymore, but continue to do what they are doing now to maintain their resources. Since only circular farmers are allowed in the learning network, circular agriculture can be seen as a strategy to get access to the external business-based networking. For nine farmers, access to the network

and knowledge was a main objective. Furthermore, all farmers receive subsidies for their multifunctional activities. Four of the interviewed farmers' main objective is to make money, and they only take in circular practices where they can earn money from it or not lose any. Circular agriculture thus contributes to their more productivity-oriented farm.

“Everything is connected to each other. It is not easy to be the best at everything. My focus is on production and that is difficult enough. If that is good, the other scores are often not very bad but I do give in on them.” Respondent 4, farmer

4.3.4 Performances

Performances are the intended and unintended outcomes of strategies (Grando et al., 2016; Martin et al., 2018). They can change conditions and strategies through learning. The ways in which the respondents evaluate their performances in circular agricultural activities specifically, have been explored here. They are business-, household welfare-, and outward-oriented.

The most important indicator based on which the farmers evaluate their outcomes and adjust their strategies, does not fit any of the categories identified above. It is the score on the ‘Kringloopwijzer’, a measurement tool of circular performances developed by the consultants and farmers together. Some farmers completely follow it, but most take it to see where they can improve their actions and in which direction their heading.

“Soon we will have the annual ceremony during which we get our circular certificates, and of course you are stroked in your honor if you receive five green check marks for all indicators. If I miss a check mark, I will think ‘How are we going to make sure we get one next year for this indicator?’. It is not even for the money, but also simply for the performance.” Respondent 4, farmer.

The business indicators based on which farmers measure their performances, are improved revenues, reduced costs, and access to markets. The farmers who experience higher margins are stimulated by this. None of the farmers mentioned whether strategies and conditions change based on the performance of the business, but they mentioned that positive results form a stimulant to

keep on doing them. Access to new markets is evaluated by farmers indirectly. Membership of Delflandshof is based on the circularity, but no other produce is sold as being circular. The access to new markets does alter the strategies outside of circular agriculture, as it opens up the way for deepening activities such as short chains and regional produce.

The performance for the welfare of the household came back in the form of better working conditions and maintenance of the resources. Two mentioned that being circular reduced their workload, for one because he had to put less on his land, and for the other because he had to do less other activities to earn an income, but these were not main drivers for the farmers.

The farmers also cared about their outside-performances, both socially and ecologically. They often coupled these. Five farmers mentioned the importance they attach to keeping the landscape open and contributing to attracting people to Midden-Delfland through circular agriculture. Others brought up similar responses when asked how what the most important outcomes are to them: *“Biodiversity and economy. The whole status of the agricultural landscape is integrated with circular practices.”* (Respondent 9, farmer) Respondent 10, the policy maker, brought up that bringing in non-locals has the potential to benefit the farmers who use deepening and broadening strategies connected to circular agriculture, as it can increase the demand for local produce through short supply chains, and agritourism activities. He had no concrete numbers on this, however.

4.3.5 Feedback Loops in Conditions, Strategies, and Performances

In this section, the feedback loops relevant to circular agriculture as brought forward by the farmers will be made explicit.

The external conditions influence the others the most. It became clear that the farmers’ network, financial compensation from the government, and consumer demand directly impact the

decision for farmers to implement strategies of closing their cycle. Access to finance and land, the ecological surroundings of the farm, and administrative regulations directly impacted internal conditions, such as the size of the farm in terms of both hectares and animals, and the allocation of resources that differs per hectare based on the conditions of the soil. The availability of the social network also impacts the knowledge base of the farmer and his motivations to contribute to his surroundings. All external conditions influence the business performances, as in a closed cycle, this is what everything ultimately turns into. The quality of the soil and the changing lifestyles of farmers impact the welfare of the household in terms of good working conditions. The regulations and ecological conditions have a large impact on the performance to the outside in both ecological and social terms, as they depend on ‘what is out there’ as a common good. To Grando et al. (2016), the external conditions can hardly be changed by one farmer alone. In Midden-Delfland, the farmers cooperate and achieve changes in the landscape, demand and regulations that way.

In this study, the internal conditions are not of influence on the external conditions directly, but the strategies and performances are. Internal conditions, especially the objectives of the farmer, impact the way he measures performance. It became clear that the farmers who apply circular practices to a limited extent only, mostly evaluate their performance in terms of business-welfare. Only the youngest one, who does not have an agricultural education, strictly follows the report card, together with the two farmers who developed it. The farmers who measure their performance in terms of household-welfare, are relatively older or have a successor. Those who measure performance towards the environment all have intrinsic motivation in circular agriculture to contribute to the biodiversity and the landscape as well. Personal objectives and performances are closely related.

The strategies are the outcome of all feedback loops and conditions, and feedback into all others through learning. The performances of these strategies impact the other conditions and strategy more visibly. All performances feed back into the internal conditions as it influences the resource allocation to enhance or neglect circular activities, and into farmers' motivation to actively keep on working towards closing cycles, for whatever reason it may be.

The performance on the report card influences the external condition of regulations directly, as based on the annual scores, the policy makers, farmers and consultant come together to develop new targets for the subsidies. This is outside of the individual producers. Overall, all performances feedback into further stimulation of the circular agricultural practices in Midden-Delfland, might it be that the municipality creates stimulating new regulations or facilitates cooperation, the farmers' network more useful courses and cooperative strategies to change the external conditions, consumers become more aware and demand more circular produced food which can stimulate the motivation towards circular farming, or the farmers themselves that create other internal conditions and follow other strategies based on the performances and external conditions.

5. Discussion

The different farm-level drivers that stimulate producers to progress towards circular agriculture to contribute to rural development were identified in the previous chapter. Whether and how the rural development paradigm fits with circular practices in the Netherlands, and how the two frameworks can be integrated to accurately describe the foreseen transition, will be discussed in this chapter. Based on this discussion, the two last research questions on the relevance of the frameworks in the circular context, will be answered in the following chapter.

In theory, the new Dutch policy vision fits the neo-endogenous rural development paradigm as defined by, amongst others, the OECD (2006) and Van der Ploeg and Roep (2003). It allows for different development trajectories, targets a wide set of both rural and urban stakeholders, and stimulates the creation of networks in which internal and external resources are combined. Not all respondents agreed that circular agriculture can be used as a rural development strategy to respond to the agricultural squeeze, or that it is beneficial to their business. From the results on the rural development paradigm, it became clear that many farmers do not see circular agriculture as something new, but as something they have always been doing. This would mean that circular agriculture should not be seen as a rural development strategy per se, but that the foreseen transition should also be analyzed seeing it as a given to every farm and farmer.

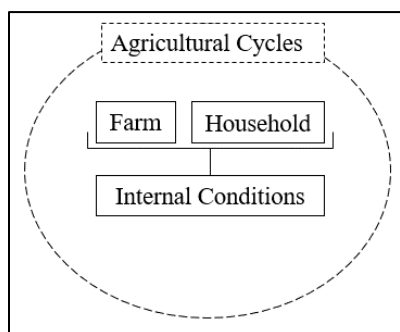


Figure 4 Circular Agriculture as an Inherent Condition to the Farm and Household

All farmers interviewed are member of the circular farmers' network of Midden-Delfland. They all use circular agriculture as a rural development strategy, albeit at different levels of intensity. When done as a strategy to either reduce costs through technical efficiency or to get access to the socio-technical network, it is a form of farming economically, as described by Van der Ploeg (2000) and Belletti (2002). The Value Triangle of Rural Development provides a framework to study activities that can stimulate the multifunctional character of the farm, building upon and maintaining local resources. Circular agriculture as farming economically fits in at the regrounding side of this triangle. Van der Ploeg and Roep (2003) put this side at the bottom, as for them, it is the base from where other rural development strategies can be pursued. There are two farmers, however, for whom milk production is not the core business activity. They are still actively involved in mobilizing resources around milk production to reground the farm into its environment and reduce costs, but it is not at the basis of their business. This would mean that it should be possible to take different sides of the triangle as the basis, not only the regrounding side.

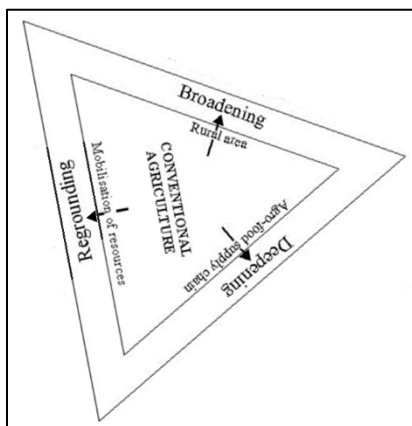


Figure 5 The Value Triangle of Rural Development Seen from Different Angles. Adapted from Van der Ploeg and Roep (2003)

To the consultant and researchers (Van der Ploeg et al., 2019), the only way to increase margins, is to reduce costs. But half of the farmers indicated that circular activities limit their

ability to increase margins, as it does limit production levels. Only those whose main objective is to create high volumes of milk, saw this as a problem. Two farmers said that circular agriculture increases production costs per liter of milk, while all others said it contributes to reduced production costs per liter. Other ways in which circular agricultural practices explicitly contribute to rural development in Midden-Delfland, are seeking subsidies for landscape management on the broadening side, and communicating added value through short supply chains at the deepening side of the triangle. None of the five farmers engaged in on-farm broadening activities communicates his circular way of working to customers. The four farmers engaged in the processing of milk and short supply chains in Delflandshof do communicate it through a label, but whether customers attach more value to the locality or circularity of the produce, they did not know. This is despite enhanced attention in Dutch media for circular agriculture. Overall, synergies between rural development strategies and circular agriculture are limited. While eight from the ten are involved in multiple rural development strategies, only four of them try to link this to circular agriculture.

To identify the different factors influencing farmers to take up circular agriculture as a rural development strategy specifically, the Conditions, Strategies, and Performances framework by Grando et al. (2016) was used. Not only the individual factors, but their continuous interaction and feedback loops proved to be of influence on the decision for a specific strategy. Grando et al. (2016) found the linkages as shown in Figure 2. The feedback he found, were in line with feedback found in this study. Important is the central role of the producer, through which factors influence each other. An additional linkage found in this study, is the one from performances directly to external conditions, bypassing the individual producer. In Midden-Delfland, one of the performances of the network relevant to rural development, is that the external conditions of the

landscape, demand, regulations, and cultural context are changed. This confirms Munchhausen's (2006a) suggestion that performances of farmers depend on those achieved by others, but this is not taken as a critique to the framework here. The other feedback found by Grando et al. (2016) were also found in this study, and will be explained below, after a visualization of the updated framework in Figure 6.

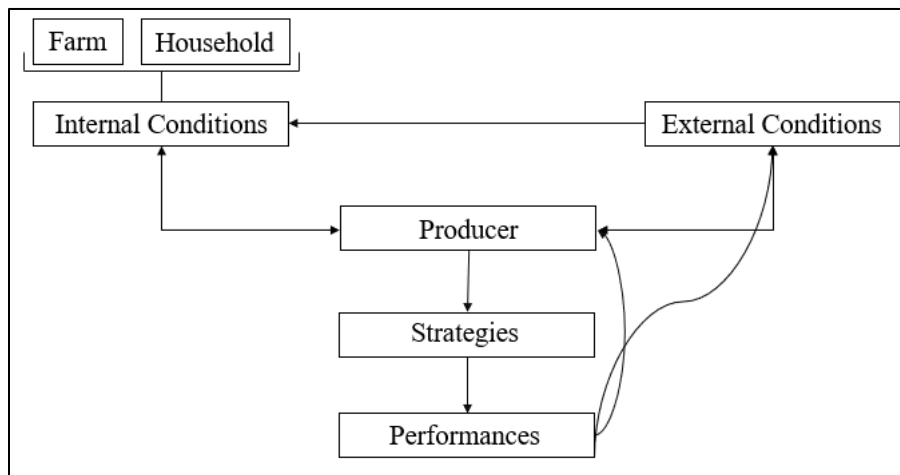


Figure 6 Updated Conditions, Strategies and Performances Model. Adapted from Grando et al. (2016)

The external conditions found to be of most influence on the producer's decision to pursue circular agricultural strategies, were unique to Midden-Delfland. The municipal regulations, the upcoming urbanization and the presence of the learning network stimulated the decision, while the poor quality of soil hampered it. These external factors influence each other, and the internal conditions and producer directly. They change strategies indirectly, through changes in the farmers' objectives or resource allocation. The fact that all of the farmers saw urbanization as a stimulant rather than as a threat for circular agriculture, for example, was because of the protective regulations of the municipality. In contrast to findings by Arzeni and Sotte (2013), and in line with Barbieri and Mahoney (2009) and Huttunen (2019), the subsidies did play a role, but none of the farmers took them as their main driver. Despite having been crowned as the most sustainable

municipality of the Netherlands, none of the respondents brought this up. How the rising costs of production factors that all Dutch farmers face influenced the decision towards circular farming, differed amongst farmers based on their objectives. For some, rising production costs were a stimulant to implement circular agriculture and keep less cows, while for others, they were seen as a limitation and stimulated them to enhance productivity. Surprising was that only three farmers saw reduced dependency on external resources as a way to reduce their risks. The external conditions of availability of labor and the role of women in society were not mentioned by any of the farmers, but those farms with mothers working in the business were more diversified, not necessarily more circular.

The external conditions influence the farmer and the internal conditions he faces directly. Access to land changes the size of the farm, subsidies and cultural context change objectives, the network changes the farmer's knowledge base, and the quality of the soil changes the workload. Despite facing the same external conditions, farmers make different strategic choices. One farmer brought up that the external condition of the quality of soil directly made him choose not to grow roughages himself, while other farmers owning the plots around him, do grow these. The most important factors here were the personal objectives of the farmer, which is in line with research by Oostindië et al. (2016). These included access to knowledge, a higher income, and conservation of the natural environment. Interesting was that many farmers use circular agricultural practices as a strategy to gain access to the network, instead of the expected vice versa. The ones with the objective of challenging themselves for fun, were the ones with the most closed cycles. The internal conditions in the household unit, namely age, education, wealth, gender composition, and generations on the farm before and after the current one, did not seem to have an impact, as those with different ones followed the same strategies, while those with similar ones followed different

strategies. The internal conditions in the business unit, mostly size, did have an impact. All farmers interviewed have farms smaller than the Dutch average, have few possibilities to expand, and practice circular agriculture. This confirms a finding of Mazzocchi (2014), but the author's finding that labor availability matters too, was not confirmed. None of the farmers had or wanted any employees. The findings on internal conditions of this study contradict the ones found by Yang and Pan (2014). They found that age, educational levels and high proportions of farm income relative to non-farm income are positively related to awareness of circular agricultural practices. In this study, these conditions were not linked to the intensity of circular agricultural practices.

The strategy and performances are the result of the sum of the general and not the individual equilibrium of the internal and external conditions, and the individual characteristics of the farmer. This has been found in this study, and refutes the critique of Von Munchhausen et al. (2016a) that the model does not show the linkages between conditions and strategies accurately as many farmers are pursuing multiple strategies at the same time. Whether circular agricultural activities are intensified over time, depends not purely on the performances such as income, but on the way the producer attaches value to these performances. The report card proved to be the most stimulating performance indicator for farmers to intensify circular agriculture, and stimulated all ten farmers. Some valued the pride they gained from it, others the exact numbers, and others appreciated it as a tool to see whether they were heading in the right direction. Financial performance was the second most important performance. All performances are valued by the producer, and from there he decides whether to alter the allocation of resources, invest into external conditions, or perform a strategy again. Learning proved to be an important factor here, as eight farmers mentioned learning from their evaluations was key in their motivations to be part of the

network. Whether unintended consequences influenced farmers, as Martin et al. (2018) suggest, did not become clear from the interviews.

This study was the first one to study the link between circular agricultural practices and rural development strategies. For a large part, the results confirm findings by other researchers on rural development and circular agriculture separately. The two frameworks used are complementary to each other, and, with minor changes, allow to understand the socio-economic farm-level drivers of circular agriculture in Midden-Delfland. Important are the following remarks.

Circular agriculture does not function as a rural development strategy per se, but actively working on closing cycles to reduce costs, or by being involved in a socio-technical network, does. All dairy farmers find themselves in cycles, in which they use the output of manure as input for the grass, and grow at least part of the feed for the cows themselves. Circular agriculture can therefore be seen outside the context of rural development strategies as well. If circular agriculture is performed as a rural development strategy, in which it is followed by socio-technical networks and with the aim to reduce costs and build upon endogenous resources, then the triangle by Van der Ploeg and Roep (2003) fits. None of the farmers brought up rural development strategies around circular agriculture that do not fit into the triangle. A finding is that the triangle can be viewed from different angles, and that circular agriculture as a regrouping strategy is not necessarily the basis for diversification for all farmers.

The Conditions, Strategies, and Performances framework of Grando et al. (2016) allowed for an exploration of the socio-economic drivers, and fit everything brought up by the respondents. An important finding is that, indeed, most different components are linked through the farmer, as the outcomes are based on his understanding and objectives. A direct link between performances

and external conditions was added, as the farmers together can change these conditions. Education and age did not seem to matter, and neither did generational issues.

An integrated version of the two updated frameworks allows for multiple strategies around circular agriculture. On the one hand, it fits into the rural development strategy Grando et al. (2016) and Van der Ploeg and Roep (2003) both describe, albeit from different angles. On the other hand, circular agricultural practices are presented as a given, that can be used for the achievement of different objectives and fit into a multitude of strategies, such as coping with farming decline or seeking political support. Both uses of circular agriculture fit into the agricultural vision as presented by the Dutch Minister, but allow different trajectories to enhance circular agriculture, and different responses to the agricultural squeeze.

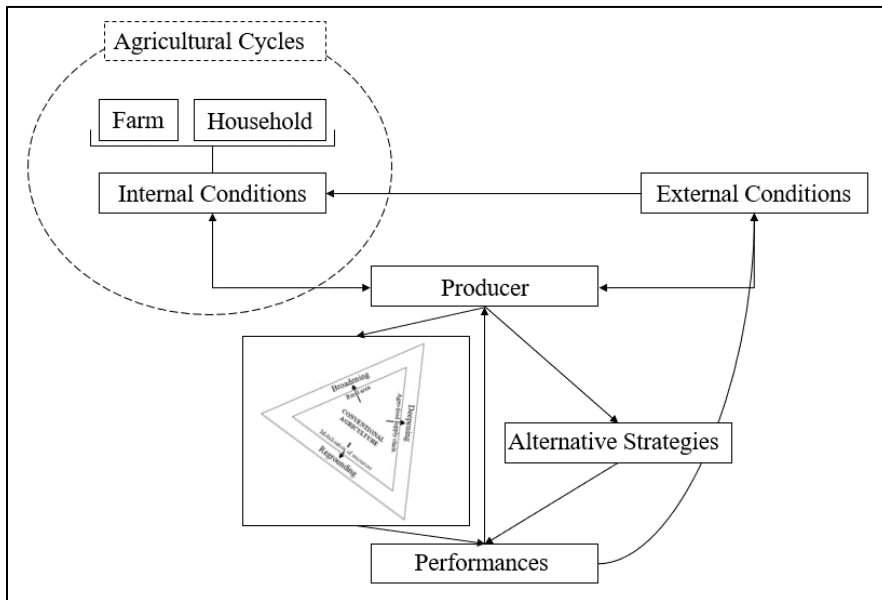


Figure 7 Integration of the Two Frameworks. Adapted from Grando et al. (2016) and Van der Ploeg and Roep (2003)

6. Conclusions and Recommendations

In response to the sustainability challenges farmers and societies face, the Dutch Minister of Agriculture has decided to stimulate rural development by demanding that all farmers will be involved in closed cycles by 2030. Many farmers in the Netherlands protest against the transition, and the respondents in Midden-Delfland have mixed opinions about it. The first aim of this research was to fill this gap for policy makers, to be able to identify the different conditions that stimulate farmers to transition. These conditions have been brought forward in the Results chapter, and were identified based on the Conditions, Strategies, and Performances Model by Grando et al. (2016). The two most important factors proved to be the presence of a knowledge network around circular farming, and the personal objectives of the individual farmer. These objectives and the ways in which farmers adjust their strategies based on learning, are strongly linked to how farmers evaluate their performances.

The second aim of this research was to fill an existing gap in literature between studies on drivers of non-circular diversification strategies, rural development, and circular farming strategies. This was done through an integration of the framework by Grando et al. (2016), with the Value Triangle of Rural Development by Van der Ploeg and Roep, (2003) that identifies different strategies of rural development. In the Discussion chapter, the two were individually adjusted and then integrated to contribute to studies on the foreseen transition towards circular farming in the Netherlands. To the Conditions, Strategies, and Performances model, a direct link was added between the performances and external conditions. From the interviews, it became apparent that, while farmers cannot change the external conditions alone, they can do so through cooperation through their network. No other new links that were not captured by Grando et al. (2016), were found. The Value Triangle of Rural Development was not adjusted, as all strategies

and activities mentioned by the farmers fit the model as it was. An important addition, however, is that the regrounding side of the triangle should not necessarily be seen as the basis of diversification and rural development, but that broadening and deepening activities can be at this basis, too.

For the integration of the two frameworks to describe the transition towards circular farming, the circular activities were entered at two different sections of the framework. When the strategy is aimed at closing the cycles to reground the farm into the wider environment, circular agriculture is seen as a rural development strategy, and entered at the ‘Strategies’ section. But, while it fits into the neo-endogenous paradigm of rural development, farmers do not use it as a rural development strategy per se. Many farmers see circular agriculture as something that is always there, and as something that fits into different strategies, be it agro-industrial farming, coping with farming decline, or blurring farm borders. Circular agriculture is also entered around the ‘Internal Conditions’ section. Which one fits the transition, is based on the objectives of the analysis, and whether it is used to study circular agriculture as a rural development strategy, or as a one.

6.1 Study Limitations

The results and their interpretation were impacted by several limitations. The first limitation was that all farmers interviewed were a member of the same municipality. They all face the same external conditions, in which the cities and consumers are nearby, expansion is hardly possible, the limited quality of the soil does not allow for profitable arable activities, and the local municipality actively stimulates circular farming activities through subsidies and the creation of a learning network. While studying these particular farmers allowed for a study on the different drivers as the farmers have been successful at circular farming for more than a decade already, it limits the generalizability to other municipalities in the country. It would have been interesting to

learn what the most important stimulants were for farmers that find themselves in different contexts, further away from cities, for example. The second limitation was that only farmers who are involved in circular agriculture as a rural development strategy, were interviewed. To better understand what policies are missed or need to be changed to stimulate the transition, it would have been of added value to interview farmers who do not want to or cannot make the transition. The third limitation has to do with the researcher. The gap in literature identified and filled in this study, was a gap in literature found in Dutch and English literature only. The linkages between circular agriculture and rural development might have been studied in other languages already.

6.2 Policy Recommendations

Based on the identified conditions that stimulate farmers to transition, and their understanding of the new agricultural policy vision, three policy recommendations can be made. With the access to knowledge, business partners, and local policy through the learning network being important stimulants, the first recommendation would be to stimulate rural municipalities to develop these networks as well. This would lower the barriers to enter, and enhance the capacities of circular agriculture to contribute to rural development as it facilitates cooperation and allows for the creation of synergies, while being built upon endogenous resources available in the community. The second recommendation is to clarify the agricultural vision, by establishing clear goals for the farmers to achieve and allow them to utilize their management abilities and external resources to obtain those goals. Regulations changing year to year makes it hard for the farmers to make wise investments and stay profitable, and many strict regulations were experienced as limiting the circularity of the farm. All the respondents indicated they were motivated to enhance their strategies by seeing their final performance on the report cards. This could be stimulated by linking the amount of subsidies to the scores achieved. A third recommendation to the Dutch government

would be to increase efforts to lobby for circular agricultural policy at the level of the European Union, and intensify efforts to enhance Dutch consumer awareness and demand. With most of the Dutch produce being exported, farmers face unequal competition as long as production standards are not enhanced in all countries. Farmers selling in the Dutch market explained that the low prices are limiting their activities. The taskforce *Circular Economy in Food* could create a national recognized label to facilitate consumers in making a sustainable choice in the supermarkets.

6.3 Suggestions for Future Research

To understand the linkages between rural development and circular agriculture, and the importance and potential of circular agriculture in itself more fully, additional research needs to be done. The first suggestion for future research, is to expand the geographical scope to more municipalities in the Netherlands, and in Europe. Conducting more studies in the Netherlands would allow for a better understanding of the stimulating and limiting factors, when an involved municipality, with all the benefits that brings, or a large potential consumer base, are absent. Conducting more studies in Europe would allow identify greater understanding on how to stimulate farmers in different national contexts to take up more environmentally sustainable practices. It is important that all countries in the European Union stimulate closing agricultural cycles, otherwise unequal competition would damage the market position of Dutch farmers and limit the successes. The second suggestion for future research is to study possibilities to enhance consumers' willingness to pay for circular produced food. Whether a nationally recognized label would be a useful tool to stimulate consumers to make sustainable choices, would require market research. The third suggestion for future research, is to study how the changes at the farm level, which happen in a niche, can be linked to the sustainability transition at the landscape level, as described in the introductory chapter. This could build on theories on transition management by,

amongst others, Loorbach and Rotmans (2006), but was outside the scope of this study on changes at the individual farm level only. A final suggestion would be to study farmers not currently involved in circular agriculture to determine why they chose to not to pursue that strategy. This study was limited by analyzing only farmers currently pursuing circular agriculture practices.

6.4 Final Comments

All farmers worldwide are involved in cycles and circular agriculture in one way or the other. Promoting the further closing of agricultural cycles has the potential to contribute to environmental sustainability of the sector as a whole. It fits all production systems and strategies pursued by farmers, and is relatively easy to implement as the first steps only require small changes to the system to be made. This study has identified the drivers of circular agriculture as a rural development strategy, and developed a toolkit through which the linkages between drivers of circular agriculture and rural development strategies can be identified. This is of importance to policy makers, as it allows them to find entry ways in which they can create a stimulant policy environment to convince farmers to further close their cycles. It is also of importance to academia, as it filled a gap in literature and developed an updated conceptual framework through which rural development can be studied.

Overall, the study showed how different components surrounding circular agriculture can be integrated to create a stimulating environment for farmers to achieve objectives that benefit the wider society as a whole. The economic, social, and environmental challenges surrounding the production of food do not only face farmers, but society as a whole. Everyone can contribute to creating less waste and using less inputs by stimulating circular economies, and lessons for both policy makers and science have been drawn from the pioneers in Midden-Delfland.

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8. Appendices

Appendix 1: Questions Asked in Semi-Structured Interviews

Farmers

Attributes

- Gender
- Age
- Educational level
- Household size
- Generation on the farm
- Successor
- Distance to urban area (in kilometers)
- Size of farm (in hectares)
- Number of people dependent on the farm

Questions

1. What income generating activities do you and your household have both on- and off-farm?
 - What multifunctional activities do you do? How are the activities connected to each other, and to the activities of other farmers in the region? How do you communicate your activities to (potential) customers?
2. What circular farming activities do you do?
 - What does 'circular' mean to you? At what level? Does circular farming enhance performance in other activities?
3. How did you learn about the opportunity of circular farming?
 - Was there a program, policy, or network you got involved in? How do you expand your knowledge now? How did you expand your knowledge before you were participating in this institution?
4. What were your motivations to get involved into circular farming activities?
 - What economic condition was the farm in prior to the transition? What alternative strategies have you considered (organic, off-farm employment, non-farm activities)?
 - How did you household play a role in this (values, interests, wellbeing, resource allocation, gender composition)? How did your farm's assets play a role in this (scale, long-term characteristics, financial situation)? How were these changed?
 - What factors increased your access to external resources? How did policies, technology, social capital, ecology, access to inputs, access to credit and demand play a role?
5. What is motivating you now to practice circular farming?
 - How do you evaluate your performance (income, risk, productivity, ecological services, income from subsidies, happiness)? What benefits do you see (both for yourself as well as for the region)?
6. How did you manage the change towards circular farming activities?
 - What adjustment costs did you face? What was different before you switched? What support measures were useful to you? What support measures were not useful?

- to you? Was there a form of support that you missed? Which one, and how? How did your network influence the decision?
7. Would you like to do more circular farming activities?
 - Which ones? What is stopping you from doing them? Can you give me an example? What limitations do you experience? Can you provide me with an example of a strategic choice you recently made?
 8. How do you see the future of your farm?
 - What strategies or activities do you see as the most promising? Why? Would you encourage more circular practices? Why, or why not? What is your opinion about the minister's vision to transition all Dutch agriculture towards circular agriculture?
 9. What will be needed to achieve this future?
 - What policies do you miss? How do you experience contact with your customers? What is the relevance of your network herein?

Policy Officer

1. How did the initiative of circular farming in Midden-Delfland start?
 - What actors were involved? How did the municipality get involved?
2. Why did the municipality decide to get involved into stimulating circular farming activities?
 - What benefits did the municipality foresee from the initiative? Was this a controversial step, or easily decided upon? What challenges did the municipality foresee?
3. Have you noticed significant changes in the development of the municipality since the introduction of circular farming?
 - Have you noticed an increase in demand for sustainable produce? Have you noted an increase in visitors? Has the biodiversity or landscape improved?
4. In what way is the municipality involved in the circular farming activities?
 - What types of policies were found to stimulate the activities? Is the involvement mostly financial, or also facilitating? How you support the expansion of the circular network?
5. Is the municipality supported by Dutch national or European international programs?
 - What support programs are being used? Is the municipality in cooperation with other municipalities or governments?
6. How is the policy surrounding circular farming connected to other policies?
 - How are policies interconnected? For example with tourism, consumption, and other businesses?
7. What are challenges experienced at the municipal level? How are these overcome?
 - Can you give me an example of the initial stage, as well as from the last two years?
8. What are the experienced benefits for the wider municipality?
 - Are other sectors linked to the agricultural one supported through this program as well? Is there an influx of (national) tourists?
9. What is the future vision of the municipality Midden-Delfland for agriculture?
 - Will you continue to promote circular farming or has a limit been reached? What other opportunities do you see for the sector in your municipality?
10. What will be needed to achieve this future?
 - What policies do you miss? What is your opinion on our minister's vision on circular agriculture?

External Consultant

1. Why did you feel the need to set up a network of circular farmers?
 - How did the idea come up for you? What was your role in the process?
2. How did the initiative of circular farming in Midden-Delfland start?
 - How did the idea come up? Why in this region, with these specific actors?
3. How did the initial process go?
 - How did the approached actors respond? Was it easy to get people enthusiastic? What challenges did you overcome? Can you provide me with an example?
4. What does the network of MinD exactly do for the farmers?
 - What services do you provide exactly? Why? What services are missing? Why?
5. What are the main challenges experienced in the network in the past two years?
 - Can you give me examples? How have you overcome these, or what limited you in overcoming these challenges?
6. What are the main benefits / what are you most proud of at the moment?
 - How do you feel about how the process went? Do you see overall improvements in economic situations?
7. What is the future of circular farming in Midden-Delfland?
 - Do you see room for growth? What opportunities and limitations do you foresee? What is needed to achieve this?
8. What is the future of circular farming in the Netherlands?
 - Do you see room for growth? What opportunities and limitations do you foresee? What is needed to achieve this?

Network's Coordinator

1. What was your role related to circular agriculture in Midden-Delfland?
 - How did you get involved? What were your motivations to participate?
2. Why was there a need to set up a network of circular farmers?
 - What were the motivations of the different actors? Who benefitted and how?
3. What does the network exactly do for the farmers involved?
 - What services are being delivered? Why were these services chosen? What services are missing?
4. How did the initiative start?
 - Which actors were involved? How were the local inhabitants stimulated to get involved?
5. How did the process go?
 - How did people react? Was it easy to get people enthusiastic? What challenges arose? Can you provide an example?
6. Have you noticed changes in the development of the municipality?
 - Is there a higher demand for local produce? Have the landscape and biodiversity, and economic situation been changed?
7. What challenges do you see in strengthening circular agriculture in Midden-Delfland?
 - Can you provide a recent example, and one from long ago? How were these overcome (if)?
8. How do you see the future of circular agriculture in Midden-Delfland?
 - Is there a limit to the success? What opportunities and challenges do you see? What is needed to take or overcome these?

Appendix 2: Research Compliance Protocol Letter



To: Daniel V Rainey
AGRI 222

From: Douglas James Adams, Chair
IRB Committee

Date: 03/11/2020

Action: Expedited Approval

Action Date: 03/11/2020

Protocol #: 2001245604

Study Title: Semi-structured interview guides for GA thesis research Anna Mulder

Expiration Date: 02/06/2021

Last Approval Date:

The above-referenced protocol has been approved following expedited review by the IRB Committee that oversees research with human subjects.

If the research involves collaboration with another institution then the research cannot commence until the Committee receives written notification of approval from the collaborating institution's IRB.

It is the Principal Investigator's responsibility to obtain review and continued approval before the expiration date.

Protocols are approved for a maximum period of one year. You may not continue any research activity beyond the expiration date without Committee approval. Please submit continuation requests early enough to allow sufficient time for review. Failure to receive approval for continuation before the expiration date will result in the automatic suspension of the approval of this protocol. Information collected following suspension is unapproved research and cannot be reported or published as research data. If you do not wish continued approval, please notify the Committee of the study closure.

Adverse Events: Any serious or unexpected adverse event must be reported to the IRB Committee within 48 hours. All other adverse events should be reported within 10 working days.

Amendments: If you wish to change any aspect of this study, such as the procedures, the consent forms, study personnel, or number of participants, please submit an amendment to the IRB. All changes must be approved by the IRB Committee before they can be initiated.

You must maintain a research file for at least 3 years after completion of the study. This file should include all correspondence with the IRB Committee, original signed consent forms, and study data.

cc: Anna Berger Mulder, Investigator