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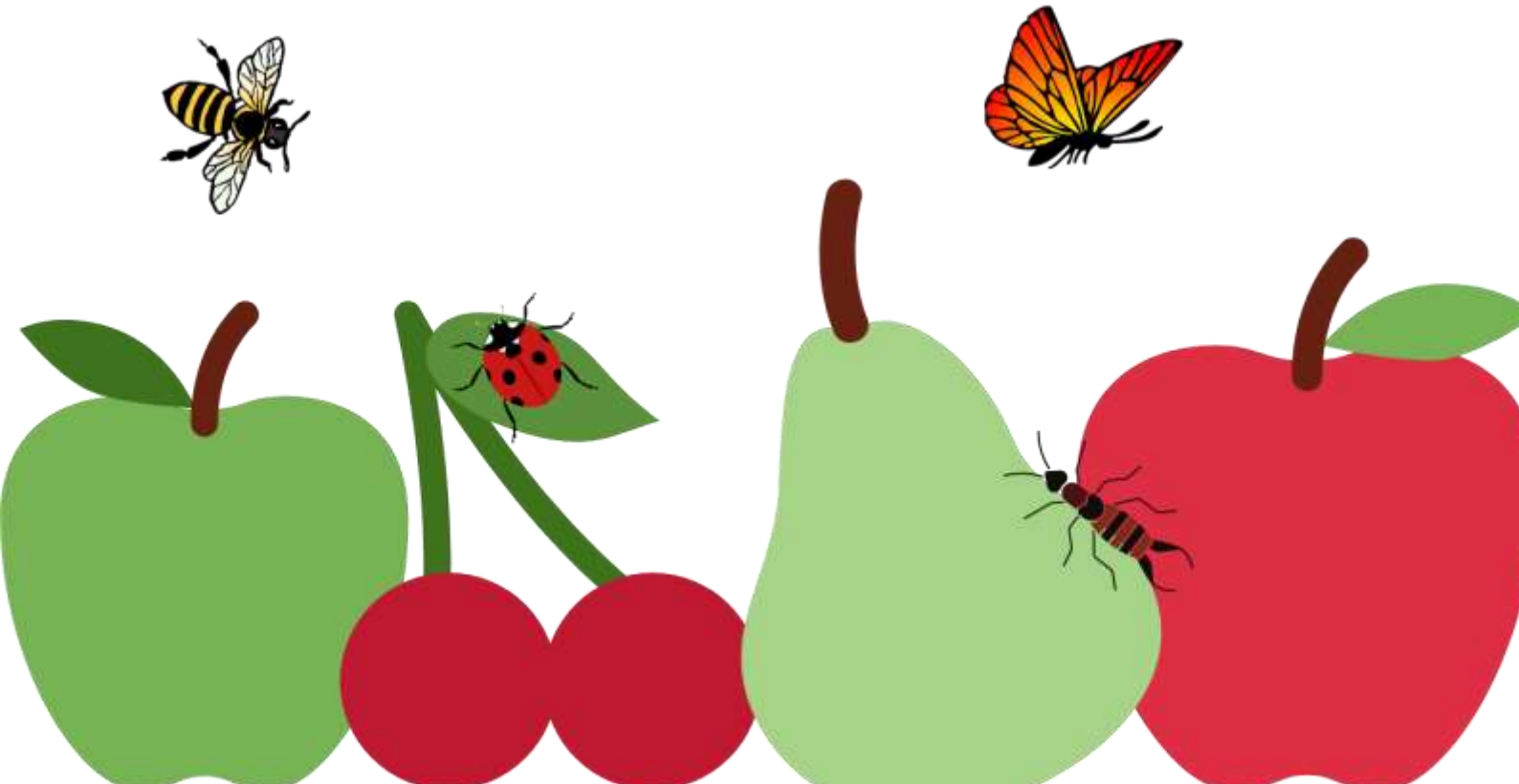
Unravelling the changing policy arrangement of nature inclusive fruit cultivation in the Betuwe, the Netherlands



Abstract

Considering the challenges of climate change, ecosystem degradation and biodiversity loss, a transition in the food system is needed. Fruit cultivation is one part of this agricultural system. A proposed way forward in the province of Gelderland in the Netherlands is nature inclusivity. The aim of this research is to identify a change in the role of actors, resources, rules and discourses in the policy arrangement towards nature inclusive fruit cultivation over time in a specific case. The research question is: *"How did the Policy Arrangement of nature inclusivity in fruit cultivation in the Betuwe develop from the year 2016 to the end of 2021?"* The question is answered by a content analysis and semi-structured interviews, using the Policy Arrangement Approach and elements of the socio-technical transition theory: the Multi-Level Perspective. The research concluded that almost all elements of the PA of NIF in the Betuwe changed. Nature inclusivity was put on the agenda for the first time and the actors shifted more towards collaborating. Some actors (as financial institutions and supermarkets) did not change their roles significantly, even though other actors would expect more contribution for nature inclusivity from them. Other results were an observed increase in knowledge, a bigger focus on nature in education and skills, more best practices and information on NIF, and more funds available for nature inclusive measures. The barriers of knowledge exchange, the perception of financial risks and the power distribution remained stable for most actors. Formal rules only changed with the increase of legislation to ban pesticides, while informal rules changed more, many voluntary initiatives and action plans were used. Most actors formed their definition of NIF during the analysed five years. The dominant discourses remained stable, while some actors began using the alternative discourses. For most actors, the intensification of Dutch agriculture is needed for food security and food production. Another dominant discourse is the separation of nature and agriculture and that there is a lack of space in the Netherlands to extensify. The alternative discourse that agriculture is part of an ecosystem and nature inclusivity would result in an increase of societal and ecological values, gained more support. Lastly, the discourse that technological innovation is the solution, remained dominant, while the discourse on the importance of nature in the transition gained support over the years.

Keywords: Fruit cultivation, nature inclusive, sustainability, actors, Betuwe

Colophon

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DE FRUITMOTOR

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1. Introduction to the research

Welcome in the Anthropocene, a new geological epoch, introduced by scientists, in which humanity has an excessive impact on the functioning of the systems and life-supporting infrastructures of the earth (Crutzen, 2006; Steffen et al., 2011; Vitousek et al., 1997). While there is a lot of scientific debate on when this new era of impactful human actions on the environment started (Lewis & Maslin, 2015; Steffen et al., 2007), there is less contradiction among scientists that so-called planetary boundaries have been crossed by humanity (Rockström et al., 2009; Steffen et al., 2018; Zalasiewicz et al., 2011). Climate change, ecosystem degradation and the tremendous loss of biodiversity are often referred to as the biggest contemporary challenges (Al-Delaimy et al., 2020; IPBES, 2019; Giddens, 2009; Millennium Ecosystem Assessment, 2005). Systematic transitions are needed to limit the causes and the impact of these challenges (Geels et al., 2017).

1.1 Research problem statement

The intensification of agriculture after the Second World War has had significant effects on the exceedance of the safe planetary boundaries on earth (Rockström et al., 2020; Webb et al., 2020; Willett et al., 2019), such as soil degradation, biodiversity loss, high consumption of freshwater, deforestation and pollution through nitrogen, phosphorus, heavy metals, antibiotics, pressure on animal welfare and microplastics (Dagevos & de Lauwere, 2021; Erisman & Verhoeven, 2020; Giller et al., 1997; Raven & Wagner, 2021; Secretariat of the Convention of Biological Diversity [CBD], 2020; Tscharntke et al., 2012). With the emissions of greenhouse gasses from the food system only, we would likely go beyond a 1.5-degree Celsius temperature rise soon after 2050 (Clark et al., 2020; Poore & Nemecek, 2018). The Intergovernmental Panel on Climate Change [IPCC] states that slightly less than a quarter of all GHG emissions from people derive from deforestation and agricultural emissions from livestock soil and nutrient management (IPCC working group II, 2014).

While on the one hand, agriculture is the largest driver of environmental change (Foley et al., 2011; Godfray & Garnett, 2014; Kuyper & Struik, 2014; Tilman et al., 2001), agriculture is also most affected by it, which puts extra pressure on the UN Sustainable Development Goal of zero hunger and food security (IPCC working group II, 2014). There are approximately 2.5 billion smallholder farmers that are not resilient to the rising stresses and shocks to sustain their livelihoods (Amaral, Baas & Wabbes, 2012; FAO, 2013).

Significant changes to the food system will be a necessary step in addressing the problems described above.

The transition to a sustainable food system requires a "shift from our current paradigm for agriculture of focusing on productivity first and sustainability as a question of reducing environmental impacts, to a paradigm where sustainability constitutes the core strategy for agricultural development" (Rockström et al., 2016, p. 6). In recent years, many reports on the problems of the current food system and how to achieve sustainable food systems have been published by international organisations, such as the Food and Agriculture Organisation (in short: FAO), the IPCC, the Convention of Biological Diversity (CBD) and the European Commission with the Farm to Fork strategy, 2030 Biodiversity Strategy and the renewed CAP (Nguyen, 2018).

According to the CBD (2020) there are various key components of importance in the transition to sustainable agriculture. Starting with integrated pest and disease management through biological control agents (in the form of natural enemies) and elimination or reduction of pesticides. Secondly, improving the management of land and water by promoting soil biodiversity. Thirdly, integrate systems of crops, livestock, fish and/or tree production for productivity and ecological benefits. Another component is the maintenance of biodiversity. As fifth is the on-farm learning and research. Furthermore, the improvement of connections between farmers and consumers. Lastly, the provision of an enabling environment in the form of policies, redirected subsidies and incentives to facilitate the transition towards sustainable agriculture (CBD, 2020).

The agricultural systems are kept in place by policies, practices, technologies, knowledge and values: Lock-in mechanisms which have reinforced the pathway of development and stand in the way of change (Bui et al., 2016; Melchior & Newig, 2021).

A trend in the last decade is the growing awareness on the decline of pollinators, which is also extremely relevant for the food system, especially for fruit cultivation. In 2018, the European Commission presented the EU Pollinators Initiative to "improve knowledge about the decline, tackle the causes and raise awareness of the issue" (European Commission, 2021a, p. 1). In Europe, 10% of bees and butterfly species is threatened with extinction (Nieto et al., 2014), while "78% of wild flower species and 84% of crop species depend, at least partly, on insects to produce seeds" (European Commission, 2018a, p. 1). In 2020, the members of the European Parliament adopted the EU Biodiversity Strategy for 2030 and a Farm to Fork Strategy: "The two strategies are mutually reinforcing, bringing together nature, farmers, business and consumers for jointly working towards a competitively sustainable

future" (European Commission, 2020a). One of the key elements in this Biodiversity Strategy is "Bring nature back to agricultural land" (European Commission, 2021b, p. 16). During one of the meetings on the Biodiversity Strategy for 2030, members of the European Parliament also called for a revision of the EU Pollinators Initiative to include a monitoring framework with measures in all EU-countries. This monitoring framework should contain objectives and indicators that are time-bound and include impact indicators and capacity building (European Commission, 2021c). More on these strategies of the European Union and other international organisations in chapter 2.

The debate on the transition towards a sustainable food and agriculture system is also present in the Netherlands. More than half of the number of hectares in the Netherlands is agricultural land (CBS, 2020a). In recent years, traditional agriculture in the Netherlands has been put under pressure due to several events. One of those events is the nitrogen case at the European Commission, which ultimately ensured that the nitrogen policies at the time were not enough and a change in law and a new nitrogen approach was demanded to protect nature reserves in the Netherlands (Raad van State, 2019; Schwartz, 2022). After the 'nitrogen reduction and nature improvement' law of 2021, a subsequent draft program is currently (June 2022) available for inspection and reaction (Aanpak Stikstof, 2022; LNV, 2022; NOS, 2022). Even though fruit cultivation is a part of the agricultural sector that does have very little to none links with nitrogen, the demand for another vision on nature and a fundamental change of agriculture is present in that part of the sector too.

In 2018, the Ministry of Agriculture, Nature and Food Quality (LNV) released a policy document stating that the Netherlands should be a frontrunner when it comes to circular agriculture. Circular agriculture can be defined as agriculture in which all the material loops have been closed and energy use has been reduced. Production, processing and distribution will be done on a local scale as much as possible (LNV, 2018). Furthermore, the concept of nature inclusive agriculture (NIA) is introduced. Careful use of natural resources, the sustainable management of soil and the minimalization of emissions are three central elements of NIA. While the focus of circular agriculture is on closing the loops of minerals and resources, the focus of NIA is on closing the loops in a responsible way regarding nature and natural processes (LNV, 2018). LNV has declared in their vision of 2018 that regional actors should explore nature inclusive food production and that provinces are responsible for investigating possible, regional policy instruments.

Currently, there is a debate going on in the Netherlands on the exact future of agriculture. There are, for example, actors that state that NIA is further reaching than circular

agriculture. According to those actors, directly focusing on nature inclusivity is a more efficient way to make the sustainable transition in agriculture, since it also takes the restoration and conservation of biodiversity into consideration (Gelderse Natuur & Milieufederatie et al., 2019; In short: GNMF). In response to the call from the Dutch government to explore nature inclusivity on a regional level (LNV, 2018), these actors have worked together in the province of Gelderland to construct an action plan on NIA in the province (GNMF et al., 2019). This action plan includes a shared, supported definition of NIA: "an economically profitable agricultural system that integrates optimal management of natural resources in a sustainable manner" (GNMF et al., 2019, p. 4).

In the action plan, the fruit sector is only briefly mentioned. Though the sector is relatively small and not as much of a contributor to the issues described above as some other sectors, it is equally affected by them. In the Netherlands, fruit cultivation can be found in a few regions: Zeeland, Zuid-Limburg, Noord-Holland, Flevoland and the Betuwe (in Gelderland), also called the river area (in Dutch: Het Rivierengebied). These regions differ on a few characteristics, most importantly on the composition of the soil and the level of the groundwater (Van Reuler et al., 2014). Even though fruit cultivation is only mentioned shortly in the action plan of the province of Gelderland (2019), it is still being explored in the fruit cultivation of the Betuwe. The Betuwe is a region between the rivers the Waal, the Rhine and the Lek in the province of Gelderland. The following municipalities are part of this region: Buren, Culemborg, Lingewaard, Neder-Betuwe, Overbetuwe, Tiel, West Betuwe, Arnhem (South) and Nijmegen (North) (Regio Totaal, n.d.; For a map see figure 1 on the next page). Fruit cultivation is of importance in the Betuwe, there is an annual harvest of between 175 and 200 million kilograms of apples and pears (Uit in Tiel, n.d.). The total amount of harvested apples and pears in the Netherlands in the year 2020 was 620 million kilograms (CBS, 2020b). The total land area of fruit cultivation in the Netherlands is 16.165 hectares (CBS, 2020b). The land area for fruit cultivation in the Betuwe is around 4.700 hectares (Uit in Tiel, n.d.).

The need to transition towards more sustainable farming practices is urgent and moving only slowly at the moment. Nature inclusivity is a relatively new concept that offers possibilities for this transition and is already adopted by some farmers and other actors. The fruit sector is a significant component of the local economy in the Betuwe. Examining how broad changes in the food system, agricultural policies, changes of paradigms and constellations of involved actors affect the ability of farmers to integrate sustainable farming practices in this specific region can thus be very valuable.

Even though there are examples of nature inclusivity in the Betuwe, it is not a sector wide trend in the region, nor in the Netherlands. This is a problem, since a sustainable food and agriculture system is needed rather sooner than later, and nature inclusivity has been introduced by various actors as a sustainable form of fruit cultivation. If nature inclusive fruit cultivation (NIF) is a solution for problems as climate change, biodiversity loss, and soil and air quality, in comparison with conventional fruit cultivation, the problem is that the transition towards it, happens too slowly and too marginal.

Figure 1. Map of a marked Betuwe region in the Netherlands (created by the author).

1.2 Research aim and research question

The aim of this research is to gain a better understanding of the mechanisms at play in fruit sector in the Betuwe, by looking at the evolvement of NIF in the policy domain in the past years. In turn, the hope is that this will contribute to successful integration of sustainable farming practices and the acceleration of the transition towards NIF as a policy domain. Using the Policy Arrangement Approach (PAA), which is part of the theories on institutional stability and change, the different dimensions of the policy domain, called the policy

arrangement (PA) will be explored: actors, resources, rules of the game and discourses. Elements of the Multi-Level Perspective (MLP) will be used to complement the PAA. These theories will be further elaborated in chapter 3. Furthermore, the hope is to identify best practices and lessons for other regions of fruit cultivation in the Netherlands. In summary, the main question that will be answered in this research is the following: **How did the policy arrangement of nature inclusivity in fruit cultivation in the Betuwe develop from the year 2016 to the end of 2021?**

1.3 Societal relevance of the research

As mentioned, the agricultural system that is in place contributes as well as faces many challenges. In plans to address these challenges, the fruit sector is often only marginally discussed. However, since the sector is very important to certain regions in the Netherlands, research about the developments in the sector can deliver valuable contributions to the debates in those regions and to the transition towards NIA.

An actor that benefits directly from the results of this research is The Fruitmotor. The vision of this supply chain cooperative is to contribute to a world in which nature and landscapes thrive and food is assigned its true value. They believe that collaboration between different supply chain parties is essential to realise sustainable production practices. The cooperative, of which anyone can become a member, launches projects in the region which with the aim of facilitating sustainable and nature inclusive farming practices, to give nature and biodiversity a boost and to promote healthy and aesthetically pleasing landscapes. An example of such a project is a scheme which allows the cooperative to buy fruit from farmers that doesn't meet retail standards. The price includes a biodiversity premium for the farmers with which they can implement sustainable farming practices. The fruit is used to produce a cider, which is sold as a sustainable regional product (De Fruitmotor, n.d.).

1.4 Scientific relevance of the research

To date, little research exists on nature inclusive fruit cultivation from a social scientific perspective, since the Dutch government introduced it as a new concept without a clear definition. Runhaar (2016; 2017), but also the Dutch government, are making the case that more research is needed to define nature inclusive agriculture in a way that it can be implemented as well in the Netherlands (LNV, 2018).

At the moment, many other concepts are applied as well in attempts to strive for more sustainable agricultural practices: climate-smart agriculture (Collins, 2018; Karlsson et al, 2018), organic agriculture (Rahmaniah et al., 2020), agroecology (Clements et al., 2004; Schowalter, 2011), green agriculture (Koohafkan et al., 2012) and regenerative agriculture (LaCanne et al., 2018; Elevitch et al., 2018; Rhodes, 2017). However, the Dutch government made the decision to not use any of these existing concepts, while NIA might have similarities with one or more of these concepts. The research will contribute to this concise scientific debate.

In addition, the research can possibly establish nature inclusive fruit cultivation as a niche of empirical interest within the sustainability transitions in the agriculture literature. It may also generate interest for a more extensive studies on the transition towards a more sustainable fruit cultivation (in the Netherlands and beyond).

2. Literature review and policy context

In this chapter, the main academic debates surrounding conservation in agriculture and nature inclusive agriculture are discussed. Consequently, the landscape of international policies and agreements relevant to the research theme will be outlined.

2.1 Conservation in agriculture: then and now

Nowadays, an interesting observation can be made in the discourse surrounding nature conservation. On the one hand, conservation is often seen as separate and non-reconcilable with human well-being interests. Others argue that a win-win situation will always occur: conservation is always in the interest of humans. Important complexities and nuances are left out (McShane et al., 2011). Especially in the international context, in which power relations may be present and a top-down approach to conservation is often used (McShane et al., 2011). Nevertheless, a recent IPCC report is clear on the direct relation between the human health and well-being and the health of ecosystems and the planet (IPCC working group II, 2022). Tallis et al. (2018) also demonstrate in their research that a future in which both people and nature globally thrive, is feasible through major shifts in production methods and the overcoming of social, economic and political challenges.

Clements et al. (2004) state that "the roots of an ecological approach to agriculture go back to the dawn of the agricultural revolution, when early farmers could contend with the elements *only* by understanding the ecological forces that could be wielded to design an agroecosystem" (p. xix). Agroecology can be seen as the oldest and most prominent concept in academic literature, that challenges the principles of modern or so-called industrial agriculture in a quest to reconnect with the natural world (Goering et al., 1993). 'Agroecology', which is a combination of the words agronomy and ecology, was first introduced in academic debate in the 1930s (Clements et al., 2004; Schowalter, 2011). During the 1980s, agroecology grew into an independently discipline. Ecology had already been defined by Haeckel more than a century earlier, in 1866. Friedrichs (1958) compared many definitions of ecology and praised the following: 'the science of the living beings as members of the whole of nature' (p. 154). One so-called 'essential' of ecology is the notion of conservation, which can be seen as a practice to maintain the health of the nonhuman environments (Townsend et al., 2000). This reconnection with the complex ecological system can be seen as a response to the problems that modern industrial agriculture faces.

2.2 The transition towards nature inclusive agriculture

The term NIA so far is only used in Dutch (policy) documents and research. It is comparable to agroecology, but it seems to be a clear choice to use a new term, to create a space in which "farmers, citizens, scientists, policymakers, agri-food companies and other stakeholders … jointly give it meaning" (Runhaar, 2016, p. 16).

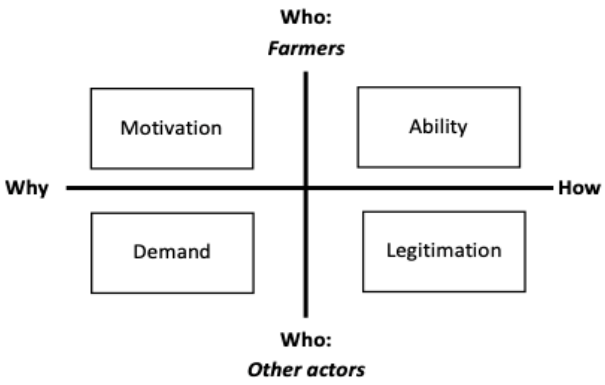
Runhaar (2016; 2017; 2021) is one of the few that has done research specifically on the transition towards NIA. In his view, the relatively newness of the term is beneficial since it can act as a 'boundary concept' that invites various actors to contribute their knowledge and to have a debate on the shared meanings of the concept (Velten et al., 2015). It also captures the key component of the debate: "a more sustainable form of agriculture that minimizes negative ecological impacts, maximizes positive ones and at the same time benefits from natural processes" (Runhaar, 2016, p. 4; EZ, 2014; Sanders et al., 2015).

Three interconnected principles of NIA can be identified: "employ ecosystem services rather than external inputs; minimize environmental pressures and contribute maximally to 'non-functional biodiversity and landscape quality" (Runhaar, 2021, p. 2). According to Runhaar (2017), the concept of NIA is not the first attempt to integrate nature conservation into agriculture. Other niche concepts have been popular in the past as well, like 'ecosystem services', 'natural capital, 'agrobiodiversity' and 'functional agrobiodiversity'. To make sure 'NIA' is not a concept that will fade into the background, it is important that it mainstreamed into agricultural policy. The degree of voluntariness of arrangements to advance NIA should be far less than other governance arrangements that attempted to integrate nature conservation into agriculture (Runhaar, 2017). Those arrangements should also "enable farmers, citizens, agri-food companies, policymakers, scientists, and stakeholders to negotiate and co-produce shared meanings about nature-inclusive farming" (Runhaar, 2017, p. 20).

Runhaar (2016) stated four preconditions for successful implementation of nature conservation measures, since "a clear definition and implementation of roles and responsibilities among actors is necessary. This will not emerge automatically, particularly when nature-inclusive farming does not align with the main interest involved" (Runhaar, 2016, p. 5). To create those important preconditions for implementation of nature conservation measures, the questions of why and how should be asked (see figure 2). Runhaar (2017) states that 'the why-question' needs to be clear and align with the motivation of the farmer, through information provision, co-creation sessions, and so on. 'The how-question' should be in line with the ability of the farmer to implement the measures. Other actors, like

consumers or interest groups, should have a clear and co-created answer to the why-question as well, which would lead to the necessary demand for nature conservation measures in agrobiodiversity and products that come from nature inclusive farms. The answer to the how-question will for these actors result in the legitimation of these nature conservation measures. The preconditions are dependent on each other, which means that the ability to implement measures or legitimation of these measures will not occur if there is only an answer to the why- or how-question. The ability and legitimation of the measures will not be there by only considering the answers to the why-question. With only the answers to the how-question, the motivation and the demand of the farmers and the other actors will not be present (Runhaar, 2017).

Figure 2. Preconditions for farmer adoption and implementation of nature conservation measures (Runhaar, 2017, p. 342).



2.3 Biodiversity and agriculture

In the literature, as seen in the figure 2 as well, Runhaar (2016; 2017) seems to focus mostly on nature conservation as one of the underlining practices of NIA, which can also be seen as nature restoration, since the (bio)diversity is in need to be brought back into the large-scale monocultures (Erisman, 2021; Šálek et al., 2018; Thompson-Hall, 2016).

Agrobiodiversity can be defined as "the diversity of plants, animals and microorganisms that directly or indirectly support food and agriculture" (Jones et al., 2021, p. 712). This agrobiodiversity is "critical to achieving healthy diets and agroecosystems" (Jones et al., 2021, p. 712). Through the current, 'modern agriculture', there has been a "considerable damage to biodiversity, primarily through land-use conversion which is expected to remain the largest driver of biodiversity loss beyond 2010 and at least to 2050, but also through

overexploitation, intensification of agricultural production systems, excessive chemical and water use, nutrient loading, pollution and introduction of alien species" (CBD, n.d.). This poses a threat to the environmental and human health. Because we depend on only a few species, varieties and breeds for food production, pest- and disease outbreaks (among crops and animals) are more likely to happen. Due to low diversity in diets, humans often miss essential micronutrients, which increases the cases of malnutrition. The current system also threatens pollinators and other (micro)organisms that are crucial in agriculture (Jones et al., 2021).

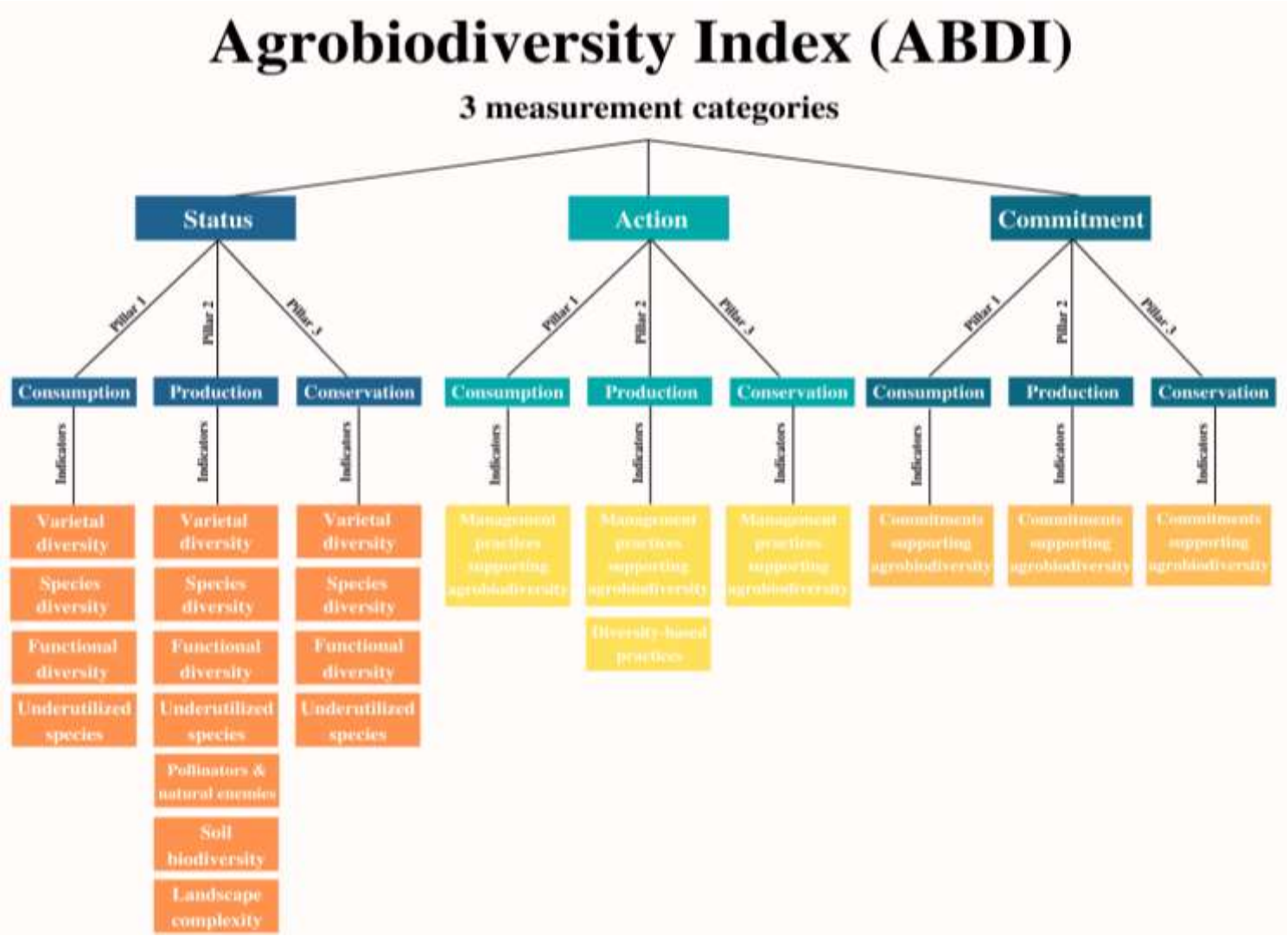
2.4 International efforts and agreements

Jones et al. (2021) proposes an Agrobiodiversity Index (ABDI; See figure 3) to measure the status, the action and the commitment of interventions on this issue. The index consists of the pillars consumption, production and conservation and 22 additional indicators. Through this food systems approach, the ABDI aims to enable "policymakers, non-governmental organizations, civil society leaders and businesses to understand relationships between dimensions of agrobiodiversity across the food system, compare agrobiodiversity use and conservation across countries, and identify priority interventions to enhance agrobiodiversity for more sustainable food systems" (Jones et al., 2021, p. 712).

Similarly, the CBD has designed a programme to address the biodiversity related challenges of the current agricultural system. This programme consists of four elements (see figure 4), which were the basis for international initiatives paired with action plans and frameworks. These initiatives (see figure 5) and the ecosystem approach are used by the CBD to support governments by improving the capacity of all kinds of stakeholders to work with agricultural biodiversity and to mainstream and integrate it into policy at all levels.

Such international programs are seen as a necessity since the challenge they address are not bound by state borders (Nukusheva et al., 2020). Governments have signed many self-enforcing international environmental agreements, especially over the past two decades (Azizi et al., 2019; Barrett, 1994; Sand & McGee, 2022). During the tenth Conference of the Parties of the CBD in 2010, the Nayoga Protocol was signed and a strategic biodiversity plan was presented. This plan, which held the 20 Aichi Targets that each addressed 1 of 5 strategic goals, was in place from 2011 until 2020 (CBD, 2011).

Figure 3. The Agrobiodiversity Index by Jones et al. (2021). Created by the author.



Research on the effectiveness, degree of implementation and use of monitoring methods on national, regional as well as local levels oftentimes points out that governments fail to meet the targets they signed for. This is shown by the Living Planet Index of the World Wide Fund for Nature (WWF) and Zoological Society of London (ZSL) (Almond et al., 2020). A similar conclusion was drawn in the report on "the state of the world's biodiversity for food and agriculture" published by the FAO (FAO, 2019). In the same year the FAO published a report with guidelines for decision-makers to achieve the Sustainable Development Goals by transforming food and agriculture (see Appendix A).

Figure 4. Four elements of the CBD programme of work on agricultural biodiversity, by Convention on Biological Diversity (n.d.). Created by the author.

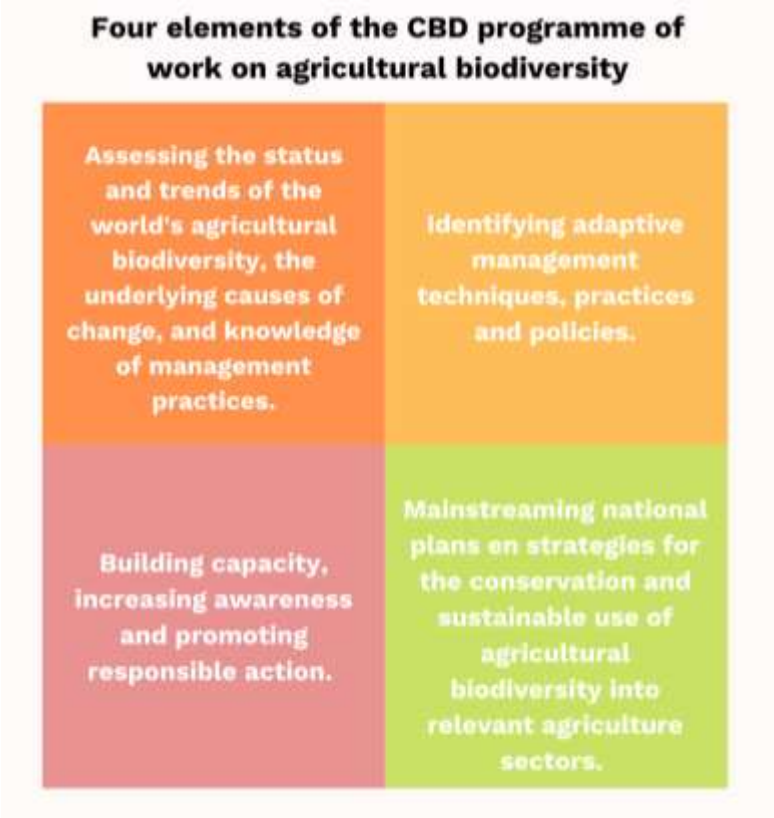


Figure 5. Three cross-cutting initiatives to address specific issues of agricultural biodiversity by Convention on Biological Diversity (n.d.). Created by the author.

IPES-Food and ETC Group are further examples of international organisations that contribute to the debate on how food systems can be transformed. They described four pathways and thirteen opportunities for a civil society-led food system transformation that reduces food related GHG-emissions by three quarters (IPES-Food & ETC Group, 2021; see table 5 of appendix B).

2.5 European policy

The European Commission (EC) also contributes to the debate by independent expert reports, like the one called "Towards a Sustainable Food System" (EC, 2020) that outlines four recommendations in the transition:

1. "Make environmental, social and economic sustainability the central objective of all policies relevant to food" (p. 31);
2. "Ensure a truly integrated approach to bring about a sustainable food system" (p. 32);
3. "Address power and information asymmetries in the food system" (p. 38);
4. "Combine regulatory, financial, behavioural, information, communication and education measure" (p. 41).

As introduced in chapter 1, the EC also introduced strategies on biodiversity conservation and restoration over several years. In 1979 the Birds Directive was introduced, in 1992 the Habitats Directive, in 2001 the Natura 2000-network and the EU Pollinator Initiative was introduced in 2018. The members of the European Parliament adopted the first Biodiversity Strategy in 2010, followed by a 2030 Biodiversity Strategy in 2020. More on these European policies in table 7, 8 and 0 of appendix B. Next to specific nature or biodiversity related policies, there are also specific strategies focused on agriculture, like the Farm to Fork strategy for a "fair, healthy and environmentally-friendly food system" (European Union, 2020, p. 1; More on this strategy in table 10 of appendix B, which is part of an overarching plan: the European Green Deal with as goal to be climate neutral in 2050 by reviewing existing law and introducing new legislation on several themes (including biodiversity and agriculture) (EC, 2019; See also figure 17 in appendix B). The EC also provides several sectors with subsidies. For the protection of nature areas that are part of the Nature-2000 network, there is the LIFE+-fund (EC, 2018b). On international level, the United Nations Framework Convention on Climate Change (in short: UNFCCC) provides also programs for the protection of nature. One example is REDD+, which is short for: Reducing Emissions from Deforestation and forest Degradation. The + stands for sustainable management of

forests, the role of conservation and forest carbon stocks in developing countries) (Caplow et al., 2011).

For agriculture, there is a so-called 'Common Agricultural Policy' (in short: CAP) in the European Union, that also provides policies and subsidies for the agricultural sector (EC, 2021d). The new legislation, called CAP 2023-27, was presented in the spring of 2021 and has been adopted end of 2021. The CAP starts at the beginning of 2023 and the EC states that it "paves the way for a fairer, greener and more performance-based CAP" (EC, 2021d). Even though it is presented as such, it received after the presentation critics as well. In a jointly media briefing of May 2021 BirdLife, ClientEarth, European Environmental Bureau and Greenpeace stated that the new CAP is a form of climate inaction, destruction of biodiversity, widespread pollution, a threat to our long-term food security and a fake performance and a free for all model (BirdLife et al., 2021). More on this critique and the 10 key objectives of the CAP 2023-27 in figure 18, table 11 and 12 of appendix B.

2.6 International policies in practice

Even though the growth of international plans and policies on protecting biodiversity and 'making agriculture greener and fairer' seems promising, the past learned that many international targets have not been met. One of the problems that is identified is the deficiency of measurement and assessment on a national level. International biodiversity agreements are often based upon self-reporting mechanism, that, even when the number of species is well monitored, it is often focused on certain places and species, which does not provide the full picture of the status. Especially in relation to food and agriculture, information is often limited to particular elements of agrobiodiversity, which does not correspond with the various steps in the process of the agriculture and food system that each need "different management actions and policy decisions" (FAO, 2019; Jones et al., 2021, p. 712).

In the translation of international targets into national, regional and local policies, there is often a lack of awareness and knowledge on the importance of biodiversity for food security and agricultural ecosystems. "Diverging interests among stakeholders hamper the development and implementation of laws, policies and regulations, as do shortages of human and financial resources" (FAO, 2019, p. 42). Xue (2015) identifies for China specifically the lack of coordination, communication and information sharing among ministeries to implement biodiversity measures that are agreed upon internationally.

Even though 80 percent of reporting countries in 2019 indicated that they are using more biodiversity-focused practices and approaches in the food production system, there are still ‘major challenges in scaling up such practices and promoting them through capacity development and strengthened policy frameworks’ (FAO, 2019, p. 41). This is due to the complexity of local ecosystems, biodiversity practices need to be made deployable for the specific context, have the tendency to be beneficial in the long term and require knowledge on ecosystems that have not been provided in learning processes in the modern agricultural and food system (FAO, 2019; Frison, 2018). Visseren-Hamakers et al. (2021) also note that there are “multiple legitimate ways of knowing, defining, valuing, and representing biodiversity, incorporating broader sets of information and indicators, including those that reflect non-Western worldviews on nature, well-being and prosperity” (p. 23). With the current focus on monitoring in the international targets, there is not a sufficient acknowledgement of - for example - land grabbing. The lack of system thinking results in a deficiency of the problems of the modern food system in relation to biodiversity (Fischer et al., 2017).

As a renewal of the Aichi Targets that were in place from 2011 until 2020, governments signed a ‘Leaders Pledge For Nature’ during the United Nations Summit on Biodiversity in September 2020 with the goal to reverse biodiversity loss by 2030 (Leaders Pledge For Nature, 2020). One of the commitments is the promotion of agroecology (Leaders Pledge For Nature, 2022). A big priority in the progress report of 2022 is the collective effort to secure “an ambitious, effective and transformational Global Biodiversity Framework, and its subsequent implementation, which commits society to being nature positive by 2030” (Leaders Pledge For Nature, 2022, p. 16).

Prime minster of the Netherlands, Mark Rutte, also signed the Leaders Pledge For Nature (2020), which did not lead to an update of the latest national Dutch policy of agriculture, which focuses on circular agriculture, with a small part on NIA, in which the regional elaboration on NIA is being encouraged (LNV, 2018, p. 25). Nature inclusive is a term that is used in several sectors in the Netherlands. The concept of ‘nature-inclusive construction’ is also being explored on a regional level (van Haaster-de Winter et al., 2020), in line with the regional explorations on NIA. The regional execution resulted in the action plan on NIA in Gelderland and a platform for NIA. It did not result yet in the implementation of certain policy measures (GNMF et al., 2019).

3. Theoretical framework

A lens of institutional stability and change will be used by employing the PAA (Arts et al., 2006). The positioning of actors and discourses will be further analysed by using elements of socio-technical transition theory, more specifically the MLP (Smith, et al., 2010; Markard et al., 2012). In this chapter, both theoretical debates and their interconnectedness will be further elaborated.

3.1 Policy Arrangement Approach (PAA)

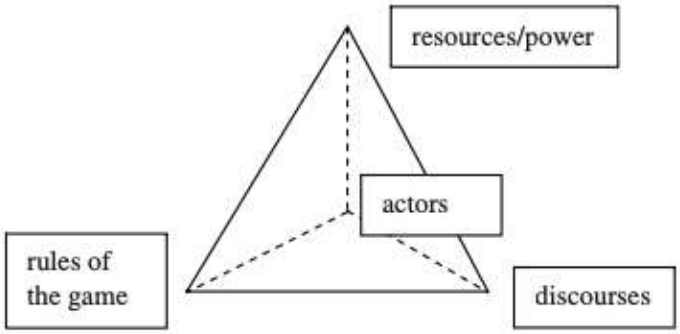
The PAA, firstly introduced by Arts, van Tatenhove & Leroy (2000), can be used to understand the relations and dynamics in policymaking processes by various actors. The approach stems from several institutional and sociological theories, one of them being Giddens' (1994) structuration theory, which states that structures and practices are connected. The PAA is part of the academic debate that tries to analyse and understand stability and change in institutional and policy processes (Leroy & Arts, 2006). The PAA can be seen, with its element of discourses, as part of the broader academic debates on discursive institutionalism. Another, older theory that is often being used to analyse changes in debates around sustainability and environmental policy is the discourse analysis, to which the PAA contributes in a less extensive way in one of the four elements of the approach. There are many frameworks, analysis and theories that tend to explain change and stability in policies and institutions, one example is the Multiple Streams Framework of Kingdon, he states that there are multiple streams, like a *problem stream* (feedback, focusing events, and so on), a *politics stream* (party ideology, national mood or the balance of interests) and a *policy stream* (including value acceptability, technical feasibility and so on). The policy stream enables *policy entrepreneurs* that need to have either access, resources or strategies to make use of the opportunity of *policy windows*, that occur not often and irregularly and can be used to realize policy change. Important for this Multiple Streams Framework is the interaction between agency and institutions (Herweg, Zohlnhöfer & Zahariadis, 2018).

The interaction and connection between social and political changes in society and changes in day-to-day practice of policy processes is especially important in the PAA (Arts et al., 2006). It is based on institutionalism, policy arrangements and political modernisation (Arts et al., 2006). These theoretical concepts are connected and will be further explained:

- The concept of institutionalisation "incorporates the development of structures, stabilisation and change: institutions, no matter how stable they appear at first sight, are subject to continual change and adjustment, deconstruction and reconstruction" (Arts et al., 2006, p. 96).). In a policy arrangement, quite solid problem definitions and offered solutions can appear when it comes to policy and discourse. When it comes to actor relations, this is the case for the division of tasks and fixed rules. Lastly, rules tend to determine the development of policy processes (Arts et al., 2006).
- PA's can be defined as the temporary stabilisation of the content and organisation of a particular policy domain or over several policy levels (Arts & van Tatenhove, 2004, p. 341; Arts et al., 2006, p. 96). The arrangements can be characterized as multi-level, dynamic and are continuously institutionalised. Continuing institutionalisation occurs as a consequence of the coaction between actors in the process of implementing policy and the occurrences of social and political transitions.
- Political modernisation can be interpreted as the "structural processes of social change and their impact on the political domain. As a consequence of all kinds of social, economic and political processes […], new relationships are coming into being between state, market and civil society, new power relationships between these subsystems, and different ideas and practices on steering and policy" (Arts et al., 2006, p. 97).

The PAA uses the PA as basis and focuses on four dimensions within this arrangement: actors, resources and power, rules (of the game) and discourses.These are interrelated and co-exist next to each other, which means that a particular order is not required and that if one of these dimensions change, the other dimensions will likely change as well (Liefferink, 2006). In a conceptualisation that summarizes the PAA, the four dimensions are visualised as part of a triangular pyramid (see figure 6).

Figure 6. PAA (Liefferink, 2006, p. 48).

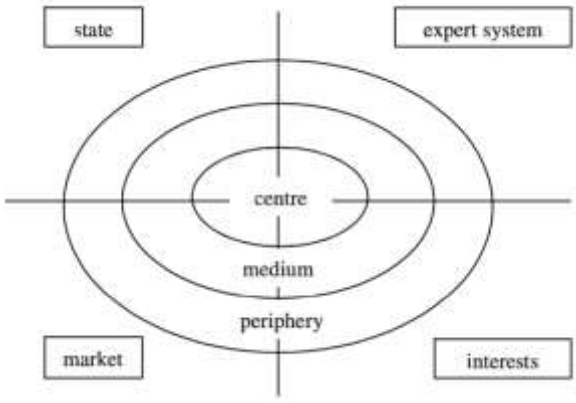


3.1.1 Actors

While many theories mainly focus on actors, their agency and coalitions, the PAA sees actors as only one part of the triangular pyramid of figure 6. Actors can be defined as "individuals […] who are […] capable of goal-oriented actions" (Marks, 1996). Other models, the PAA being amongst them, use a broader description of an actor, in which the actor can also be an organisation. In the PAA, actors are being seen as players in a PA and can be: national governments, (international) non-governmental organisations, companies and the European Union (van Tatenhove, Arts & Leroy, 2000). More than one actor can form a coalition on the basis of shared beliefs (Sabatier, 1998) or shared discourses (Hajer, 1993), or in the case of the PAA: "'narratives' prevailing in a given policy arrangement" (Liefferink, 2006, p. 52).

By doing an analysis of the PAA, starting from the actor point-of-view, it is useful to do a network analysis and to map the actors in comparison to each other. This comparison can be done by using the state, expert system, market and interests as important characteristics of the relative position in a PA of the actors and their coalitions (see figure 7). An actor or coalition can also take a leadership role, a so-called *"*policy entrepreneur*"* (Mintrom & Norman, 2009). In the PA(s) this role would be displayed by for example: the introduction of objectives, setting out a policy direction or the input of funding(s) (van Tatenhove, Arts & Leroy, 2000).

Figure 7. A map of actors and the relative positions in a PA (Liefferink, 2006, p. 52).



3.1.2 Rules of the game

Another part of the triangular pyramid consists of the formal and informal rules and regulations that are present in the policy domain. By starting the analysis from a rules-of-the-game-perspective, the accentuate is on how PAs are being affected by institutional change. Rules of the game set the boundaries in the so-called political culture, in which actors can

influence the policies at stake (Giddens, 1984; Ostrom, 1999), the rules can also enable actors to let their voice be heard more (Giddens, 1984; Liefferink, 2006). Rules are often connected to resources and power, considering the establishment, modification and rejection of rules. Besides, rules are also being formulated through underlying discourses, often characterized by the conception of governance, "the relationships between and the share of responsibility of state, market and civil society*"* (Liefferink, 2006, p. 56). In the PAA, analysing the rules of the game gives the opportunity of (predicting and) evaluating the (expected) result of (new) rules (Liefferink, 2006).

3.1.3 Resources and power

The division of resources, like money, facilities, authority, political legitimacy, information and knowledge that play a role in the PA, is combined with distributed power (Liefferink, 2006). While power can be used to demand resources (Burns, 2000), the mobilisation of resources can also be used to be in control in a PA, mostly being seen as having more authority resources (Robbins et al., 2014). Just like the other four elements in the arrangement, resources are subject to change. Resource and power distribution can be analysed using the policy network analysis (Rhodes, 2006). The bottom line of this network approach is the notion that actors are to a certain extent dependent on each other for the possession and management of resources (Gunton, 2015; Sandström & Widmark, 2007). By identifying the power relations between actors in the form of resource dependencies, 'resource coalitions' can be determined. These resource coalitions are, in their functioning, also being influenced by the level of authority of the individual actors (Meijers & Stead, 2004). For the analysis, it is important to determine which resources are available in the PA and which actors are capable of the mobilisation of these resources (Buizer, 2008; Wiering & Arts, 2006). Even though resources can be used to make changes and to determine the outcome in a PA, it can also be seen as a goal to collect more resources to improve the position of the actors or coalition in the PA (Liefferink, 2006). The distribution of resources and power is (closely) linked to the rules of the game, as it is determined by these formal and informal rules and vice versa. The last domain, discourses, can be deployed to gain the resource of political legitimacy (Steffek, 2009). The other way around, it is also possible to have the power to introduce new narratives or change them, which is called discursive power (Liefferink, 2006; Fuchs & Kalfagianni, 2009). The resource domain of the PAA enables the researcher to measure the impact of a certain (policy) intervention, a predominant discourse or new discourse on resources and the distribution of power (Liefferink, 2006).

3.1.4 Discourses

The last dimension the PAA consists of discourses. Discourses are defined as *"*the views and narratives of the actors involved (norms, values, definitions of problems and approaches to solutions)" (Liefferink, 2006, p. 47). In the PAA, two different levels of discourses are being distinguished. The first level being the preferred relationship between state, market and civil society, in other words the 'mode of governance' (Liefferink, 2006). The second level focuses on the definitions and linked characteristics of the problem, the roots and causes of this problem and the desirable solutions (van Tatenhove, 2017). Such discourses determine the position someone occupies in the debate and what strategies the person adheres to in the PA (Liefferink, 2006). According to Hermwille (2015), certain discourses accelerate "a particular framing of a system and its dynamics and suggest particular ways in which these should develop or transform to bring about a particular set of outcomes" (p. 10). As stated before, through the shared discourses, often specifically on both levels, coalitions may emerge. In a PA, there are often dominant discourses and so-called alternative discourses (van Tatenhove, 2017). It is possible that the alternative discourse eventually replaces the dominant one, but the dynamic is already present through the interaction of the various discourses in the PA (Arts, van Tatenhove & Leroy, 2000). This interaction can influence the rules of the game, the resources and their distribution, the division of power and the actors in the PA. There are two different research paths to take when starting from a discourse point in the PAA analysis. By focusing on the first level, the preferred way of governance, it is possible to analyse the effects of political modernisation (Arts & van Tatenhove, 2006). Studying the second level of discourses, the problem definition, causes and solutions, gives insights into the relation of practices and structures of the PA in terms of language. Analysing both will capture conflicting ideas on a practice and a structure level, and provides a wider picture (Liefferink, 2006).

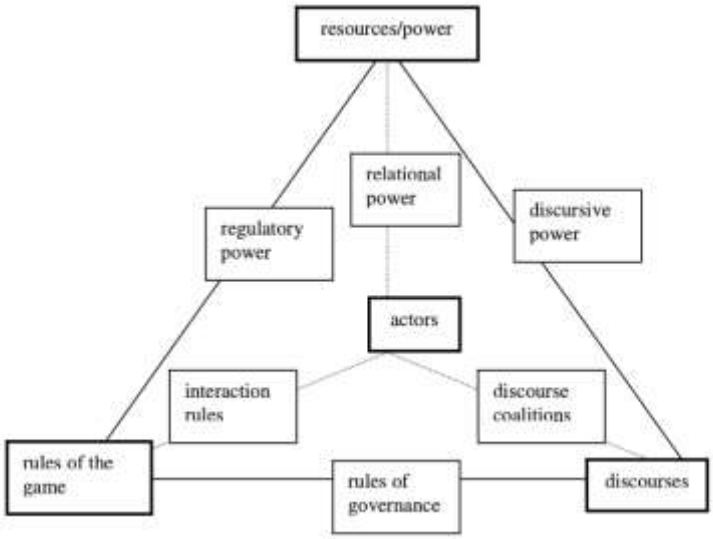
Various academic perspectives have emerged on discourse, like the frame analysis and post-structuralism (Howarth, 2000). Somorin et al. (2012) have developed a theoretical framework that uses both. Post-structuralism is "strong on 'structure' (language as a structured system that shapes the thoughts, speech acts, behaviour and practices of people)" (Somorin et al., 2012, p. 289). The frame analysis is "strong on 'agency' (human beings who name and frame the world around them in a particular way)". Raitio (2008) states that some would argue that frames can be seen as social constructions, and others would argue that frames are the cognitive structures of someone's memory. Frames exist for two main functions: firstly, they help actors understand their experiences (what is happening, what are

the boundaries, what counts as an event, and so on). Second, frames push actors in a certain way of deciding or of a behavioural response (Perri, 2005). However, framing does not take place in a closed societal bubble, frames "are influenced by and nested in wider overarching discourses, including global ones. Therefore, we need the [post structural] perspective too, in order to have a full 'discursive picture' of policy responses" (Somorin et al., 2012, p. 290).

3.1.5 Concluding remarks on PAA

As shortly described in the four domains, there are many analytical possibilities of the four dimensions, dependent from which angle the research starts and on which connections one focuses (see figure 8). In order to capture the interrelatedness, it is important to use all domains in the research (Liefferink, 2006).

Figure 8. The analytical possibilities of the four dimensions (Liefferink, 2006, p. 60).



Changes in a PA will occur when there is internal or external incongruence (Boonstra, 2004). Internal incongruence takes place when the dimensions differ from each other. External incongruence occurs when the wider societal and political environment differ from the PA (Wiering et al., 2017).

Because of the research on the interrelatedness of the characteristics of one domain on the other dimensions, an overview of ideal types of PAs has been created (see table 1, Liefferink 2006). For this research, there was no aim to identify to which or more ideal typologies the PA of NIF belongs.

Table 1. Basic, ideal typology of PAs (Liefferink, 2006, p. 62)

Characteristic / Ideal type	Access (number of actors in inner circle)	Control over major resources	Prevailing rule of interaction	General character of substantive discourses
Etatism	low	state	instrumentality	imposed
Liberal-pluralism	high	spread	competition	conflicting
Neo-corporatism	limited	shared	negotiation	agreed
Sub-politics	specific	non-state actors	solidarity	challenging

As was earlier, changes in actors, rules of the game, resources and power or discourses and the institutionalisation of PA do not only emerge from the (inter)actions of actors involved in the practices of the policy domain, *"*but are also influenced by structural processes of social and political change, in other words: by political modernisation*"* (Arts, Leroy & Tatenhove, 2006, p. 101). The PAA's acknowledgement of the relation between the and the influence structural changes and policy dynamics have on each other are important in this research. To connect the PAA to the wider changes in society, elements of the MLP will be used to facilitate a broader perspective regarding the role of actors and discourses.

3.2 The Multi-Level Perspective

Melchior & Newig (2021) state that agriculture is an important threat and driver of a (more) sustainable world and is therefore often researched through transition, transformations and transformative change frameworks, one of them being the MLP:

> Agricultural systems typically have co-evolved with other societal structures, like retailers, land management, technology (for example: precision farming), consumer habit (for example: meat consumption) and environmental and agricultural law such as the European Union Common Agricultural Policy. Agricultural systems can therefore well be described as socio-technical regimes in the sense of the 'sustainability transitions' literature (Melchior & Newig, 2021, p. 2).

The MLP is one of the theories that can be used to identify fundamental changes and distinguishes three levels of structure (see figure 9):

- The landscape consists of slow changing structures that are deeply embedded in society, like culture, societal values and the prevailing economic paradigms. The changing structures of the landscape are able to put pressure on the existing regime (Geels, 2002; Smith & Raven, 2012);
- The regime consists of the prevailing socio-technical systems which service the needs of society including the consumption, production, digital communications and transport systems. The regime consists of various dimensions: markets, industry, policy, culture, science and technology. These dimensions are stable, but are also in itself dynamic, since several dynamic processes are taking place within these dimensions (Geels, 2002; Smith & Raven, 2012);
- The niche is the protective space in which innovations emerge and develop (Geels, 2002; Smith & Raven, 2012). The niche consists of two levels: the project level and the global level (Geels & Raven, 2006). The project level consists of associated innovations that are each grounded in a specific local context. The global level can be seen as "a network of intermediaries and advocates promote social networking, social learning and mobilises resources across the local level" (Martin, 2016, p. 150).

It can be argued that NIF is a niche in the fruit cultivation and that the MLP can be used to distinguish several dimensions and levels of society that enable an understanding of the transition to a sustainable form of fruit cultivation (Martin, 2016; van der Windt & Swart, 2018). The MLP has been used in the agroecological transition in Nicaragua (Schiller et al., 2020).

In this research, a limited theory of the MLP has been used, to elaborate on the role of actors and discourses in the PAA. The MLP is not being used to outline a sector wide transition, but to broaden the understanding of certain elements in the PA.

3.2.1 MLP and discourse

Discourses are a common element in the PAA and the MLP (Geels, 2014; Hermwille, 2015; Smith & Raven, 2012). "Within the MLP, discourse gives meaning to, and is embedded within the practices of, the social and technical structures that constitute the niche and the regime; in turn shaping the dynamics of regime reproduction and niche innovation" (Martin, 2016, p. 150). Discourses are one of the factors that determine the occurrence of the transition and if it does, the pace of the upscaling of the niche that is surrounded with these discourses (Ampe et al, 2020; Komendantova & Neumueller, 2020). Berg and Hukkinen (2011) also

state that innovations that try to enable a transition are often surrounded by complex discourses and contradictory framings. . The concept of framing is well established in social movement theory (Snow & Benford, 1988; Snow, et al., 1986). Martin (2016) uses this concept to address the role of discourse in the MLP (see figure 10). On the one hand, discourses can be used to support a change in the regime. On the other hand, discourses can be used to prevent changes in the regime (as showed in figure 10). Actors in niches and regimes contribute to discourses that are able to accelerate "a particular framing of a system and its dynamics and suggest particular ways in which these should develop or transform to bring about a particular set of outcomes" (Hermwille, 2015, p. 10). Frames can be used to change overarching discourses.

Figure 9. MLP on transitions (revised version of Geels, 2002, p. 1263 by Geels, 2019, p. 191).

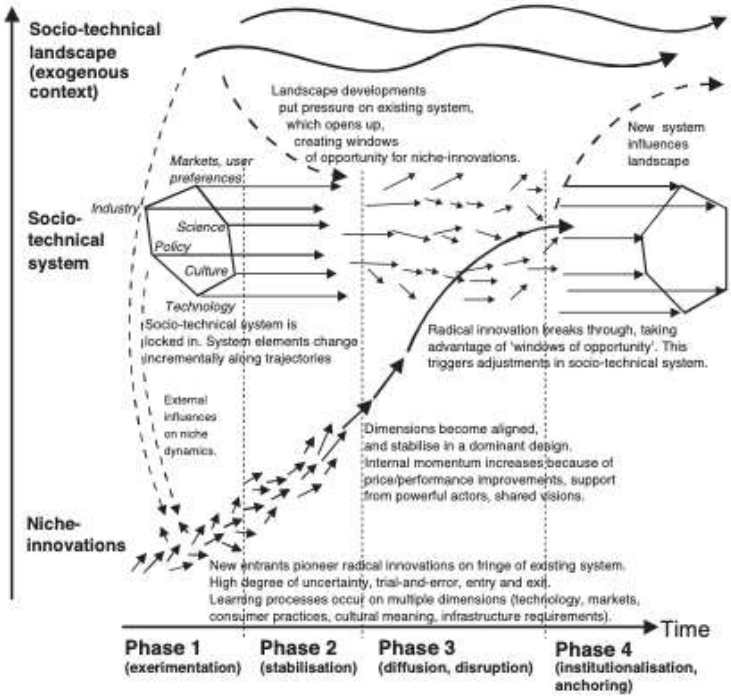
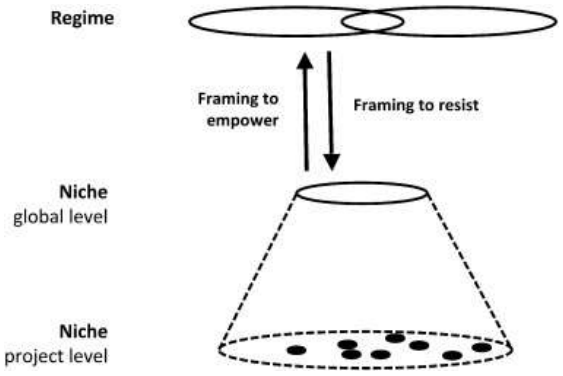


Figure 10. The framing of niche innovations with the MLP (Martin, 2016, p. 151).



3.2.2 MLP and actors

The MLP distinguishes actors that are part of the niche and actors that are part of the regime. Niche actors are organisations and individuals that are proposing or, and working on innovation, in contrast to regime actors that enforce the established mindset and work within the existing rules and system (Fischer & Newig, 2016; Geels, 2014). By distinguishing actors in existing systems and more innovative pathways beforehand, the researcher is challenged to be aware of where the actors are coming from. This adds to the PAA, since the PAA only distinguishes public and private actors, without placing them in broader transitions and structures.

3.2.3 Concluding remarks on MLP

Like other transition theories, the MLP has been criticized for the lack of agency in the framework and the missing elaboration on power relationships within the various levels (Pesch, 2015). The MLP has also been criticized for being apolitical and not open to multiple transition pathways (Greenwood & Levin, 2007; Haas, 2019). Nevertheless, the MLP has been used on many occasions to understand the process of transitions in terms of interactions between the multi-level socio-technical structure which constitute society (Smith et al. 2010). This research is focused on the development of the PA of NIF, which is possibly in line with a transition of the agricultural and food system. Due to the PA being the central focus of the research aim and question, the MLP has only been used for the element of discourse and to distinguish various actors, and not to research a transition within the agricultural and food system.

3.3 Conceptual framework

3.3.1 Operationalisation

Now that the definitions of the concepts central to the research have been formulated, the next step towards operationalization is to create an overview of how the theoretical constructs can be applied in the real world, in terms of variables that can be measured, and to identify a scale of measurement (van Thiel, 2014).

In operationalizing the PAA, Wiering & Arts (2006) distinguished several change indicators for the four dimensions, which they have categorized as substance or organisational aspects. Discourses and (some) rules can be categorized as substantive aspects,

while (some) rules, actors and resources are categorized as organizational aspects. The change indicators will be measured through qualitative methods, on an ordinal scale (Van Thiel, 2014) since the results of the analysis can be ordered by the degree to which they differ.

Figure 11. Operationalisation of the PAA (Wiering & Arts, 2006, p. 328).

Concept	Aspects	Dimensions	Change indicators
Policy arrangement	Substance	Discourses	Change in:
			*Paradigms
			*Utopias
			*Policy programmes
		Rules[a]	*Legislation
	Organisation	Actors	*Procedures
			*Political culture
			*Actor constellation
			*Interaction patterns
			*Coalitions and oppositions
		Resources	*Resource constellation
			*Power relations
			*Political influence

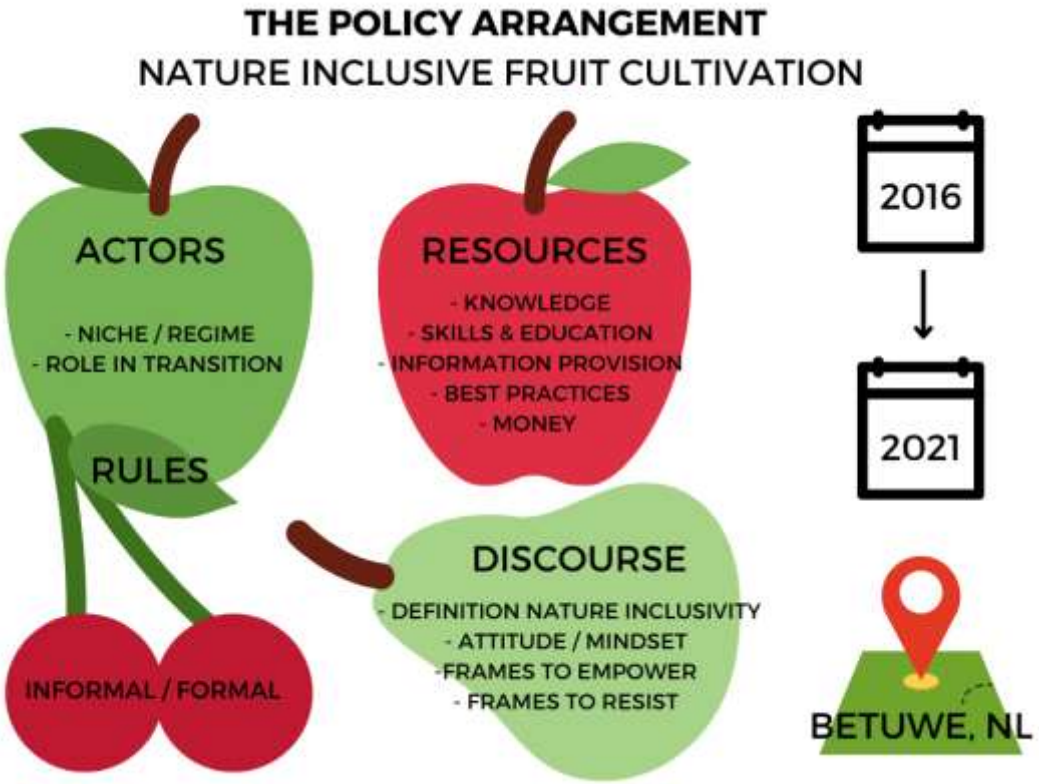
[a]Rules can be both substantive and organisational in nature.

3.3.2 Conceptual framework

The conceptual framework is the *"*structure for organising and supporting ideas; a mechanism for systematically arranging abstractions; sometimes revolutionary or original, and usually rigid*"* (Weaver-Hart, 1988, p. 11). As can be seen in the conceptual framework for this research (see figure 12), the main focus will be on the PAA in combination with a few elements of the MLP. The analysis of the PA (from 2016 until 2021) will be done by starting from the actors-side, to provide an overview of who is involved in the PA and who uses the discourses, resources and rules. For this analysis, the elements of niche and regime actors of the MLP will be used since it provides broader ways to categorize and analyse the actors. When analysing the discourses, the framing to empower and framing to resist of the MLP will be taken into account as well, to categorise the frames that are being used and what it can possibly mean for changes in the PA. The frames may support a change in the PA and what will withstand a change in the PA. For the research, the decision has been made to focus on the changes in the PA, rather than the changes in the landscape of the MLP. Since the four dimensions (actors, resources and power, rules and discourse) seemed very interesting in the beginning of the research, while knowing that there was a new action plan (that can be seen as an introduction of a policy direction) and a new actor (the Fruitmotor), the researcher choose for the PAA as main theory. In the PAA, it is easier to identify where change starts (in which

dimension) and how it spreads through the PA. In the MLP, it always seems to start with an innovation of a niche actor. The subject of this research is not about a new technology, but possibly more a change in the form of a mindset. The research aims to describe the development of the PA over the past five years, due to those possible drivers of change or stability.

Figure 12. The conceptual framework of the research. Created by the author.



4. Methodology

4.1 Research strategy

For the research, a literature overview and policy context has been made, followed by the creation of the theoretical framework and the conceptual model. After the construction of the research proposal, an intensive stakeholder mapping has been done, and the data collection phase existed of 17 semi-structured interviews with experts and various types of actors involved in NIF in the Betuwe region. After the data collection phase, the data of the semi-structured interviews and the platforms and documents have been analysed, while in the meantime the master thesis was written. After analyzing the data, the research question was answered. As became clear from the choice of the collection of data, a qualitative research strategy was used. The nature of the desired knowledge to answer the research question asks for a qualitative method. The research has a case study design.

4.2 Research methods, data collection and data analysis

The research methods that have been used is a content analysis, combined with the analysis of semi-structured interviews. The content analysis will be used to interpret the content of certain documents, platforms (on websites) and articles (van Thiel, 2014), that are, to certain degrees, important in the fruit cultivation sector. The following platforms and documents have been analysed:

- Actieplan Natuurinclusieve Landbouw Gelderland (in English: Plan of Action NIA; GNMF et al., 2019);
- Brochure Fruit Tech Campus (Fruit Tech Campus, 2020);
- Platform FRUITVOORUIT.NL (in English: Platform Fruit-Ahead; Platform Fruitvooruit.nl, n.d.);
- Platform Natuurinclusieve landbouw Gelderland (in English: Platform NIA Gelderland; Platform Natuurinclusieve Landbouw Gelderland, n.d.);
- Realisatieplan Visie LNV: Op weg met nieuw perspectief (in English: Plan of realization vision Agriculture, Nature and Foodquality: On the way with new perspective; LNV, 2019).
- Rijksnatuurvisie 2014: Natuurlijk verder (In English: National Nature Vision 2014: Continuing naturally; EZ, 2014);

- Visie Landbouw, Natuur en Voedsel: Waardevol en verbonden (in English: Vision Agriculture, Nature and Food: Valuable and connected; LNV, 2018).

The 17 interviews (overview in table 2) that have been conducted for this research, have been recorded, then transcribed and last, processed by coding the interview through the Atlas.ti program. The documents and platforms have also been coded through Atlas.ti using the following codes:

- Actors: old: own description;
- Actors: old: description by others;
- Actors: new: own description / description by others;
- Actors: role in transition;
- Power distribution: change;
- Power distribution: stability;
- Resources: knowledge;
- Resources: skills and education;
- Resources: best practices;
- Resources: information provision;
- Resources: money;
- Rules: informal;
- Rules: formal;
- Discourse: defining nature inclusivity;
- Discourse: attitude/mindset;
- Discourse: frames to resist;
- Discourse: frames to empower.

Table 2. Overview of interview for master thesis research.

No.	**Organisation / Individual**	**Date, duration**	**Location**	**IG***
1.	Centrale Adviesdienst Fruitteelt	28/05/2021, 43:12	Online, through Zoom	B
2.	Expert NIA: Hens Runhaar	03/06/2021, 31:38	Online, through Zoom	D
3.	Fruit farmer 1	25/05/2021, 41:50	At their fruit plot	A
4.	Fruit farmer 2 / NFO	27/05/2021, 42:00	At their fruit plot	A
5.	Fruit farmer 3	07/06/2021, 54:55	At their fruit plot	A
6.	FruitMasters B.V.	16/06/2021, 43:53	Online, through Zoom	B

7.	Fruitmotor / PhD circular business models in transition studies at the RU: Hilde Engels	28/05/2021, 49:44	Online, through Zoom	B/D
8.	Fruitmotor / Dienst Landbouwkundig Onderzoek (in English: Service Agricultural Research) at the WUR: Henri Holster	26/05/2021, 1:19:41	Online, through Zoom	B/D
9.	Municipality of Zaltbommel	25/05/2021, 34:25	Online, through Zoom	C
10.	Natuur & Milieu Gelderland / Platform Natuurinclusieve Landbouw Gelderland	25/05/2021, 54:16	Online, through Zoom	B
11.	Province of Gelderland: Lydia Dik	11/06/2021, 39:26	Online, through Zoom	C
12.	Province of Gelderland: John Rocks	17/06/2021, 36:06	Online, through Zoom	C
13.	Rabobank West-Betuwe	27/05/2021, 55:05	Online, through Zoom	C
14.	Senior field researcher and Project Manager Sustainable Agriculture: Pieter de Wolf	25/05/2021, 1:04:36	Online, through Skype	D
15.	Stichting Doornik Natuurakkers	18/05/2021, 1:02:27	Bemmel	A
16.	Vereniging Agrarisch Natuur- en Landschapsbeheer Tieler en Culemborger Waarden	03/06/2021, 35:30	Online, through Zoom	B
17.	Waterschap Rivierenland	03/06/2021, 44:50	Online, through Zoom	C

** = IG: Interview guide (included in appendix B).*

The various interview guides that have been used for this research are included in Appendix C. With a variation referred to as A to D (A= Fruit farmers; B= Interest groups / Companies (purchasers); C= Governmental organisations / Financial institutions; D= Experts). The interview guides gave direction but were not strictly followed during the interviews. The interviews were conducted in collaboration with a fellow master student, whose line of questioning focused on a different research problem. However, all resulting data were used and analysed for this research.

4.3 Research philosophy

The research philosophy can be defined as questioning the bias of the researcher (Moon & Blackman, 2014). The research philosophy focuses on the way the researchers perceives the world and how it will be studied, it informs the design, conduct, analysis and interpretation of

the research (Moses & Knutsen, 2012). The research paradigm is a set of agreements, assumptions and beliefs the researcher brings to the research (Guba & Lincoln, 1994). There are 4 overarching components: ontology, epistemology, axiology and methodology.

The ontological position regards the approach to the nature of reality. A research can be conducted from the belief that only one reality exists or that multiple realities exists. These beliefs are called realism and relativism respectively. This research operates from a relativist position. Each participant of the research reports on their own experienced reality, and realities of various actors with different viewpoints can very much differ from each other.

The epistemology position depends on what counts as knowledge and how researchers can understand reality. Objectivism is based on the principle that knowledge is out there to be discovered. There is one single objective truth, whereas constructivism argues that people construct knowledge, based on their experiences, perceptions and interactions with the world (Bryman, 2012). Another position is subjectivism, which states that there is no single objective truth, but that knowledge is socially constructed. Knowledge is what society considers to be knowledge.

In this research, a constructivist approach has been used, since the interviewees seem to construct their knowledge on their own perspective. In line with the constructivist approach is interpretivism that answers the question of methodology how we can collect the acquire knowledge. The research aim of this research is to understand the changes and stability in a PA, which will not result in one single truth, since it is open for interpretation, for the interviewees as well as the interviewer.

Axiology is derived from the Greek word ‘axios’, which means ‘value’. Multiple types of values can be identified: social, political, moral and ethical values. People use their own judgement on value to decide what is right and wrong, but also, in academia, to decide on what is worth researching (Biddle & Schafft, 2014). It focuses on the question: Should there be research to simply understand or should the goal change society for the better and if the latter is being used, what can be considered as better (Aliyu et al., 2015; Killam, 2013). In this research, the goal of the research is to implement the results to change society for the better, in this case to help accelerate the shift to a more sustainable fruit cultivation system as part of mitigating the extensive negative environmental and social impacts of the current food system.

4.4 Validity and reliability of the research

Although validity and reliability are not as clear cut where qualitative data are concerned, measures can be taken to ensure the validity and reliability of a study of qualitative nature. Validity needs to be addressed in order to ensure that the findings of the research represent the real world, and that the research measures what was intended to be measured (Thiel, 2014). To that end, the choices, interpretations and conclusions in the process of this research were extensively noted down, described and explained. Furthermore, triangulation will be used as a strategy to enhance the validity.

Reliability is the repeatability of research (Bryman, 2012). If the same study is repeated, either by the same researcher or another, does it result in the same findings? The method of interviewing is difficult for the reliability, because of the consistency and objective of interviews. Therefore, it is important to elaborate on all decisions made (Denscombe, 2003).

5. Results

The 4 elements in the PAA are connected and interdependent, as was mentioned in earlier chapters. One can hardly describe one without touching on another. Nevertheless, the results chapter is broadly structured to respectively elaborate on the actors, resources and power, rules and discourses in the fruit cultivation sector in the Betuwe. The transition theory of the MLP is woven into the paragraphs through certain elements, like the distinction between regime and niche actors, the divergence of the frames to empower and the discourse use to resist the transition. The concepts of lock-ins, barriers and facilitators are used in the paragraph on resources and power, rules and discourse. Each element ends with concluding remarks. The general conclusion of the research will follow in chapter 7.

5.1 Actors

Various actors are involved in the fruit cultivation sector in the Betuwe. These actors may have played various roles in the last five years and may play roles in the transition towards nature inclusivity as well. A distinction is made between niche and regime actors. The actors are further categorized according to the different supply chain parties and other relevant parties for fruit cultivation in the Betuwe (see figure 13). Actors in the supply chain are farmers, supermarkets, cooperatives, and auctions, amongst others.

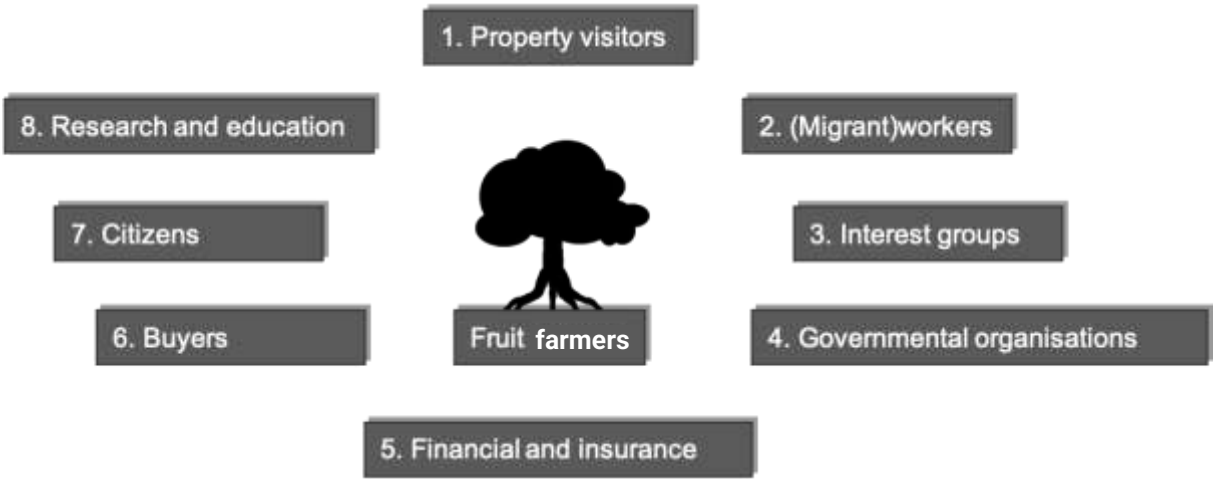
Central in fruit cultivation are fruit farmers. One of the other relevant parties in the fruit sector are the so-called ‘erfbetreders’ (in English: property visitors) in the form of representatives of companies for input, advisory organisations and inspection services. A second category consists of the (migrant)workers in the orchard. A third category is characterized by interest groups. A fourth category consists of governmental organisations. Financial and insurance organisations belong to a fifth category. A sixth category includes buyers as: auctions, cooperatives, processing companies and retail organisations, which resell the products in the original form or in a new product. The seventh category represents citizens, who have a dual role in the form of consumers within the production chain as well (Berglund & Matti, 2006). The last category is on research and education. It is possible that an actor takes on various roles and belongs to multiple categories.

Over the past years, the landscape of actors has changed. A decline in the amount of fruit farmers has continued over the past five years. If a fruit farmer quits, the neighbour takes over the land, which increases the scale of their business (Interview 1). For some fruit farmers

with big parcels, the variety of work activities changed as well, they often include stickering and packaging to be able to directly supply supermarkets (Interview 12). According to a representative of one of the property visitors: Centrale Adviesdienst Fruitteelt (CAF), which is a private consultancy agency for fruit farmers, there seems to be an upcoming interest of young fruit farmers due to the recent profitable years and the start of the Fruit Tech Campus, which tries to attract young fruit farmers (Interview 1). The traditional construction of auctions seems to have been replaced by contracts through for example FruitMasters with retail and fruit farmers (Interview 12). The Fruitmotor started in 2016 and has grown over the past years in employees and impact (Interview 7 & 16).

An overview of these actors and their descriptions can be found in Appendix D. The following paragraphs will focus on the collaboration of these actors and their respective roles.

Figure 13. Categories of actors in fruit cultivation. Created by the author.



5.1.1 Collaboration of the actors

Through the interviews and the document analysis, it became clear that the focus of the actors shifted more to collaborating with each other during the last five years, the actors from the Fruitmotor used, separate from each other, the same quote: "Alone you go faster, together you get further," (Interview 7 & 8). Also, the interviewees from Natuur & Milieu mentioned the word "together" in their interview 25 times (Interview 10).

The "Plan of Action NIA" (2018) and the "Platform NIA Gelderland" (2021) are practical realisations of many months of preparation through deliberation in the form of working groups and writing sessions. In the platform, 19 organisations are involved "that have the ambition together to motivate farmers in Gelderland to start nature inclusive working methods" (Interview 10; Platform NIL Gelderland, n.d.). The Plan of Action is also a

collaboration between many actors from the several categories (see table 3 for an overview of which actors are involved). Their goal is to "motivate all agriculture companies in Gelderland to work nature inclusive in 2027" (GNMF, et al., 2019). The actors "feel jointly responsible for the goals and commit themselves with appropriate roles" (GNMF, et al., 2019). In line with the theory of the PAA, the actors behave like policy entrepreneurs in writing this plan, they try to set out a policy direction and introduce objectives that are collectively found important.

Table 3. Actors that collaborated on the action plan or are a partner of the platform 'NIA Gelderland' (Interview 8 & 10; GNMF et al., 2019; Platform NIL Gelderland, n.d.). More information relevant for the Betuwe case study can be found in appendix D.

		Partner in…	
Name actor	Category	Action plan	Platform
GNMF	Interest groups		
LTO Noord	Interest groups		
Vereniging Agrarisch Landschap Achterhoek (VALA)	Interest groups		
De Marke (Agro- Innovatiecentrum)	Research and education		
Natuurmonumenten	Interest groups		
Collectief Rivierenland Agrarisch Natuurbeheer	Interest groups		
De Fruitmotor	Buyers & interest groups		
Coöperatief Agrarisch Natuur Collectief Veluwe	Interest groups		
Waardevol Cultuurlandschap Winterswijk	Interest groups		
Graan Geluk	Buyers		
Doornik Natuurakkers	(Fruit) farmer & interest groups		
Heideboerderij Veluwezoom	(Fruit) farmers & interest groups		
Geldersch Landschap & Kasteelen	Interest groups		
Gelders Particulier Grondbezit	Interest groups		
IVN Gelderland	Interest groups		
Staatsbosbeheer	Interest groups		
Stichting Landschapsbeheer Gelderland	Interest groups		
Gemeente Ede	Governmental organisations		
Gemeente Brummen	Governmental organisations		
Provincie Gelderland	Governmental organisations		

Gelders Agrarisch Jongeren Kontact	Interest groups		

The Action Plan states that these nature inclusive measures should be taken, since agriculture, as well as fruit cultivation deals with several problems. Fruit cultivation specific deals mainly with a high input model of 'crop protection products' and 'pesticides. Even though the use of pesticides is less than 30 years ago ("when everything was 'dead' in the orchard": Interview 2), the high input of pesticides still results in soil degradation, (water) pollution and biodiversity loss (Interview 8). Wild pollinators have declined over the past decades, while these pollinators are very important in fruit cultivation (Interview 3, 7 & 8). The presence of fertilizer is less compared to other agricultural sectors, so the current nitrogen crisis does rather have an influence on the image of farmers than their day-to-day practices (Interview 3). The pressure to deliver fruit that fits the aesthetic norm, as well as the price dependency on the supply of the world market are named as important problems of fruit cultivation (Interview 2, 3, 4 & 8). The changing climate and different weather conditions result in a higher demand for water, also in the Betuwe, which is an area between two main rivers. This is also experienced as a current problem in the fruit cultivation sector (Interview 2 & 8).

The actors actively choose to use the term nature inclusive and shifted away from terms like organic agriculture and fruit cultivation. This is mainly connected to the use of the term nature inclusive in the policy document of the Dutch agricultural ministry (LNV, 2018). Organic fruit cultivation is seen as another type of farming and not the same as nature inclusivity (more on this in the chapter on discourse, 5.4). Organic fruit cultivation is only 3-4% of fruit cultivation in the Betuwe (Interview 8).

The combination of agriculture ánd nature interest groups in this collaboration, makes the action plan and platform more interesting to finance for actors like the province (Interview 10). The broad collaboration also connects several networks with each other (GNMF, et al., 2019).

The involvement of nature organisations in the collaboration can also raise doubts among some actors, like the representative of the Rabobank West-Betuwe, even though the collaboration with Natuur & Milieu in this case is not known by this actor (Interview 13). The broadly supported vision among the interviewed actors, is that collaborating is needed for a positive change (Interview 3, 6, 7, 8, 10 & 11). It is called a form of "leadership" to stand up for collaboration with organisations that are not alike to your own organisation with the risk of being less liked by your "members" (Interview 14). Empathy and the skill to reason from the other person are needed in the collaboration with such a variety of actors (Interview 15).

FruitMasters, the biggest fruit cooperative and auction of the Netherlands, accentuates the importance that nature inclusive principles are widely supported and told by actors from the regime (Interview 6), Natuur & Milieu (in English: Nature & Environment) also underlines the power of various actors in the collaboration for the platform nature inclusive, since some actors are more likely to engage in a dialogue with each other than others (Interview 10).

Within this collaboration, there is a focus on storytelling, actors as the Fruitmotor and the platform Fruitvooruit work on the image of fruit cultivation to connect farmers with consumers (Interview 4, 6, 7, 8 & 9; Platform Fruitvooruit.nl, n.d.). The importance of the image has increased over the years, since the action of Greenpeace about the pesticides involved in fruit cultivation in 2016 (Interview 6; Greenpeace, 2016) and the focus on the nitrogen crisis, starting in 2018 (Interview 3). Though fruit cultivation is not a big contributor to the nitrogen crisis, both developments can be seen as changes in the structure that influences the relations within the PA.

The collaboration is visible in education as well, especially with the establishment of the Fruit Tech Campus. Even though the focus is mostly on innovation and technique, a collaboration with the Fruitmotor resulted in the integration of nature inclusivity in one of the courses (Interview 6).

There is also a demand from fruit farmers and other organisations to increase collaboration, especially within the production chain and other influential organisations to this chain, like financial institutions, retail organisations, nongovernmental organisations and the government (Interview 4, 6 & 7).

There is also still room for improvement in the collaboration, many research that is done by retail does not appear in trade magazines (Interview 13). There is a general vision of interviewed actors that it is difficult to collaborate with retail organisations on issues like nature inclusivity (Interview 5, 7, 9, 10, 15 & 17). On the other hand, the LNV notes a trend of “supermarkets seeking a collaboration with farmers, horticulturists and manufacturers” (2019, p. 31). Some actors, like the “Waterschappen Rivierenland” (the governmental water authority), is also working on nature inclusivity, but is scarcely involved in the collaboration so far (Interview 7).

5.1.2 Niche actors

The Fruitmotor can be seen as a niche actor in fruit cultivation in the Betuwe. While many other actors are part of the current system of efficiency, the Fruitmotor introduced a product

that values fruit that fails the to meet retail appearance standards. They buy it from farmers and produce cider with it. Instead of investing the revenue in the old system of efficiency and intensive farming, the revenue goes into measures to increase the biodiversity on the fruit plots (Interview 7). The Fruitmotor profiles itself in this "aanjaagrol" (in English: boost role) and tries to connect actors through knowledge sharing networks (like Natuurinclusief Betuws Boeren, in English: Nature Inclusive Farming in the Betuwe), pilots and the communication of success stories and lessons learned (Interview 2, 3, 8 & 9). They bring together the frontrunners and the so called "middle", to generate a balance in making an impact, to introduce pilots, to raise criticism and issues and to share best practices (Interview 7, 8 & 16). The arrival of the Fruitmotor has brought about a change in the PA over the past five years. Biodiversity and nature inclusivity have moved up the agenda and collaboration has been fueled (Interview 9 & 17).

Another organisation that started acting more like a niche actor over the past few years is the environmental interest group Natuur & Milieu, they changed from the self-appointed role of "giving commentary from the sidelines after the policy document was done" (Interview 10) to participating in the process of bringing together various actors and creating a (policy) direction through the Plan of Action and facilitating a platform for sharing knowledge and nature inclusive projects (Interview 10; GNMF, et al., 2019; Platform NIL Gelderland, n.d.). Collaboration efforts have increased, which is a notable innovation since the fruit sector can be seen as the most individualistic agricultural sector in the Netherlands. Traditionally, there is not a collaborative mindset within the fruit production chain (Interview 8).

5.1.3 The important role of property visitors

Even though every category of actors plays its own important role, the property visitors are often mentioned first in the interviews as influential in fruit cultivation (Interview 3, 4, 5, 7, 8 & 16), since they visit the farms and orchards on a regular basis and are in direct contact with the farmers. There are three varieties of property visitors (figure 14), from which especially the advisory organisations (like the CAF, Fruitconsult or CLM) are seen as the most influential in a transition towards a more nature inclusive PA.

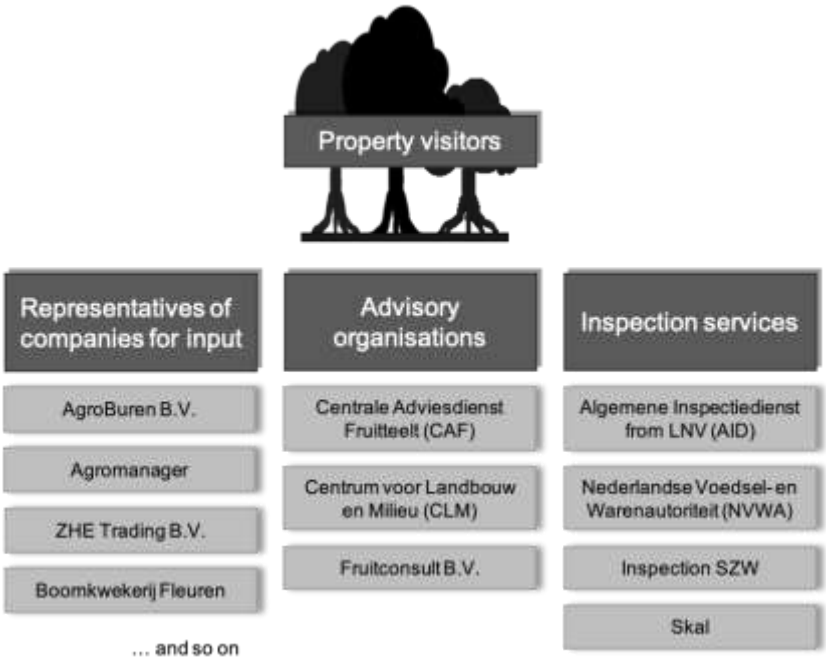
Even though the exchange of knowledge on nature inclusivity, information and the conduction of experiments by advisory organisations is seen as very important (Interview 3), this is not what the interviewed actors currently experience. One of the main reasons given for this, is the current dependence of many advisory organisations on the dominant paradigm of

intensive agriculture. Often, the advisory organisations (like CAF and Fruitconsult B.V.) sell crop protection products or pesticides, whereas nature inclusivity often means to use less of those, which gives makes for a conflict of interests (Interview 4, 5, 7 & 16). There is a lot of pressure on the sector in terms of producing good looking fruit. Advisory organisations tend to stick to the traditional discourse and resources, because that seems to work in the short term. There are still many pilots and experiments on nature inclusivity, in which the advisory organisations are involved themselves. With results not yet being available, a certain sense of uncertainty comes with acting on the insights of these experiments (Interview 8).
Furthermore, expert Pieter de Wolf points out that oftentimes there are too little resources made available for refresher courses on nature inclusivity, so if new knowledge on nature inclusivity is available, it is not being translated into the advice (Interview 14). In the plan of action, the advisory organisations are also given the role as advocates for more nature inclusivity, which does not translate into reality (GNMF, et al., 2019). Next to the (often) conflicts of interests, lack of resources for refresher courses and experiments that are still running, a change of mindset within the organisations towards nature in combination with agriculture, seems to be of importance for the potential role of advisory organsations for a change in the PA (elaborated on in paragraph 5.4).

5.1.4 The role of fruit farmers and (migrant) workers

The contributors of the plan of action of NIA "want to entice all farmers with land in Gelderland to participate. They must be motivated to take measures or have them taken on their land. Special attention is given to farmers who are at the forefront of NIA, so that they can make further progress" (GNMF, et al., 2019, p. 12). The fruit farmers themselves often start when they have an intrinsic motivation to include nature more in their practices (Interview 8). Bringing nature back into the orchard can also be done for the positive influence it has on the image of fruit cultivation (Interview 4), the view of citizens and consumers on fruit cultivation plays a role here (Interview 3). Another incentive for NIF is the desire to show that it can be done differently (Interview 4), the longing to be less dependent on pesticides and crop protection products (Interview 7), or the ambition to discover something new that nature has to offer (Interview 3).

Figure 14. Overview of property visitors. Created by the author.



In the past five years there has been a growing attention for nature inclusive measures. This is due to several trends, from social pressure through campaigns about the decline of the pollinator population or presenting pesticides as poison to changing (European) policies on which pesticides or crop protection products may be used (Interview 6 & 7). As a result, fruit farmers are getting help to deal with those changes, and everyone handles it in their own way. There are big differences between fruit farmers. For some there is a role to test and experiment with nature inclusive measures and others tend to wait until a measure proves to gives the wanted result (Interview 4, 5 & 8). An important reason for restraint is the dependence on the marketability of the product. Some fruit farmers can communicate easily with their customers through a stand or country shop near their fruit plot, while other fruit farmers depend on contracts with retail organisations that only want good looking fruit (Interview 3 & 5). If the fruit farmers would receive a fixed price for their products, they would dare to experiment more, but that is often not the case. Many fruit farmers do not only depend on contracts with retail organisations, they also depend on the supply of the world market, which causes prices to fluctuate. This results in putting insuring a good harvest above trying out nature inclusive measures that may endanger that good harvest (Interview 5).

The role of the fruit farmer, as a producer of food, should change to a broader role, according to the Fruitmotor. The fruit farmer can also be a producer of clean water and air, nature, and biodiversity, a creator of an environment in which you want to recreate, and a

supplier or processor of residual flows: “A multifunctional farmer” (Interview 8). To achieve this, farmers need proper appreaciation and help according to The Fruitmotor (Interview 7). As long as the valuation system is not in place, it will certainly not become attractive for more fruit farmers than the ones that are already trying to include nature inclusivity measures in their orchard, since the question: “What’s in it for me?” is often named as important. The Fruitmotor wants to test Key Performance Indicators for NIF in the Betuwe to develop a valuation system (Interview 8).

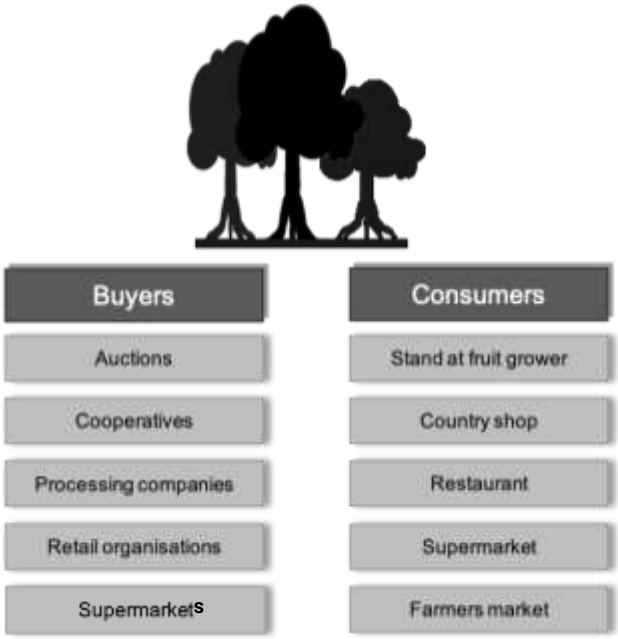
The (migrant) workers and contractors mainly have an executive role. If the fruit farmer wants to include nature inclusive measures, then all workers in the orchard should be well instructed and educated to be able to execute the measures properly. Often, in the case of mowing, due to lack of time per orchard to serve as many customers as possible, workers do not take the time for differentiated mowing (Interview 7). It did not become clear in the research if the time pressure has increased over the past five years.

5.1.5 The role of buyers

In 2014, the ministry stated that the role of producers and consumers should be to use natural resources more sustainably, since natural capital is finite and that this would preferably lead to a new valuation of nature. How producers and consumers would use natural resources more sustainably in the food and agricultural system was not specified in the document (EZ, 2014). In this paragraph, the research examines the role of the production chain, with one the hand the buyers of the fruit and the consumers of the fruit on the other hand. There are several types of buyers and locations where fruit is to be bought by consumers (figure 15).

Expert Runhaar states that buyers have reasons to commit to nature inclusivity. On the one hand, this will be good for the security of supply. Unhealthy soil and biodiversity are not. In addition, products from NIA can potentially be market well. The problem of the latter is that this often does not yield much (Interview 2). In 2019, supermarkets started a project to enable consumers to make responsible choices, to fill out their role in the transition towards a sustainable food system (LNV, 2019). This is exactly what one of the interviewees of the province proposes, a QR code to show the production conditions to make consumers more aware in their choices (Interview 12). This shifts the responsibility in the production chain to the consumer, which is part of a mindset on individual responsibilities and freedom of choice. Another reason has also been put forward however: It is difficult to get in contact with supermarkets. That is why a focus on the consumer side can feel more impactful in the short term (Interview 7).

Figure 15. Type of buyers and locations for consumption. Created by the author.



Several actors state that supermarkets have an important role in influencing nature inclusivity (Interview 6, 7, 11 & 12). An important way is the requirements they place on the fruit farmers and suppliers. Requiring certification, as the Jumbo does with the On the Way to Planetproof label, can bring about a change in the production of food (Interview 11). The requirements do not automatically have a more nature inclusive outcome, it often still preserves traditional agricultural practices. Especially the requirements that are in place for the appearance of fruits: fruit can only be sold if it is spotless. In the case of pears, fruit farmers are forced to use pesticides against the pear psylla. While this insect is not harmful for the quality of the pear, it leaves behind black spots and thus makes the fruit less appealing according to the norm (Interview 12). The power of the supermarkets is big, if they are not satisfied with the Dutch fruit, they could import more foreign fruit. Vice versa, the fruit farmers can also seek out foreign buyers if they are not happy with the certification process and the requirements from the national market actors (Interview 11).

FruitMasters is the biggest fruit cooperative of the Netherlands and the most influential in the fruit sector of the Betuwe. On nature inclusivity, they say: “We will never fully promote anything, we tell both sides of the story and the fruit farmer choose what suits him or her” (Interview 6). If something becomes mandatory, through for example certification, legislation or through requirements of costumers of FruitMasters, they will support the fruit farmers in this transition (Interview 6). Another way to support the fruit farmers is through an available arrangement to pay the fruit farmer an advance of the money

before the harvest. FruitMasters wants to take the role of a knowledge platform with a large reach, through the sharing of best practices in a magazine, but also yearly product meetings and fruit farmer family days. Facilitating the collaboration between fruit farmers is seen as an important role of the cooperative (Interview 6).

5.1.6 The role of citizens

Citizens take on different roles in the PA of fruit cultivation. On the one hand, they are consumers that buy fruit and various products that contain fruit. On the other hand, they are citizens that can sign a petition about fruit cultivation, share a social media post, go to a protest, watch a documentary, recreate in the Betuwe, and so on. Even though one citizen and one consumer are the same person, there can be a non-convergence of these roles.

The awareness of consumers is something that the LNV (2018) points out in their vision:

> It is important that she/he knows that food production has a major impact on our living environment. This requires a change, because until now the majority of consumers mainly opted for a low price and a lot of convenience, while many people set increasingly higher demands on their living environment and on the farmers and horticulturists who work in it (p. 15).

In the Betuwe, there are initiatives to include citizens in nature inclusivity. An example is the project of Gonzend Rivierenland (in English: “Buzzing Riverland”) (Interview 7). The consumer often does not know the story of the production of the food (Interview 8) or about nature inclusivity (Interview 2). Fruitvooruit is one of the platforms that tries to tell the food production story (Interview 6), while the Fruitmotor tells the story of nature inclusivity (Interview 7), but the dialogue and the direct connection between the citizen and the farmer is also important (LNV, 2018).

Some actors state that it is important that not only the consumer is made responsible since the government also has a role to play (Interview 8 & 10). The Rijksnatuurvisie of 2014, a vision on nature written by the Dutch government in collaboration with various societal actors, includes a statement that the not only the government should be

responsible, but the citizen is also included, while often the responsibility seems to be more on citizens (EZ, 2014).

Citizens can influence the PA through their willingsness to pay more for food that is produced nature inclusive (Interview 16 & 17; GNMF, et al., 2019). Currently, there is no label that marks products from NIA. Taking the label for organic products as an example, some actors state the consumer will most likely not be willing to pay more for nature inclusive produced food (Interview 2, 4, 5, 6 & 14). Others believe it can be achieved by changing the way food is valued, but they also state this is a difficult change, since consumers are used to spending only a fraction of their income on food (Interview 7 & 15).

In conclusion, it can be stated that the role of citizens is twofold in this PA. A certain awareness is strived for, in addition to being willing to contribute to nature inclusivity by paying a higher price for example.

5.1.7 The role of interest groups

Three types of interest groups are distinguished in this case study: one for agriculture and farmers, one for the combination of agriculture and nature and one for nature specifically. In general, interest groups seem to change as slowly as their weakest link, since they do not want to lose any members (Interview 7).

The most important one for the farmers is the LTO (Land- en Tuinbouw Organisatie, in English: Agri- and Horticultural Organisation) and specifically for fruit farmers: the NFO (Nederlandse Fruittelers Organisatie, in English: Dutch Fruit Farmers Organisation). The role of these interest groups is influential, since they have a big network of farmers and fruit farmers and are in direct contact with them (GNMF, et al., 2019). The interest groups find it important that nothing is made compulsory and that there is a reward for implementing nature inclusive measures (Interview 7). If the members of an interest group broadly support nature inclusivity, it is more likely that the network will be used for knowledge sharing on this subject. In the past five years, this type of knowledge sharing has taken place more outside the interest groups (Interview 7, 9 & 11).

The so-called Agricultural Nature Associations are spread over the region. There is an umbrella organisation active in the Betuwe that is called Collectief Rivierenland (in English: Collective Riverland). VANL-TCW is one of the local organisations that is part of this Collective. The role of these organisations has always been to encourage farmers to take nature into account more in their practices. This role has changed in recent years, because of

the increase of attention for nature. There has also been a greater demand for financial compensation, so the Agricultural Nature Associations started looking at the business side as well (Interview 16). Knowledge sharing networks of these organisations usually consist of members that already show an interest in the interconnectedness of nature and agriculture. The organisations should focus more on fruit farming in the future to make a bigger impact there. At the moment, they mainly focus on grasslands and meadow bird protection and not so much on making fruit cultivation more nature inclusive (Interview 16).

There are various types of nature interest groups that are active in the Betuwe and have some connection with the PA of fruit cultivation. Some have a direct contact with fruit farmers in working together to replace beech or conifer hedges with biodiverse hedges, like Stichting Landschapsbeheer Gelderland (In English: Foundation Landscape Management Gelderland; Interview 9). Geldersch Landschap & Kasteelen (in English: Gelders Landscape & Castles) and Natuurmonumenten (in English: Nature Monuments) introduce NIA on lands they manage that include agriculture already. They can use their network to increase support for nature inclusivity (GNMF, et al., 2019). Others mainly try to increase awareness about nature (inclusivity), like IVN Gelderland (in English: Institution for Nature Education and Sustainability Gelderland; GNMF, et al., 2019). Like stated at the niche actors, Natuur & Milieu Gelderland has their own pioneer role in the collaboration.

Especially the facilitation of dialogues with the own networks is an important role of the interest groups, but the own expertise and skills of each organisation is the most influential on the PA. Especially in what ways and if they use it for more nature inclusivity in fruit cultivation.

5.1.8 The role of governmental organisations

The attitude towards governmental organisations in terms of trust differs per actor. Some believe that the role of the governmental organisations should be small, others would like to them to take more responsibility.

The volatility of the government's course is mentioned as an argument to keep the role of the government small (Interview 3). Also, some mention that governmental institutions are not always aware of what is going on in a practical sense. This can result in policies that are not in line with what is achievable for the implementers of those policies (Interview 6).

A common view is that the government should take more responsibility in the form of a facilitating role (Interview 3, 4 & 6) through financial support to stimulate nature inclusive measures (Interview 4, 6 & 11) and knowledge exchange (Interview 3). The governmental

level is an important distinction in this case: provinces can provide bigger subsidies than municipalities (Interview 9). Such subsidies could take the form of innovation schemes (Interview 11).

Changing agricultural policy is not a municipal competence. However the municipality can influence agricultural practices through the Omgevingswet (in English: Environment and Planning Act). When issuing a building permit, the rules of the new legislation must be complied with. For existing fruit orchards this Planning Act makes no difference since the municipality is not giving a new permit. Only in the case of starting fruit farmers, there is a possibility to enforce more nature inclusivity, but like stated at before: oftentimes there is an overtake of old fruit orchards, instead of the establishment of new ones (Interview 9).

Some actors wish that the government would set stricter requirements instead of voluntary measures.When it comes to pesticides and crop protection products, a change can be perceived: more and more products are banned (Interview 16). The governmental Water Authority could take a more prominent role by having more conversations with fruit farmers on nature inclusivity and the decrease of the use of pesticides, with increased water quality as a result (Interview 8 & 9). According to the Water Authority, these conversations are already happening (Interview 17), their role would be particularly powerful if the infrastructure they manage was also made more biodiverse (Interview 7). Starting the conversations with fruit farmers could also be a role for the water company Dunea, who benefits from good water quality (Interview 9). There are additional options at the Water Authority, since they also manage the groundwater level, which would also allow them to take nature into account more (Interview 17).

Due to the ministry itself, the role of governmental organisations should be to provide room for experiments and pilots, to facilitate knowledge exchange and to give access to subsidies (LNV, 2018). Through the NIA-platform of Gelderland more provincial subsidies have become available for nature inclusive agricultural projects (NMFG, et al., 2019). Some specifically do not wish for more regulation (LNV, 2019; Interview 3). There was not an increase in legislation in the past five years, only more regulations on allowed pesticides by the European Union (Interview 6). The influence of the national government has been decentralised to regional organisations and institutions. An example is the development on a regional level for nature inclusive action plans and collaborations (LNV, 2018), which also happened in Gelderland in the past five years (GNMF, et al., 2019; Platform NIL Gelderland, n.d.).

5.1.9 The role of financial institutes and insurance companies

Financial institutes and insurance companies set certain conditions when giving out loans or paying insurance claims. Within the PA, this affects the possibilities of fruit farmers. The actors indicate that there are often nature inclusive pioneers who run into problems at the financial institute, who mostly still operate within the bounds of the dominant agricultural regime. Intensive farming and efficiency are conditions that need to be present to be able to repay the loan (Interview 10 & 16). A practical translation seems to take time (Interview 10), the financial institutions have changed throughout the past five years in looking more at the long term and assessing projects and loan applications on sustainability (Interview 13 & 16). There is still room to align policy and conditions more closely with nature inclusive practices.

5.1.10 The role of research and education

The production of knowledge through independent research and education is important (Interview 3, 7 & 11), but also the sharing of that information and the integration of knowledge on NIA in curricula is essential for the adaptation (Interview 8 & 11). “Circular agriculture, basic knowledge of biodiversity, nature and landscape in rural areas must be part of the permanent curriculum” (GNMF, et al., 2019, p. 12).

Expert Pieter de Wolf says: “What a knowledge institution can do is to continue to work on innovation for practical purposes and simply be independent in this. Not in the sense of how it should be done, but how it can be done. Also show it if something is not working, that can also be very important” (Interview 11). De Wolf also emphasizes that as a researcher you are continuously scrutinised for the possible presence of a political agenda or not. The independency of the researcher, which de Wolf attributes to political preference, is important in research (Interview 11).

5.1.11 Conclusion actors

Attention for a nature inclusive way of fruit farming has significantly increased in the past five years. This is mainly due to several trends: social pressure through campaigns about the decline of the pollinator population and presenting pesticides as poison, and changing (European) legislation to banning pesticides or crop protection products. Furthermore, the NIA action plan and platform and the new niche actor the Fruitmotor introduced many nature inclusive projects and measures in collaborations and discussions.

Due to the NIA action plan and learning networks, actors in the PA started working together more, an interesting development, since the fruit sector is known to be the most individualistic sector of all agricultural sectors. Through this collaboration, the role of some actors changed in terms of NIF, while the roles of other actors remained stable even though in some instances a change is expected by their environment.

Some fruit farmers started to test and experiment with nature inclusive measures, while others tend to wait until the measures prove to give the desired outcome. The role of the fruit farmers became one of sharing best practices and knowledge. Actors like financial institutions, insurance companies and property visitors are currently expected to fulfil more of a supportive role when it comes to nature inclusivity. However, they deal with conflicting interests which has not change over the analysed five years. The financial institutions and insurance companies are focused on financial revenue and see deviations from the status quo as a threat to this system. Their interest mainly revolves around money and not creating societal or ecological value. Property visitors like private advisory organisations trust technology, crop protection products and pesticides more than natural pest control and working with nature instead of against it. Moreover, they are often part of an organisation that sells crop protection products and pesticides, which makes for a conflict of interest. The interviewees perceived working together with supermarkets as difficult. As a result, the focus seems to be more on consumers in the production chain, even though supermarkets play an important role in demanding a certain appearance of fruit, which is one of the biggest barriers in the transition towards NIF. Thanks to pollinator and pesticide campaigns, citizens have become more aware of the problems in the fruit sector over the analysed five years. The interviewees do not expect consumers to pay more for nature inclusive fruit, however, even though they do state that as an important role for them. FruitMasters is a buyer of fruit that is more focused on working together with the fruit farmers. Over the analysed five years, they helped to include nature inclusive measures in PlanetProof certification and helped to introduce a new course for young fruit farmers with FruitTechCampus. This new educational institution is mainly focused on technology as a solution for fruit cultivation. In research, there are more nature inclusive pilots than there were in the beginning of the analysed five years. However, in most research, a focus on technology is mainly present. The role of the national government has become more decentralised and is seen as a more facilitating role. While the European Union decreases the amount of pesticides and crop protection products that are allowed to be used by legislation, the province of Gelderland nor the Netherlands have yet formulated a nature inclusive base line for 2030, which interviewees would state as a

role for the governmental institutions. Even though there is more on nature inclusivity in (voluntary) policy documents than at the beginning of the analysed five years, some still miss a clear vision or goal of percentages. Nature interest group Natuur en Milieu shifted more towards collaborating with various actors on NIA. Furthermore, nature-agriculture interest groups tend to focus more on meadow birds instead of nature inclusivity in the fruit sector. Agricultural interest groups seemed to see technology as a safer solution than nature over the analysed five years.

5.2 Resources and power

Within the PA of fruit cultivation in the Betuwe the change of the resources: knowledge, skills and education, best practices, information provision and money have been researched. This sub chapter ends with the power distribution that is connected to these resources and a conclusion.

5.2.1 Knowledge

There has been a knowledge increase within the area of NIF. Besides the increase in knowledge there has also been a shift in the demand of a specific kind of knowledge regarding nature inclusivity (Interview 1, 2, 3, 6, 8, & 17). Five years ago, the amount of knowledge and specific interest in knowledge on this topic was not prevailing on the agenda. There is still a lack of specific knowledge and skills on how to benefit from nature (Interview 6 & 8), the urge to create and share more ecological knowledge has increased (Interview 8). While knowledge on NIF was almost unthinkable five years ago, specific nature inclusive knowledge, such as pheromone confusion for the fruit moth, to protect the fruit but not at the expense of nature, has gained attention (Interview 4).

The exchange of knowledge is being seen as a fruitful form of collaboration between farmers. By doing so, farmers are learning from each other's experience and experimentations. This is currently being done through exchange networks. However, there is a rise in demand for more exchange networks and other forms of collaboration (Interview 3). For the past few years, the platform has brought knowledge groups and research is being conducted at experimental farms (Interview 10 & 17; GNMF, et al., 2019; LNV, 2019). For involved stakeholders and especially financial institutions there is an interest to stay alert on the development of knowledge within the fruit sector. This is one of the reasons why stakeholders like financial institutions are also connected to those platforms (Interview 13).

Many farmers are trying to protect their expertise on nature inclusivity, to foster a unique selling point on the market. This competitive attitude leads to a barrier to cooperate and exchange knowledge with each other (Interview 8). Moreover, there seems to exist a binary way of thinking within the process of knowledge exchange. For example, dynamic fruit cultivation which uses no fertilizer and crop protection products is being seen as a different mode of agriculture. This leads to a denial towards the ability to exchange knowledge. However, these knowledge systems could cooperate in such a way that even supposed opposite ways of agriculture can use the best of each other's knowledge (Interview 8). The combination of agriculture in the form of crops and fruit cultivation is often being seen as 'not done', while there are certainly possibilities for exchange within the area of nature inclusivity (Interview 14).

The focus of research is often on specific issues, such as phasing out crop protection products. While, for example, much broader ecosystem research is needed to solve other problems caused by agriculture on nature (Interview 14).

When knowledge institutions conduct research, the knowledge does not always reach the farmer. This can be a result of a cut back on agricultural advice or on the privatization of knowledge. The knowledge is now often owned by organisations that use it to sell their products. As a result, knowledge becomes intertwined in market mechanisms and does not benefit nature inclusivity (Interview 2). An incentive must be created for farmers so that they are willing to accept and implement the knowledge about nature inclusivity (Interview 2; GNMF, et al., 2019; Platform NIL Gelderland, n.d.). The additional commercial interest of some advisory organisations poses a barrier in creating this incentive (Interview 2).

Transitioning towards NIF comes with uncertainties. Those uncertainties can relate to a question like: what if harmful animals come along and there is not enough knowledge available about natural pest control to get rid of them, eventually leading to harvest fails? This leads to the need for new research which tackles such uncertainties (Interview 1). Also of importance is the knowledge which is currently being used. What knowledge is still valuable for NIF? And which knowledge is no longer useable? What should be re-examined? Those questions have gained more attention over the past five years (Interview 1 & 8).

In the past years there has been an enormous increase in technological innovation and forthcoming knowledge. In turn, this has led to an increase in data management and the use of data for crop productivity. The combination of technological innovation and ecological knowledge could offer possibilities for agriculture (Interview 3, 4, 5 & 6; LNV, 2018).

It takes a lot of effort and time to conduct research in experimental gardens, which emphasizes the importance of conducting research in current tree orchards. A specific focus would lie on collaboration between farmers. The knowledge networks who are already working on these nature inclusive measures show effects already after one year (Interview 14).

5.2.2 Skills and education

Education and further training of nature inclusive knowledge and skills should provide tools to move along the transition towards nature inclusive farming (Interview 10). In addition, this should mitigate uncertainties (Interview 12). While those developments remain marginal, those are recognized as important (GNMF, et al., 2019). Within vocational education there have been developments in which education is oriented towards the relationship between land, biodiversity, landscape, different ecological cycles and climate issues. There is "among others: a Nature Inclusive Agricultural curriculum in vocational education (both MBO (in English: Secondary Vocational Education) and HBO (in English: University of Applied Sciences)), following the Green Deal of NIA Green Education "Living on Farmland" for primary and secondary education" (GNMF, et al., 2019, p. 28). The knowledge derived from these programs should also be directed towards other stakeholders within the sector. This means existing fruit farmers, property visitors and advisory organisations should be included as well (LNV, 2019).

The new Fruit Tech Campus should contribute to this spreading of knowledge (Interview 4, 6, 7 & 13). A nature inclusive mindset should be an underlying value in the curriculum. Fruit farmers should embrace nature and seek its positive aspects instead of seeing nature as a mess that needs to be controlled. Fruit farmers have to learn to deal with this differently as it is still a major obstacle (Interview 8 & 15). An example is the so called "black border" (in Dutch: zwarte rand): "You spray everything that there is to death with glyphosate. When nothing grows there, then it does not bother you, in the sense that it does not take away energy or minerals and that there is no moisture. This has been taught to the fruit farmers to a large extent in the past" (Interview 8).

The Fruit Tech Campus has a new "MBO BBL-degree" with the following triangle: 'fruit' (cultivation and product), 'technology' (mechanization, storage, sorting, and packaging) and 'data' (ICT and information management) (Fruit Tech Campus, 2020). Within this degree nature and biodiversity will be part of cultivation and product. However, some stakeholders think this needs to be taken even further and that nature and biodiversity should be one of the main pillars within the degree (Interview 7, 8, 10 & 15).

As a result of the decreasing of crop protection products, farmers are forced to approach pests in a different way (Interview 3). This could entail a switch towards nature inclusive farming. These nature inclusive measures can arise out of specific interests, but also from necessity (Interview 3 & 10). Benefitting from nature and natural pest control resources (introducing predatory species which mitigate harmful species) gives opportunities to provide more support in skills and education from the Nature Inclusive Platform (Interview 10). The Fruitmotor designed a workbook containing learning modules specifically aimed at the implementation of nature inclusive measures (De Fruitmotor, 2019).

This shows that developments are occurring within the area of education and skills. A side note is that this has only recently started to develop. There is still an ongoing search on the specificity of nature inclusivity within the overall harvesting processes. One of the challenges is the ongoing emphasis on especially technological innovation instead of changing norms and values towards nature inclusivity.

5.2.3 Best practices

According to various interviewees, many best practices have been implemented over the last years. The replacement of hedges (Interview 1 & 9), the reducement of spraying circles (Interview 9), the creation of flower borders (Interview 3), the installation of nesting facilities for pollinators, birds and other animals (Interview 7 & 8), the processing of residual flows with the Krenkelaar juices of the Fruitmotor, to create added value (Interview 1), the application of strip cultivation (Interview 3) are a few examples.

The application of strip cultivation ensures that infections will spread less in the tree orchard (Interview 12). Therefore, nut trees could diversify the orchard. However, the plantation of nut trees does not occur often as it does not fit the farmers expertise. The places in which strip cultivation occurs is at farms whose expertise is a diversified crop environment or on those farms with farmers that are open to try this (Interview 3).

Sharing best practices is not always easy. Often there is not enough data available to show what nature inclusive measures yield exactly. This also relates to the financial side of certain measures, specifically the weighing of the costs against the benefits of transitioning towards nature inclusivity. In addition to financial best practices, change is also needed in the mindset of the fruit farmers. Some fruit farmers stated that nature inclusive measures result in “messy looking lands” and therefore, are not interested in learning more about those measurements (Interview 3). “Fruit farmers especially need best practices to see that it results in something good” (Interview 8). These pilots are steadily developing. When farmers are

convinced or experience specific practices to be cheaper than expected, they are more likely inclined in a more favourable direction towards nature inclusivity (Interview 6, 8, 9 & 10). Best practices are a way to change the attitude of fruit farmers and other actors to feel more concerned, connected and better supported (Interview 10).

Various networks and activities exist to share best practices. One example is Fruitpact, which offers travels to other regions and other countries to learn about different practices (Interview 13). However, these practices are often focused on technological innovations, instead of nature inclusive measures. In contrast, the network Nature inclusive Betuws Farming is focused (almost) exclusively on nature inclusive measures (Interview 15 & 16). A further example is: "Oogst van Morgen" (in English: Harvest of Tomorrow). This is an organisation that collaborates with several stakeholders, amongst which governmental institutions. They offer living labs and are familiar with experimental settings to research the best practices (Interview 7). These networks are of great importance to share experiences and knowledge.

Another common observation is that small flower strips fruit farmers often achieve small wins. An example of a small win is reducing the presence of the pear sucker (in Dutch: perenbladvlo), by planting a a strip of 30 centimeters of flowers. Some fruit farmers settle for these small victories and try not to achieve more (Interview 3). In the area of water, the Water Authority would like to show more best practices and inspire fruit farmers. One way to do this would be to communicate more best practices on their website. This could be an incentive to collaborate more in the field of best practices regarding water (Interview 17).

Existing best practice learning networks must also be linked to educational and research institutions. By doing so, they can convert the data provided by the networks into new forthcoming implementations, also knowledge and technologies. There must be room for experimentation on experimental farms, but also in regulations and in terms of financial possibilities (GNMF, et al., 2019).

Pesticides and crop protection products are resources for fruit farmers to deal with insect plagues and unwanted plants that are perceived as competitors to the energy of the fruit trees and of the nutrients in the soil (Interview 1 & 8). The availability of these pesticides and crop protection products is decreasing, mostly due to legislation. The fruit farmers are therefore forced to use other resources and sometimes this means that nature inclusive practices are being implemented (Interview 3).

5.2.4 Information provision

Information on agriculture and specifically fruit cultivation is being produced and shared by several actors. For example, the NFO publishes a trade magazine called “Fruitteelt” and members of the CAF receive a newsletter and free access to the website “Fruitregistratie.nl”. Information provision also happens through a monthly European Fruit Magazine, newsletters from FruitMasters and AgruniekRijnvallei, and agricultural news platforms like AGF.nl (in English: Potatoes, Vegetables and Fruit) that also publishes the magazine “Uniek” four times a year (in English: Unique). Furthermore, the Water Authority publishes their activities related to biodiversity on “Blauw-Groen Netwerk” (in English: Blue-Green Network; Interview 1, 6 & 17; AGF, n.d.; AgruniekRijnvallei, n.d.; Fruitregistratiewijzer, n.d.; European Fruit Magazine, n.d.). Fruitvooruit is focused on publicizing information about fruit farmers and cultivation to the citizens in the Netherlands. They aim to receive valuation for their product and the fruit farmers.

> Telling the story of the fruit sector to society with power. About how fruit cultivation has changed, how sustainable the sector already is. A story based on facts and figures, from independent sources. The parties from the platform show where the fruit sector excels and what is still being worked on, or needs to be done, in further sustainability (Platform Fruitvooruit.nl, n.d., about us).

Next to their main focus, they also provide information to fruit farmers with a Cultivation Innovation Roadmap (in Dutch: “Teelt Innovatie Roadmap”; Platform Fruitvooruit.nl, n.d.).

Information can be powerful, since it often determines the discourse, mindset and level of awareness of a group of actors (Interview 7 & 8). Informing the fruit farmers about the future is very important, especially which pesticides are being phased out, so that the fruit farmers can anticipate on time (Interview 1). Five years ago, there was no vision from the province on the future of agriculture, the vision, including financing, is important for the transition (Interview 10). The plan of action is also a form of information provision, since it contains the vision of a lot of actors (Interview 11; Platform NIL Gelderland, n.d.). One of the goals of the platform is “involving and informing project participants and stakeholders outside projects. Organizing and contributing to a lively communication within the platform” (GNMF, et al., 2019, p. 31).

There is room for improvement in the content of the information provision. The government could formulate a clear bottom line for the future of biodiversity and nature inclusivity. This would be useful in setting out the directions to get to the goal of increasing biodiversity and nature inclusivity by 2030 (Interview 2 & 8).

Information is also provided from outside the sector. For example, Greenpeace campaigned against the use of pesticides in the summer of 2016 (Greenpeace, 2017). This campaign created a lot of awareness for customers: questions were asked, supermarkets were shelled, and the image of fruit farmers deteriorated (Interview 6). CLM (in English: Center for Agriculture and Environment) published a report commissioned by Greenpeace which stated that supermarkets could help to make the production process more sustainable (Hees, et al., 2016). In the past five years, the report and the campaign mark a significant boost to the attention to sustainability within the production process and the reduction of pesticide use (Interview 6).

There is still room for improvement on information provision by the sector. The commercial interests of advisory organisations, that do a lot with provision of information, can be a problem for nature inclusive information (Interview 2 & 8). Some organisations state that their communication can be improved, like the Water Authority, especially on the subject of biodiverse hedges (Interview 17).

Including nature inclusivity in existing certification (like On the way to Planetproof), ensures that information about nature inclusive measures is disseminated (Interview 13). As a result, there is a noticeable increase over the past few years in awareness of nature inclusive measures: diversity of wind hedges, flower strips and bee hotels (Interview 5 & 13). The development of certification often takes years, for that reason it is important to include nature inclusivity in existing certification that is used by many fruit farmers and also other parties in the product chain, like supermarkets (Interview 6).

5.2.5 Money

Fruit farmers invest money in inputs like pesticides and crop protection products and are therefore often dependent on suppliers and the prices of pesticides and crop protection products. This sort of dependency could decrease with a change to NIF. It would help if farmers received a continuously stream of income for ecosystem services, but expert Runhaar indicates that it is difficult to predict how those revenue models will develop (Interview 2). Due to the high price of land in the Netherlands, the representative of the Rabobank West Betuwe sees does not see any potential in a revenue model for ecosystem services. He calls

land with ecosystem services “fallow land”, land that is not utilized for production, “a piece of nature is not profitable” (Interview 13). The question arises: who will pay for the ecosystem services? According to him European money would be the only option (Interview 13). Expert de Wolf indicates it would be good if farmland would actually be certified as farmland, so that the price will not be pushed up by speculating of using the land for housing, but instead decrease (Interview 14).

The Rabobank West Betuwe facilitates “companies that want to invest in a new spraying technique or in a new, more resilient crop variety that needs to be sprayed less, as long as there is enough revenue potential” (Interview 13). This does not leave much room for bigger nature inclusive investments that are not having direct revenue potential.

In the Realisation Plan for the vision of the LNV there is a biodiversity loan: “The Rabobank stimulates their clients to actively raise their sustainability demands to a higher level. To this end, tailor-made financing instruments have been developed, such as the recently introduced 'Biodiversity Loan'” (LNV, 2019, p. 34). The Triodos Bank also invests in the relationship with nature: “An example of this is the Kiem initiative, in which there is collaboration with Stichting Grondbeheer to make land available for the longer term for sustainable forms of agriculture and where 'true pricing' is applied” (LNV, 2019, p. 34).

However, such opportunities are often missed or not utilised by people in the sector. The financial risk is perceived as too big at this moment to switch to a nature-inclusive orchard (Interview 17). For example, a farmer says that spraying is the most profitable. There is less spraying than before, but to prevent a mouse infestation for example (which can cause a lot of damage), it is more profitable to spray (Interview 5). There is also a fear that yields will be lower with nature-inclusive cultivation (Interview 6 & 9). There is often a transitional situation, in which there is not a complete balance in the orchard and therefore an existing chance that there will be smaller yields. That is a problem at the moment because there is no room for loss and no margins to take such risks (Interview 8).

Nature-inclusive measures cost money. For some farmers it is worth it because they see it as beneficial for nature and for their image. For others it may not be worth this money, because they do not really know what they get in return. Investments below 10,000 euros are possible, investments above 10,000 euros must be earned back (Interview 12).

Additionally, management costs money. It is said: "It just costs us revenue, if you compensate for that revenue, then we are quite willing to do more" (Interview 9). An adapted revenue model in which the citizen contributes to the environment is a named possibility. This money can also come from other parties. A reward or a long-term deal would therefore help

implement nature-inclusive measures (Interview 6), such a long-term deal would provide more certainty for farmers. This search for valuation instruments is mainly done by government bodies: “Water Authority or municipalities, we are not used to looking at other parties in the chain” (Interview 8).

More funds have become available for nature-inclusive agriculture in recent years. The Province gives more subsidies than before (Interview 7). The RegioDeal for Rivierenland also provides funds: funds and projects to strengthen biodiversity in the region (Interview 7; Rijksoverheid, 2020). In addition to RegioDeals, the “Interbestuurlijk Programma Vitaal Platteland” (in English: Interadministrative Program for a Vital Rural Area; In short: IBP-VP) is also mentioned by the Ministry of ANF (2019) as a possible instrument. Furthermore, the NIA platform provides funding to focus on developing knowledge and best practices (Interview 10; GNMF, et al., 2019). Via the project "Revenue Models and Instruments", the NIA platform aims to set up a landscape fund in Gelderland (and therefore also in the Betuwe) to promote nature inclusivity. That is a fund for:

> … investments in and management of the landscape outside the Gelders Nature Network and in addition to the current arrangements for agricultural nature management. Ambition for investments in the period 2019-2027 amounting to €10 to 20 million per year […]. The system for this Landscape Fund should contribute to structural change in the countryside (GNMF, et al., 2019, p. 30).

Expert de Wolf reacts sceptically to subsidies from government agencies. These are often temporary, which does not provide enough trust to make investments for several years (Interview 14). The Landscape Fund is trying to tackle this problem. There is also collaboration regarding investments. For example, Fruitvooruit uses money from various partners and members to develop knowledge and innovation (Platform Fruitvooruit.nl, n.d.).

In terms of purchasing price, the supermarkets might as well get an apple from Eastern Europe, Chile or New Zealand (Interview 12). High minimum wage in NL (relative to other countries) results in worse competitive position (Interview 1). Furthermore, consumers are currently used to spending relatively little money on food (Interview 1). One of the pillars of the plan of action is therefore: “Increasing the awareness of the residents of Gelderland about healthy food, nature-inclusive production and the assocsiated costs. Due to increased

awareness of this, the willingness to pay more for food will increase" (GNMF, et al., 2019, p. 31).

For larger investments, there are green discounts from the European Central Bank, you get a discount on your interest rate. This green discount is an instrument to stimulate such investments and make them profitable more quickly. This applies to large investments such as solar panels, not to smaller investments as is often the case with nature-inclusive measures. It is not profitable to set up a financing instrument for this (Interview 13).

5.2.6 Power distribution

The power of the supermarkets was already great and still is great. The actors have no answer to the question of whether this position of power has increased in the past five years specifically (Interview 1, 4, 5, 10, 11, 12, 13 & 16). Because four to five auctions have merged into a large one: Fruitmasters, the position of this cooperative has become stronger (Interview 4 & 13).

The government has little power in relation to businesses, introducing legal rules and requirements would give the government more power, but that is only the case in the field of crop protection in fruit cultivation, no legislation towards nature-inclusivity (Interview 11). According to some interviewees: in recent years, the call has become louder for the government to take on a facilitating role when it comes dialogues between actors, instead of imposing legislation (Interview 9 & 17). From a similar mindset, the Water Authority therefore chooses not to use power resources (Interview 17).

The fruit farmer seems to have the least power in recent years, they are expected to do what businesses, cooperatives and the government ask of them (Interview 1 & 4). This has led to many fruit farmers being forced to expand their business, which makes them more vulnerable (Interview 3).

The dominant position of the interest group the LTO seems to have declined in recent years, because it is precisely the conservative and progressive farmers who say that they no longer feel represented (Interview 10). Other actors indicate that the dominant position of organizations such as LTO is indeed strong, which gives them significant power during negotiations (Interview 15).

The organisations with the most money are often the most powerful, such as banks and crop protection products and pesticide suppliers, the latter having gained this power through the trust of fruit farmers, whose property they often visit as advisors (Interview 16)

5.2.7 Conclusion resources and power distribution

There has been an increase in NIF-knowledge. However, there is still a demand for specific (mostly ecological) knowledge to provide solutions for situations that underline the unpredictability of nature and the uncertainties this brings about for NIF. Most available knowledge is currently focused on specific issues (like phasing out pesticides), instead of providing broad knowledge for NIF. More knowledge exchange networks and experimental farms have been developed in the past five years. For the sake of time efficiency, this research could also be done in existing orchards.

The barriers for knowledge exchange stayed the same: The competitive attitude and the attitude that a conventional fruit farmer cannot learn from other types, like dynamic fruit cultivation. As a result of privatising knowledge, knowledge becomes intertwined in market mechanisms and does not benefit nature inclusivity. There is an increase noticeable in technological innovation and knowledge on data for crop productivity. There is a wish to combine this more with ecological knowledge.

In the PA, an increase of focus on nature in education can be observed over the analysed five years, although the focus is mostly on technological innovation still. A demand exists for educating not only farmers that are starting, but also actors that are already active in the sector (fruit farmers, but also property visitors and others involved in fruit cultivation) still exists. NIF-skills have evolved over time as well, sometimes due to their interest and sometimes to benefit the image of fruit farmers, but also from necessity (due to less crop protection or pesticide products).

Best practices and information on NIF are currently shared more within the sector and have evolved more than five years ago, even though there is still room for development. There is a need for a clear bottom line for nature inclusivity in the year 2030 from the Dutch government. Information provision is also being done by other actors, through including it more over the past five years in certification. Five years ago a big campaign on pesticides of Greenpeace had a lot of impact on the PA. This can also be perceived as an event outside this specific PA that influences the PA of fruit cultivation in the Betuwe.

Even though there are more NIA-funds and the LNV (2019) states that there is a ‘Biodiversity Loan’ (of the Rabobank), the actors in the sector see a (lack of) financial resources as one of the biggest barriers for NIF, especially in terms of the possible loss of revenue. The belief that agriculture should be efficient and the perception of nature as non-profitable did not change. For some fruit farmers the investments (especially the ones below

10.000 euros) became worth it throughout the years, but the uncertainty of what you will receive in return are for others a reason to wait for more available knowledge.

The power distribution has been mostly stable over the analysed five years. The supermarkets, banks and crop protection products and pesticide suppliers were the most powerful. Cooperative FruitMasters got a better power position due to expansion and interest group LTO seems to have lost some power due to members that no longer feel represented. Fruit farmers had and still have the least power.

5.3 Rules

Part of the PA are the formal and informal 'rules of the game'. These rules as well as changes of the rules are described in the following paragraphs.

5.3.1 Formal rules

In recent years, the 'On the way to Planetproof' certification has been developed, which can be seen as new, non-statutory rules that farmers must adhere to if they are affiliated with FruitMasters (Interview 1, 3 & 7). These certifications sometimes contain elements of nature inclusivity (Interview 6). In addition, specific Key Performance Indicators (KPIs) are being developed for NIF (Interview 8; Platform NIL Gelderland, n.d.). These KPIs were delivered in May 2022 and are ready to be tested at eight different fruit farmers (Interview 8). One of the developers of the KPIs: Holster of the Fruitmotor hopes that these will not be seen as "a settlement tool, but more as a valuation or incentive tool" (Interview 8).

According to the plan of action of NIA in Gelderland, there should be more legislation to create space to implement nature inclusivity at a provincial and national level (GNMF, et al., 2019; LNV, 2019). In 2014, there was already a wish and, according to the document, a development to enrich policies with "nature in the middle of our society" (EZ, p. 35). Expert Runhaar states that currently there is ample discussion about more governmental subsidies and steering arrangement. At the same time he states that this will not work if the system continues to encourage intensification. More is needed than subsidies and incentives for nature inclusivity, especially a different mindset is really needed. The current formal rules and rules that are in development in the Netherlands but have not been implemented yet, will not be able to achieve this, but may contribute to a change of mindset (Interview 2). Agricultural subsidies are mostly an European competence and therefore not always possible to regulate or give on a national or regional level (Interview 12). That change,

including the focus on nature inclusivity, instead of efficiency and economies of scale, should therefore be supported by the European Union (Interview 2 & 12).

The fruit farmers are experiencing increasing pressure from monitoring on existing legal rules. These rules are not necessarily based on nature inclusiveness, although they do include the ban on certain types of pesticides and plant protection products (Interview 1 & 7). Such rules are sometimes seen as something that stands in the way of a more sustainable way of farming (Interview 4). There are also new actors who have become involved with rules in recent years, such as the Water Authority (Interview 1).

Maintaining and completing, for example, certification does take time and effort, which is often experienced as a burden by the fruit farmers (Interview 4 & 5). These formal rules in the form of certification tend to change the role of the fruit farmer in his own orchard to more of a management role (Interview 3).

Regulatory pressure on crop protection products and pesticides is causing unrest among fruit farmers. There is hardly any class 2 fruit that fruit farmers can economically profit from, unless they have a farmer stand or farm shop. While in the production of class 1 fruit there are less resources, in the form of pesticides and crop protection products, available (Interview 4 & 5). Even though the farmers feel like they need the input to produce class 1 fruit. Furthermore, a farmer states that organic inputs are often more expensive and must be used more often than conventional inputs. In addition, it is considered unfair that in other sectors or abroad it is still allowed to use substances in contrary to the Dutch fruit cultivation, while this should be regulated European wide or worldwide (Interview 5 & 13). One of the interviewees of the Province of Gelderland does indicate that this legislation for fewer plant protection products and pesticides will come from the European Union (Interview 12). This should also be included in world trade rules in the future. At the moment, fruit is imported that is not produced under the rules that production in Europe has to comply with (Interview 12). There is a desire from farmers, but also other actors, to make regulations so that Dutch products must first be sold in the Netherlands and products may only be imported when these products are no longer available (Interview 5 & 12).

In addition, the actors in the PA are aware that more European regulations will be forthcoming from the 2030 European biodiversity strategy, but it is not yet concrete at the moment what these future rules will mean for fruit cultivation (Interview 6). For example, there are laws in other countries to make 5% of the land more biodiverse, European authorities are thinking about including this (Interview 7). There are farmers and other actors

who want to get ahead of this and start working on biodiversity and nature inclusivity now (Interview 3, 7, 8, 10 & 15; Platform NIL Gelderland, n.d.).

In recent years, zoning plans have been scrutinized more and more critically. Nothing has changed yet, but rules could be set here for the size of spraying circles, other nature-inclusive measures and the admission of crop support facilities (Interview 9).

There are actors who are against new formal rules in the field of nature inclusivity. Expert de Wolf would prefer that no measures are prescribed, but that "the space is given to come up with solutions yourself" (Interview 14).

In general, there is a trend that the formal rules in the field of plant protection product use are increasing step by step. This change is still quite slow (Interview 16). In the field of nature-inclusive measures, a number have recently been included in existing certification (Interview 6). Key Performance Indicators are also being developed (Interview 8). Apart from the nature-inclusive measures in the existing certification, no new regulations have been added, although this is expected from the European Union (Interview 7). According to the representative of the Agricultural Nature Association VANL-TCW, new formal rules would incentivize fruit farmers more to implement the measures, whereas the voluntary basis does not always seem to work (Interview 16). Therefore, it is important that the fruit farmers receive something in return (Interview 7).

5.3.2 Informal rules

In the year 2016, it was ordinary to go your own way as a fruit farmer, not to be too concerned with others or nature, that is different now (Interview 6).

Traditionally, nature in your orchard, such as flower borders, has been experienced as “junk” or “messy”. This is still an informal rule for some farmers. Such farmers are therefore difficult to entice to apply nature-inclusive measures (Interview 8).

Another informal rule that has changed with some farmers, but not many yet, is leaving branches after pruning. Such branches start to digest and are then nutrition for the trees. In this process they are also important hiding places for insects, such as earwigs that are natural pest controlling insects. Leaving branches is still labelled as 'messy' for a large part of the farmers (Interview 8).

There used to be an informal rule to spray dead vegetation, as this would retain moisture. This has changed somewhat in recent years after the dry summers, when it was experienced as nice that the vegetation around the tree retained moisture (Interview 8).

In recent years, the informal rule (in addition to the formal rules) has emerged to use as little plant protection products as possible (LNV, 2019).

The representative of the Water Authority mentions several informal rules that have changed in line with the organisation's own practices. For example, mowing is now done in phases and much more thought is being given to biodiversity. Five years ago, that was not on the agenda at all and was not considered, informal rules were not aimed at biodiversity (Interview 17).

This awareness of biodiversity already existed five years ago among municipalities and CLM, when they signed a declaration of intent “Beedeal” with fruit farmers and beekeeper associations. This stated that less pesticides would be used and that roadsides should be managed more ecologically. Such a letter of intent falls under informal rules, since it is made entirely on the basis of voluntary agreements (Interview 9). This also includes the Plan of Action of NIA in Gelderland and the platform. Such agreements are made on a voluntary basis and pave the way for a possible transition in best practices and can contribute to changing ingrained informal rules.

5.3.3 Conclusion rules

The formal rules in the PA have not changed much over the analysed five years. In the last decades, there is a trend going on of legislation on crop protection products and pesticides, less are allowed in 2021 compared to 2016. Some nature inclusive measures have been included in existing certification. An increase in formal rules is expected from the implementation of the 2030 Biodiversity Strategy of the European Union.

Some informal rules have been stable, like the rule that nature in the orchard is ‘junk’. Some have changed, like the rule to use as little plant protection products as possible. In 2016, there was already a “Beedeal” with informal rules and the action plan that developed over the years can also be seen to change informal rules, since it is all based on voluntary measures.

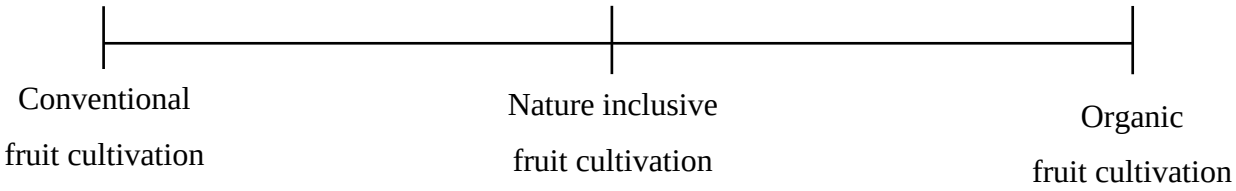
5.4 Discourse

Within the PA of fruit cultivation in the Betuwe the change of the discourse, in the form of the definition of nature inclusivity, the frames to resist and the frames to empower of a change in the PA towards NIF, have been researched.

5.4.1 Definition of nature inclusivity

Expert Runhaar compares nature inclusivity with agroecology, he states that NIA is not only about ecosystem services, but a broader definition including contributing to biodiversity, even without directly benefitting from it. Agriculture should adjust to nature, instead of the other way around. It would mean a trend of extensification of fruit cultivation, instead of the trend of more intensification. Runhaar places NIF between conventional and organic fruit cultivation (as shown in figure 16), since according to him, the focus is not on the organic part, but on the nature inclusivity (Interview 2).

Figure 16. Runhaar's perception on the position of nature inclusive fruit cultivation. Made by author (Interview 2).



The representative of advisory organisation the CAF associates NIF with a food forest. He states that the connection of nature and agriculture is central, and that the nature inclusive fruit farmer is not dependent on a "jar of chemistry, but that there are also larvae, ladybugs, parasitic wasps and lacewings that contribute" (Interview 1).

For two fruit farmers it is about restoring the balance of nature and fruit cultivation in the orchard (Interview 3 & 4). Letting nature do its work, without leaving it completely to nature. That adjustment would remain part of the fruit farming profession (Interview 3). Another fruit farmer would call it "being more concerned with wild bees" (Interview 5). Others call it "taking nature into account in fruit farming practices" (Interview 16 & 17). A representative of the municipality adds the importance of improving the soil in a nature inclusive system (Interview 9).

The representative of FruitMasters would also agree that it is about "producing food in balance with nature" but focuses in her definition on the production of food. "A food forest could be a form of nature inclusivity, but I think this is a lot less workable, because then your productivity per hectare drops so much that you can no longer feed the world" (Interview 6). Expert de Wolf also emphasizes that "you should not want to imitate natural processes, because then it is no longer agriculture" (Interview 14), which tends to separate agriculture and nature as different entities.

Engels of the Fruitmotor adds that nature inclusivity is about restoring ecosystems and a circular economy. She argues that a circular economy would only work if the use of chemicals is being stopped completely, since the circular reuse of materials is only possible when the materials are one hundred percent "clean" (meaning: natural with no chemical inputs). NIF would mean less yield per hectare and a slightly higher price for the consumer. The smaller yield would result in the same profit, due to the higher price and the fact that the fruit farmer would need fewer external inputs in a nature inclusive orchard (Interview 7). A new revenue model is inextricably linked to NIF (Interview 7 & 11). Holster of the Fruitmotor adds that a nature inclusive orchard would become part of the surrounding ecosystem again (Interview 8).

There are some actors that focus on the connection of nature and biodiversity to economic feasibility in defining NIA (Interview 10, 13 & 16). Sustaining the livelihood of the farmer, is important as well in the definition of the Plan of Action (GNMF et al., 2019).

The term "functional agrobiodiversity" is also mentioned as part of the definition of NIF. One of the two interviewed representatives of the province of Gelderland refers to it in terms of the different types of food that is being grown in an orchard. She cites the movie "The Biggest Little Farm" as the definition of nature inclusivity (Interview 11).

Among the interviewed actors, there are similar definitions of nature inclusivity. However, the actors take different starting points in the elaboration of the definitions. Some actors take the natural balance in the orchard as a starting point, while others point to the production of fruit or the revenue model of the fruit farmer as the main focus with taking nature into account as a secondary, adjective matter.

The definition of nature inclusivity has been applied to agriculture and fruit farming in the last five years. In the Rijksnatuurvisie of 2014, nature inclusive was not yet in a definition applied to construction or agriculture and was separately defined as "nature included. It indicates a way of thinking and acting in which nature is always considered" (EZ, 2014, p. 19). This definition fits most definitions that take the production process of fruit or the revenue model of the fruit farmer as starting point while considering nature (Interview 6 & 14).

The definition of the Plan of Action has been composed by a collaboration of some interviewed actors and other stakeholders in the PA of agriculture in Gelderland, this definition is in line with all elements that are cited by the interviewed actors:

> In Gelderland we have socially desirable agriculture that produces within the ecological capacity of the environment. Farmers are rewarded for their efforts. New revenue models make it attractive to be a nature inclusive agricultural entrepreneur. Cycles are closed regionally in such a way that the quality of soil, water and air is good. Agricultural soils have healthy soils, rich in organic matter and full of soil life. We have attractive, vital and regional landscapes. Biodiversity has increased and we see plenty of insects, flowering herbs and farmland birds. Healthy products with recognizable quality are produced here, which we are proud of. Agriculture is prepared for a changing climate and contributes to the prevention of climate change by sequestering carbon in the soil and in landscape features and by reducing greenhouse gas emissions (GNMF, et al., 2019, p. 7).

5.4.2 The dominant and the alternative discourses

In the PA of fruit cultivation in the Betuwe dominant and alternative discourses can be distinguished. Over the past five years, the alternative discourses have gained popularity in the PA. The dominant discourses still exist, and the alternative discourses are currently not adopted by enough actors to become the dominant discourses.

One of the most present dominant discourses in the Betuwe is the dominant Dutch discourse on agriculture: that increase of efficiency and the intensification of the Dutch agriculture is needed to feed the world population and to defeat hunger (Interview 1, 5, 6 & 14; EZ, 2014; LNV, 2018). Nature is seen as a threat to food security and food production (Interview 1 & 6). In line with this dominant discourse is that intensification of agriculture is needed because of the lack of space in the Netherlands and the focus on the export (Interview 1). In harmony with both discourses is the notion that nature and agriculture are separate entities (Interview 6 & 14). These dominant Dutch agricultural discourses are also dominant fruit cultivation discourses in the Betuwe.

As alternative to the last dominant discourse is the notion that agriculture is part of a natural process (Interview 7, 8, 10 & 16) and that even agriculture is dependent on nature (Interview 6 & 15). Extensification of agriculture would mean that food will be valued more, and the function of agriculture will be broadened to societal and ecological revenue (Interview

7). Currently, some fruit farmers make this connection with social and ecological value currently easier in comparison to 2016 (Interview 3 & 4).

Another dominant discourse is in line with the first two dominant discourses on intensification and food safety, and stems from 'ecomodernism', which can be defined as the following: "with technological innovation, climate mitigation does not have to come at the expense of the economy. Instead, economic growth can be decoupled from ecological harm through efficiency gains and the technological intensification of human activities" (Isenhour, 2016, p. 315). Five years ago, this discourse was dominantly present in the Betuwe: a "technological fix" will solve the issues, instead of a system change including nature inclusivity. Even though this discourse has lost support over the years, it is still a dominant discourse (Interview 9, 12 & 13; Fruit Tech Campus, 2020). One of the interviewees of the province of Gelderland even states that there is an increase in research on phasing out nature in the orchard with pollinator-machinery and a form of gutter cultivation, in which nutrients from soil are just added, which is a far-reaching form of technological innovation that would makes nature for fruit production redundant (Interview 12). The alternative discourse stating a system change towards nature inclusivity is needed, begins to receive more support, especially from actors that were involved in the action plan of GNMF, et al. (2019) and some fruit farmers that are active in the learning network "Nature Inclusive Farming Betuwe" (Interview 3 & 4). In general, fruit farmers are more aware of the importance of pollinators than in other agriculture sectors (Interview 9), while the other side of nature inclusivity: the importance of natural pest control animals is still among a minority of fruit farmers (Interview 4 & 9). Some actors acknowledge the importance of nature, but only in combination with technology (Interview 6 & 14), others tend to think inside the fruit-tree box: nut trees or other forms of agriculture do not belong in an orchard (Interview 9).

5.4.3 The frames to resist

The pressure to produce class 1 fruit in order to earn enough profit in the current intensive agricultural system is an incentive for conventional fruit production and retains bigger nature inclusive implementations (Interview 1, 4, 5 & 12). Fruit farmers that have a revenue model that is not only dependent on fruit production and gain profit from a farm shop or the hospitality sector, are more likely to take bigger steps in the nature inclusive transition (Interview 3 & 8). Part of this frame is the notion that a reward system is missing for nature inclusivity, this could compensate the lost revenue by implementing nature inclusivity (Interview 2 & 8).

5.4.4 The frames to empower

Including nature regionally in more than only orchards of fruit farmers, would make more societal (for a change in mindset and awareness) and ecological impact (for biodiversity). It needs to be a collaboration among various actors. This regional perspective has gained more support over the analysed five years (Interview 7 & 8; GNMF, et al. (2019); LNV, 2018). This regional perspective also occurs in combination with a broader notion of sustainability: "A Dutch apple that is locally produced should be the option in the supermarkets, instead of the option of imported apples from Chili that have an enormous carbon footprint" (Interview 4).

Furthermore, the awareness of consumers on the importance of pollinators has increased over the analysed years. Nature inclusivity could get a boost when this awareness is broadened by the importance of natural pest control animals, like earwigs, which did not happen in these five years. The majority of consumers still have the understanding that fruit should look like class 1 fruit, which is getting more difficult with fewer crop protection products and more dependence on nature inclusivity (Interview 6).

A frame that empowers NIF is the frame that nature looks good, is appealing, good for tourism and (mental) health, which has gained support by actors active in fruit cultivation over the years (Interview 8).

5.4.5 Conclusion discourse

In the data collection phase, the definition of nature inclusivity did not result in a clear change over time. Five years ago, the majority of actors did not think about the definition of NIF and only started to define it later.

The change in mindset among some actors is interesting, these actors started to see nature and fruit production as two sides of the same coin, while other actors maintained their perspective that both are separate entities. Two other dominant discourses are: the increase of efficiency and intensification of agriculture is needed for food security, and technology is more capable to fix the problems than nature. The alternative discourse stating a system change towards nature inclusivity is needed, has gained more support over the analysed five years.

Even though the awareness of consumers on the importance of nature has increased, the pressure of the production of class 1 fruit only changed for some actors that have a revenue model with several money-generating activities, it is a broadly used frame to resist

NIF. Two frames that empower NIF gained more support during the analysed five years. Firstly, nature is extra appealing for tourism and good for the (mental) health of citizens. Secondly, the importance of various actors in the region to collaborate on gaining a bigger societal and ecological impact.

6. Discussion

6.1 Contributions to the debate

The debate surrounding nature inclusive fruit cultivation in the Betuwe is part of the broader debates about sustainability transitions in the food system. In the light of the many protests that took place in the Netherlands in June and July of 2022, the importance of this research is further underscored. Especially the framing of the media and the so-called “hardening of the protest” are remarkable. It is called the “farmers protests”, while it are mostly livestock farmers that are at the frontline of the protest. Without specification of the profession, the media tends to ‘lump’ all farmers ‘together’, even though many arable, agri- and horticulture (of which fruit is a subcategory) farmers might not be part of these protests and are willing to contribute or make the transition towards sustainable farming. This shows the importance of specific research and case studies. “Farmers” are not one group, it is needed to make a distinction of several categories, since the various professions also have different roles in the transitions and differentiated connections to issues as animal welfare, heavy metals or microplastics. The analysed plan of action and platform of NIA shows that plans and projects are often focused on “agriculture”, which is an important starting point, but needs specific elaboration for various production processes, since fruit farmers themselves also see fruit farming as a separate profession from arable or livestock farming and therefore need specific knowledge and skills for NIF.

Even though specific research is needed and the distinction between various types of farming is also useful, it should also be reflected towards a broader sustainability debate on the food system transition. Often, there is a lack of this connection within research (which is also a limitation of this research) and action plans or policies. Nature inclusivity within the food system might be part of the debate on proteins in which plant-based proteins are proven as more efficient and sustainable way of food producing than animal proteins (Grasso et al., 2021). Separating these debates means that connections are missed, such as the fact that less land is needed for a food system that does not revolve around animal proteins and the implications this has for possibilities for extensification of other forms of agriculture (Tague, 2022).

The results of the research show that even though there are some changes towards nature inclusivity, these are mostly implemented when rules become mandatory. Concrete goals and a long-term vision would contribute to the transition, to include a broader group of

farmers than the frontrunners. Monitoring of this goal and vision would allow for early redirections, which is in line with broader sustainable food transition debates on working environmental policies (Fanzo et al., 2021).

Even though there is a broad collaboration on NIA and NIF specifically in the Betuwe, the research shows that there are some actors, like supermarkets and financial institutions, that are missing to overcome the barriers, which is in line with current sustainable food debates on the role of financial institutions, international and national policies and supermarkets in the transition (Dombret & Kenadjian, 2021; Lee, Cullerton & Herron, 2020).

6.2 Other insights that emerge from different perspectives

In a research project, the researcher makes a choice on the theories and the conceptual framework, therefore it is interesting to look at the analysis with other theories (van Thiel, 2014). There are many social theories that provide a framework to analyse policy change. A few examples are the configuration approach (in het Veld et al., 1991), the social practices theory (Shove et al., 2012) and Hajer's argumentive approach (1997). Another interesting perspective that has been used in recent research on NIA in the Netherlands is the Innovation Systems Approach which contains overlap with the PAA, but also contains some new elements (Vermunt et al., 2022).

The configuration approach is a theory in which the continuous interaction between actors drives policy change (in het Veld et al., 1991). This approach consists of two important dimensions: the social and the cognitive. Whereas the social dimension focuses on certain rules of and patterns in interaction, the cognitive dimension incorporates the changing and stabilizing perception of the real world (Termeer, 1993). While looking at the results of the case study of fruit cultivation in the Betuwe, it becomes clear that the facilitation of interaction is seen as a very important element of the transition towards NIF. In this specific case, niche actor the Fruitmotor was often mentioned as the facilitator of conversations and cooperation. The deep-seated mindset of agriculture and nature as two separated, even competitive entities, is being contested and debated in the interaction between the actors that are, in terms of the MLP, in the regime. This mindset is even present in fruit farmers that are a member of the Fruitmoto, and might therefore be labeld as frontrunners, however the results have indicated a limited change of various degrees to this mindset during the past five years. According to Natuur & Milieu Gelderland (Interview 10), this would not have been the case if the actors would have stayed "on their own islands" and would not have emerged in

conversations. The importance of communication, in the form of conversations or dialogues is also amplified in the literature (Bushe & Marshak, 2015; Dutta & Zapata, 2019 & Mena et al., 2009).

As an addition to this prior way of looking at the results, the argumentive approach of Hajer (1997), would also be able to contribute as a theory to the analysis of the results. Instead of deriving discourses in the analysis, the researcher would identify story-lines. The central concept of this theory is, next to its discourse-coalitions (which are also a part of the PAA theory), the 'story-line'. Story-lines can be defined as "narratives on social reality through which elements from many different domains are combined and that provide actors with a set of symbolic references that suggest a common understanding" (Hajer, 1997, p. 62). Story-lines bundle knowledge, arrange actors and generate discourse coalitions (Nielsen, 2014). Looking at the results of the analysis of this research, there are a few story-lines, that are now called dominant and alternative discourses that can be distinguished: one based on ecomodernism, one that revolves around the notion that intensification in the agricultural system is needed for food security and one that states that nature should be separate from agriculture. The actors that reproduce these story-lines can be categorised in so called 'discourse-coalitions', even though the collaborations and the dialogues are meant to unite various actors, instead of polarizing the actors involved again, it may still be useful to find similarities between the coalitions as well.

As stated in earlier chapters, Arts et al. (2006) emphasize that the PAA can be used to analyse changes in structures of society and changes in day-to-day practices of policy processes. Changes in day-to-day practices in society would also be something that can be related to the PAA, especially combined with the discourse side of the triangular pyramid. During the data collection- and analysis phase, social practice theory came forward as another useful theory. Even though the elements of Shove et al. (2012) do to a certain degree come about in the PAA, using both theories would have captured conflicting ideas on a practice and a structure level, and provides a wider picture (Liefferink, 2006). Even though the meaning of the practices appeared in the concept of discourse in the PAA and the materials and skills and know how were present in the sub-chapter of the resources (of the PAA), some of the practical content of the interviews was lost by grouping discourse and having to leave out the social practices, which was a conceptual choice at the beginning of the research. However, the practical side, which can well be captured with Shove's practice theory (Halkier, Katz-Gerrof & Martens, 2011), could have been useful to specifically identify changes is social practices that came about by a changing PA. Shove's theory on social practices contains the following

elements: Materials, Meaning and Skills and know how. When looking through a practice lens, it can be argued that these elemenets have changed in the past five years, similar to the elements in the PA. Many social practices, like the creation of flower borders or participating in the Planetproof-certification, are introduced in the last five years. Other practices, like the use of pesticides and crop protection products, or the vegetation under the trees have changed less drastically. Especially the elements of materials and meaning have changed a lot over the past five years. The element of skills and know how has also changed, but also still requires some change to contribute to more nature inclusive social practices.

The Innovation System Approach (ISA) has currently been used in research on NIA in the Netherlands by Vermunt et al. (2022). In the research, a broad definition is used of the innovation system, extending beyond infrastructures and technology- and knowledge transfer which was originally the focus of Lundvall (1985) and Freeman (1995). They define innovation systems as "societal subsystems, actors, and institutions contributing in one way or the other, directly or indirectly, intentionally or not, to the emergence or production of innovation and serving a particular societal need such as transport or food provision" (Vermunt et al., 2022, p. 4). Innovation systems contain the structural elements: actors (individuals, organisations and networks), institutions ('rules of the game'), interactions (relationships in networks and bilateral) and infrastructure (physical, knowledge and financial) (Vermunt et al., 2022). Even though there are similarities between the elements of both theories, the ISA would add to the PA and the elements of the MLP that have been used in this research by doing research on the interactions, in the form of relationships between actors. The institutions are embedded in the element of rules of the PA, although the ISA calls soft institutions 'shared social and cultural values' which is more specific than the term "informal rules". The element of 'infrastructure' would also add to the PA with the physical subcategory on 'machinery, roads, ports and buildings', which is not contained in the PA and would possibly add to the research. A variant on the ISA in the form of "Innovation Ecosystems" adds to both the ISA as the PA with the component of artifacts, which challenges the researcher to also look at objectives and how they impact (farm) culture. However, the definition used by Granstrand & Holgersson (2020) does show some similarities with the element 'resources' of the PA: "products and services, tangible and resources, technological and non-technological resources, and other types of system inputs and outputs, including innovations" (p. 3).

6.3 Limitations of the research

There were some limitations in this research, namely the choice for actors and especially the limited amount of fruit farmers, the choice of semi-structured interviews and document analysis and the choice of the used theory. These will be further elaborated in the following paragraph.

Firstly, due to the limited time frame for this master thesis research, not all actors could be interviewed in the fruit cultivation sector in the Betuwe. Some choices had to be made, in whom to interview and who not. Especially the actors that were mentioned a lot in the exploratory conversations and the first interviews, were invited for an interview. By using the snowball method, more actors were invited as well. The choice to interview fruit farmers that were involved with projects of the Fruitmotor already, can be seen as a limit to the research. Even though the interviewed fruit farmers seemed to have a good overview over the broader mindset among fruit farmers, thanks to: a function at the interest group for fruit farmers (NFO), so called “good contacts with neighbours” or the learning network of the Fruitmotor. It would still have been interesting to talk to fruit farmers that were not at all involved with the Fruitmotor. By interviewing actors in the fruit sector who are not directly involved with (projects of) the Fruitmotor but who work closely with fruit farmers, the impact of this limitation was lessened.

Secondly, the methodological choice to conduct semi-structured interfiews and to analyse documents posed a limitation. Even though these methods were helpful to construct the change of the PAA over the last five years, it could have been an addition to make use of focus group research. Focus groups are often used to study the response and the discourse use of a small group whose response can be expected from a larger population (Barbour & Kitzinger, 1999; Edmunds, 1999; Merriam-Webster, n.d.). This focus group could possibly have given an even better representation of the current discourse and mindset among actors in the fruit sector in the Betuwe, especially since meaning is often constructed and transformed in communication between actors (Batel & Castro, 2018).

Lastly, since this research is focused on the development of the PA and not the transition within an agricultural and food system, the MLP has only been used for the element of discourse and actors and not to research a transition within the agricultural and food system. Which would still be interesting, but then with the theory of transformative governance, instead of only the MLP. Since the theory of transformative governance is

especially developed with biodiversity in mind and uses a broad range of governance approaches (Visseren-Hamakers et al., 2021).

7. Conclusion

The analysis of the PA of NIF in the Betuwe resulted in a conclusion that there is a change in the majority of analysed elements over the timespan of 2016 until 2021. Even though some elements or parts of elements remained stable in these five years, a change in one or more of the four elements of the PA, means that the PA is on a changing course. In this chapter, a short conclusion on all elements and recommendations for further research will be provided.

Even though only one new actor (the Fruitmotor) became active, there was a change in roles of the existing actors in the past five years. The focus shifted towards more collaboration and nature inclusivity was put on the agenda. For some actors, specific expected roles were formulated by interviewees and in documents. Such foreseen roles will most likely change more in the future.

The element of resources changed more than the element of power distribution. There was especially an increase in knowledge, a bigger focus on nature in education and skills, more exchange of best practices and information on NIF. Additionally, more funds have become available for the implementation of nature inclusive measures. The barriers of knowledge exchange, the perception of financial risks and the power distribution remained stable for the majority of actors over the analysed five years.

With regards to the rules in the PA, a clear distinction can be observed. While there has been change when it comes to informal rules, the formal rules have stayed largely the same. The only change that was found in the formal rules is the increase of legislation on pesticides. An important informal rule has stayed the same: the one that perceives nature as "messy". The Beedeal, a voluntary initiative, was already present in 2016, followed by more intentions of changing the informal rules were added, like the plan of action.

The discourses that are present in the PA have undergone some changes to some extent. For most actors, the definition of NIF was formed during the analysed five years. The dominant discourses remained stable, while some actors started using the alternative discourses more. Most actors see the intensification of Dutch agriculture as a necessity for food security and production. Another dominant discourse is the perceived dichotomy of nature and agriculture and the impossibility of bringing them together since that would mean a less intensive form of agriculture. The alternative discourse that agriculture is part of an ecosystem and nature inclusivity would result in an increase of societal and ecological values, gained more support over the analysed years. Lastly, the discourse that technological

innovation is the solution, remained dominant, while the discourse on the importance of nature in the transition gained support over the years.

7.1 Recommendations

For the benefit of research on the PA of NIF, it would be useful to do more research on principles of other types of sustainable farming, next to nature inclusivity, like regenerative farming, to see if and how these principles can be implemented into NIA.

It would be useful to examine the role of consumers extensively by doing quantitative research among citizens in the Netherlands. The research could focus on the question: are citizens willing to pay more to support fruit farmers to become nature inclusive? Since this has been studied only for meadow birds (Runhaar, 2016).

It would be interesting to change the theoretical framework and do more research on story-lines and discourse coalitions. Even though you divide people into coalitions, it may be interesting to look at it with the ACF framework, including (policy) beliefs and to see who is the policy broker and what role that policy broker may take in the transition of NIF or NIA in the Netherlands.

For the European Union and the national governments, it would be useful to set specific goals per country and monitor these goals extensively. The self-monitoring and voluntariness of much legislation on sustainability shows a lack of action. Also in this research, the mandatory regulations of less pesticide products available are implemented much earlier than voluntary measures. Specific goals on nature inclusivity (as in percentages) are missing, which would contribute to a long-term vision of the various actors.

The food system transition can only be made if all actors are taking their responsibility. It is important that all responsibilities are clear and that all actors are monitored on these responsibilities. In this research, the fruit farmer seems to deal with mandatory changes (with the decline of available crop protection products and pesticides), while actors like supermarkets and financial institutions can take responsibilities voluntarily without consequences if they do not contribute to the nature inclusive transition in fruit cultivation.

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9. Appendix

9.1 Appendix A: Table of the Agroecological Biodiversity Index

In this appendix the table of the Agroecological Biodiversity Index of Jones et al. (2021) is incorporated with its measurements categories, corresponding pillars and relating indicators.

Table 4. ABDI indicator framework of Jones et al. (2021).

Measurement category	Pillar	Indicator	Aims to capture
Status	Consumption	Varietal diversity	Food consumption diversity at the varietal level (for example, basmati, long grain or wild rice) or breed level (for example, Saddleback, Duroc or Hereford pig), since each variety or breed has a unique nutritional value. For example, carotenoid levels are almost null in the Cavendish banana cultivar, whereas specific local cultivars from Papua Guinea contain >100 mg of carotenoids[30].
		Species diversity	Food consumption diversity at the species level (for example, apple, orange or pear), since each species has unique nutritional characteristics. The larger the dietary species richness, the larger the likelihood of nutrient adequacy[31]. For example, maize is high in carbohydrates, beans are rich in protein and fibre, and pumpkin is rich in vitamin A[32].
		Functional diversity	Food consumption diversity at the nutritional function level—that is, the diversity of food groups (for example, cereals, vegetables or fruits) or nutrients required for a healthy diet, since each food group has a unique nutritional value. For example, a healthy diet for women requires the daily consumption of at least five functional food groups[33].
		Underutilized species	Use of underutilized or neglected species, varieties or breeds in food consumption, which are often rich in nutrients that play a critical and often undervalued role in people's diets[34]. Many underutilized plant species have excellent nutritional profiles[7]. For example, indigenous vegetables such as roselle and hair lettuce are known to be important sources of iron, while others such as moringa (*Moringa oleifera*), African nightshade (*Solanum scabrum*) and jute mallow (*Corchorus olitorius*) are excellent sources of provitamin A[35].
	Production	Varietal diversity	Agricultural production diversity at the varietal or breed level, since each variety or breed has a unique agronomic and ecological value that can be managed to improve sustainability outcomes. For example, cropping varietal mixtures can support insect pest control and improve yields and economic and nutritional outcomes[36].
		Species diversity	Agricultural production diversity at the species level, since increased crop, livestock, tree or fish species diversity is often associated with improved ecosystem functioning[37,38,39,40]. For example, complex rice systems integrating fish, duck and azolla in rice cropping have been shown to increase system resilience compared with conventional or organic monocultures[7].
		Functional diversity	Agricultural production diversity at the level of agronomic or ecological traits (for example, drought tolerance, disease resistance, root depth or leaf area), since increased functional trait diversity is associated with improved ecosystem functioning (for example, soil nutrient cycling or water purification) that is beneficial for agricultural and natural systems[41,42]. For example, rotating potato with cover crops and deep-rooted crops such as alfalfa or small grains can improve soil quality, disease suppression and tuber yield and quality[43].
		Underutilized species	Agricultural production of local, indigenous, traditional or neglected species, varieties or breeds, which are often better adapted to local environmental conditions, making production systems more resilient to environmental stressors[44]. For example, traditional bean varieties in Uganda were found to have higher resistance than modern varieties to pests and diseases[45].
		Pollinators and natural enemies	Diversity of crop pollinators and natural enemies of crop, fish and livestock pests, where these provide pollination and biological pest control services to agriculture. For example, most fruits and vegetables are animal-pollinator-dependent crops[46], and fruit and vegetable production systems with an abundance of suitable pollinator species are more likely to have plentiful harvests, benefiting agriculture and biodiversity[47].
		Soil biodiversity	Diversity of soil organisms, which support nutrient cycling and maintain healthy soils, which are fundamental to sustainable agriculture production[48].
		Landscape complexity	Complexity of agricultural landscape composition and configuration, since more complex landscapes (for example, with a higher proportion of semi-natural habitat) are associated with higher levels of biodiversity and improved ecosystem service provision to agriculture (for example, pollination and pest control)[49]. For example, Fahrig et al.[50] show that decreasing crop field size is consistently associated with positive effects on farmland biodiversity, benefiting from easy access to the semi-natural field boundary habitats. The proportion of natural habitat can be increased on-farm through flower strips, hedgerows and set-aside, and off-farm by safeguarding forests, shrubland and grassland remnants.

	Conservation	Varietal diversity	Diversity of genetic resources for food and agriculture within individual crops and livestock species in conservation, since each variety or breed has unique agronomic, ecological and nutritional traits. Their conservation for future use is critical for identifying desirable traits for breeding varieties and breeds adapted to new conditions[51]. For example, the conservation of many varieties of a single crop will help ensure the future capacity of that crop to adapt to droughts, become resistant to new pests and diseases, or provide better nutritional functions[51].
		Species diversity	Diversity of genetic resources for food and agriculture in conservation at the species level, since each species has unique agronomic, ecological and nutritional traits. Their conservation for future use is critical for identifying new desirable traits for breeding crops, livestock and fish adapted to new conditions. For example, different wild relatives of crops, livestock and fish (including their ancestors) can provide novel adaptive and/or resistance genes as a result of evolutionary processes in nature that can be used in breeding.
		Functional diversity	Diversity of genetic resources for food and agriculture at the species and varietal/breed levels in conservation that provide essential roles and functions at the level of agronomic, ecological and nutritional traits to meet consumer demands and overcome production challenges. For example, genetic sequencing was used to identify traits associated with drought tolerance in chickpeas[51].
		Underutilized species	Conservation of local, indigenous, traditional, neglected and underutilized species and varieties or breeds used for food and agriculture, including their wild relatives, landraces and breeds, some of which are threatened with extinction after millennia of selection by farmers[51].
Action	Consumption	Management practices supporting agrobiodiversity	Tools or mechanisms to foster the consumption of diverse foods for healthy diets (for example, dietary guidelines).
	Production	Diversity-based practices	Adoption of diversity-based farming practices, such as intercropping, agroforestry, crop rotation and mixed farming systems, which help increase the level of diversity and resilience in production systems.
		Management practices supporting agrobiodiversity	Adoption of other farming practices that help maintain and enhance levels of agrobiodiversity, such as reduced agrochemical inputs and reduced tillage.
	Conservation	Management practices supporting agrobiodiversity	Tools or mechanisms to protect and safeguard genetic resources for food and agriculture for future use, such as gene banks that conserve accessions of plant genetic resources for food and agriculture.
Commitment	Consumption	Commitments supporting agrobiodiversity	Policy commitments to enhancing agrobiodiversity in consumption for healthy diets, disaggregating policies that mention agrobiodiversity in this context from those that define strategies or set targets to achieve change. Relevant commitments include, for example, Bhutan's national strategy to promote local varieties and their market opportunities.
	Production	Commitments supporting agrobiodiversity	Policy commitments to enhancing agrobiodiversity in production for sustainable agriculture, disaggregating policies that mention agrobiodiversity in this context from those that define strategies or set targets to achieve change. Relevant commitments include, for example, Somalia's national target to ensure that, by 2030, areas under agriculture, aquaculture and forestry are managed sustainably through diversifying management practices, such as with agroforestry.
	Conservation	Commitments supporting agrobiodiversity	Policy commitments to enhancing agrobiodiversity in conservation for future use options, disaggregating policies that mention agrobiodiversity in this context from those that define strategies or set targets to achieve change. Relevant commitments include, for example, India's national target to conserve 70% of the genetic diversity of crops, including their wild relatives and other socio-economically valuable plant species, while respecting, preserving and maintaining associated indigenous and local knowledge.

The 22 indicators in the ABDI are designed to measure agrobiodiversity within each pillar of the food system (consumption, production and conservation) across three measurement categories (status, action and commitment).

9.2 Appendix B: Overview of action plans and policies

Table 5. The key principles and actions of the "Transforming food and agriculture to achieve the SDGs"-report of the Food and Agriculture Organization (FAO, 2018).

Key principles	Actions
• Increase productivity, employment and value addition in food systems; • Protect and enhance natural resources; • Improve livelihoods and foster inclusive economic growth • Enhance the resilience of people, communities and ecosystems; • Adapt governance to new challenges.	1. Facilitate access to productive resources, finance and services; 2. Connect smallholders to markets; 3. Encourage diversification of production and income; 4. Build producers' knowledge and develop their capacities; 5. Enhance soil health and restore land; 6. Protect water and manage scarcity; 7. Mainstream biodiversity conservation and protect ecosystem functions; 8. Reduce losses, encourage reuse and recycle, and promote sustainable consumption; 9. Empower people and fight inequalities; 10. Promote secure tenure rights; 11. Use social protection tools to enhance productivity and income; 12. Improve nutrition and promote balanced diets; 13. Prevent and protect against shocks: enhance resilience; 14. Prepare for and respond to shocks; 15. Address and adapt to climate change; 16. Strengthen ecosystem resilience; 17. Enhance policy dialogue and coordination; 18. Strengthen innovation systems; 19. Adapt and improve investment and finance; 20. Strengthen the enabling environment and reform the institutional framework.

Table 6. The pathways and opportunities to transform the food systems by 2045 (IPES-Food & ETC Group, 2021).

Pathway 1: Rooting food systems in diversity, agroecology and human rights
Opportunity 1: Building resilience through diversity and agroecology
Opportunity 2: Defending human rights, nature rights, and renegotiating the contract between state and society
Opportunity 3: Accelerating shifts towards territorial supply chains and ethical consumerism
Pathway 2: Transforming governance structures
Opportunity 4: Reviewing, reforming and reconfiguring the UN's agri-food agencies
Opportunity 5: Cracking down on corporate impunity and techno-fixes
Opportunity 6: Adopting an international agreement on food emergencies
Opportunity 7: Building food policies, food policy councils, and new forms of citizen participation

Pathway 3: Shifting financial flows
Opportunity 8: Redirecting Research & Development and technical budget lines to sustainable food systems
Opportunity 9: Reforming major commodity subsidies
Opportunity 10: Levying junk food and taxing corporations fairly
Pathway 4: Rethinking the modalities of civil society collaboration
Opportunity 11: Making cross-sectoral collaborations the norm
Opportunity 12: Developing new tools to block corporate commodity chains and hack closed-door negotiations
Opportunity 13: Building new partnerships to finance a quarter century of food system transformation

Table 7. European Union Biodiversity Strategies over the years (sources are in the table).

Biodiversity Strategy 2020, adopted in 2010	**Biodiversity Strategy 2030, adopted in 2021**
European Commission (2011)	European Commission (2021b)
2050 vision: "By 2050 European Union biodiversity and the ecosystem services it provides – its natural capital – are protected, valued and appropriately restored for biodiversity's intrinsic value and for their essential contribution to human wellbeing and economic prosperity, and so that catastrophic changes caused by the loss of biodiversity are avoided" (p. 3).	**2050 vision:** "Ensure that by 2050 all of the world's ecosystems are restored, resilient, and adequately protected. The world should commit to the net-gain principle to give nature back more than it takes. As part of this, the world should commit to no human-induced extinction of species, at minimum where avoidable" (p. 3).
2020 headline target: "Halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss" (p. 3).	**2030 milestone:** "Ensure that Europe's biodiversity will be on the path to recovery by 2030 for the benefit of people, the planet, the climate and our economy, in line with the 2030 Agenda for Sustainable Development and with the objectives at the Paris Agreement on Climate Change" (p. 3).

Table 8. European Union's Biodiversity Strategy 2020 (European Commission, 2011).

Target 1: Fully implement the birds and habitats directives
Action 1: Complete the establishment of the Natura 2000 network and ensure good management
Action 2: Ensure adequate financing of Natura 2000 sites

Action 3: Increase stakeholder awareness and involvement and improve enforcement
Action 4: Improve and streamline monitoring and reporting
Target 2: Maintain and restore ecosystems and their services
Action 5: Improve knowledge of ecosystems and their services in the EU
Action 6: Set priorities to restore and promote the use of green infrastructure
Action 7: Ensure no net loss of biodiversity and ecosystem services
Target 3: Increase the contribution of agriculture and forestry to maintaining and enhancing biodiversity
Action 8: Enhance direct payments for environmental public goods in the EU CAP
Action 9: Better target Rural Development to biodiversity conservation
Action 10: Conserve Europe's agricultural genetic diversity
Action 11: Encourage forest holders to protect and enhance forest biodiversity
Action 12: Integrate biodiversity measures in the forest management plans
Target 4: Ensure the sustainable use of fisheries resources
Action 13: Improve the management of fished stocks
Action 14: Eliminate adverse impacts on fish stocks, species, habitats and ecosystems
Target 5: Combat invasive alien species
Action 15: Strengthen the EU Plant and Animal Health Regimes
Action 16: Establish a dedicated instrument on Invasive Alien Species
Target 6: Help avert global biodiversity loss
Action 17: Reduce indirect drivers of biodiversity loss
Action 18: Mobilise additional resources for global biodiversity conservation
Action 19: 'Biodiversity proof' EU development coordination
Action 20: Regulate access to genetic resources and the fair and equitable sharing of benefits arising from their use

Table 9. European Union's Biodiversity Strategy 2030 (European Commission, 2021b).

Pillar 1: Protecting nature in the EU
Protect 30% of the EU's land and 30% of its seas for nature
Strictly protect 10% of our land and sea for nature
Ensuring a coherent Trans-European Nature Network
Effectively manage all protected areas

Pillar 2: Restoring nature in the EU

- Propose legally binding EU targets for restoration
- Ensure 30% of EU protected species and habitats are in favourable conservation status or have positive trends by 2030
- Bring nature back to agricultural land
- Restore soil ecosystems
- Reverse the decline of pollinators
- Increase the quantity of forests and improve their health and resilience
- Restore Europe's free flowing rivers
- Create win-wins for energy generation
- Restore marine ecosystems
- Bring nature back to urban spaces
- Reduce pollution
- Tackle invasive alien species

Pillar Three: Enabling transformative change

- Create a new European biodiversity governance framework
- Build on an integrated and whole-of-society approach
- Unlock at least €20 billion a year for nature
- Ensuring the sustainability of the financial system
- Step up implementation and enforcement of EU environmental legislation
- Ensure the full and timely implementation of the EU Nature Directives
- Improve knowledge and research
- Improve education and skill

Pillar Four: EU action to support biodiversity globally

- Broker an ambitious post-2020 global framework for biodiversity
- Protect marine biodiversity
- Strengthen EU trade agreements
- Crack down on illegal trade
- International cooperation, neighbourhood policy and resource mobilisation

Table 10. European Commission's 'Farm to Fork strategy' (European Commission 2020).

1. Need for action
2. Building the food chain that works for consumers, producers, climate and the environment
• Ensuring sustainable food production • Ensuring food security • Stimulating sustainable food processing, wholesale, retail, hospitality and food services practices • Promoting sustainable food consumption and facilitating the shift to healthy, sustainable diets • Reducing food loss and waste • Combating food fraud along the food supply chain
3. Enabling the transition
• Research, innovation, technology and investments • Advisory services, data and knowledge sharing, and skills
4. Promoting the global transition

Figure 17. The 10 elements of the European Green Deal (European Commission, 2019).

Figure 18. The 10 key objectives of the Common Agricultural Policy 2023-27 (European Commission, 2021e, p. 15).

Table 11. Elaboration on the key objectives of CAP 2023-27 (European Commission, 2021d).

To ensure a fair income for farmers
Supporting viable farm income and the resilience of the agricultural sector across the EU, in order to enhance long-term food security and agricultural diversity, as well as to ensure the economic sustainability of agricultural production.

To increase competitiveness
Enhance market orientation and increase farm competitiveness both in the short and long term, including greater focus on research, technology and digitalisation.

To improve the position of farmers in the food chain
Improve farmer's position in the value chain through measures such as strengthening cooperation among farmers, increasing market transparency and ensuring effective mechanisms against unfair trading practices

Climate change action
Contribute to climate change mitigation and adaptation, including by reducing greenhouse gas emissions and enhancing carbon sequestration, as well as promoting sustainable energy.

Environmental care
Foster sustainable development and efficient management of natural resources such as water, soil and air, including by reducing chemical dependency.

To preserve landscapes and biodiversity
Contribute to halting and reversing biodiversity loss, enhance ecosystem services and preserve habitats and landscapes.

To support generational renewal
Attract and sustain young farmers and new farmers and facilitate sustainable business development in rural areas.

Vibrant rural areas
Promote employment, growth, gender equality, including the participation of women in farming, social inclusion and local development in rural areas, as well as the circular bio-economy and sustainable forestry.

To protect food and health quality
Improve the response of EU agriculture to societal demands on food and health, including high-quality, safe and nutritious food produced in a sustainable way, to reduce food waste, as well as to improve animal welfare and combat antimicrobial resistance.

Fostering knowledge and innovation
Modernise agriculture and rural areas through fostering and sharing knowledge, innovation and digitalisation, and by encouraging their uptake by farmers through improved access to research, innovation, knowledge exchange and training.

Table 12. Review of CAP 2023-27 of BirdLife et al. (2021).

Climate inaction		
What's needed	**What's in the new CAP**	**Rating**
End funding for intensive livestock production, reduce the numbers of animals farmed.	Harmful CAP subsidies to intensive livestock farming will continue through coupled payments (currently around €3bn per year go to livestock production) and investment support (such as livestock stables). Eco-schemes to improve animal welfare are at risk of becoming hidden subsidies for factory farms.	

Better manure and fertiliser management to reduce nitrogen pollution.	No mandatory requirements to reduce nutrient use. Use of a 'Farm Sustainability Tool for Nutrients' aimed at achieving nutrient balance, preventing emissions into the air, soil and water, was initially proposed as mandatory, but will now be voluntary.	
Protect and restore grasslands and peatlands as key carbon sinks.	Mandatory rules ('conditionally') to protect grasslands and peatlands have been seriously weakened by ministers and MEPs. CAP beneficiaries can plough up additional grasslands and manage peatlands unsustainably and still receive funding.	

Destruction of biodiversity		
What's needed	**What's in the new CAP**	**Rating**
Restore at least 10% space for nature (e.g. flower strips, hedgerows) on all farms.	Weak mandatory rules: the area is likely to be under 5% space required to be set aside, whereas the minimum to be effective is 10-14%. Non-arable farms (39% of EU farmland) are exempted. There is no binding link to the EU Biodiversity Strategy target of at least 10% of landscape features on farms by 2030	
Significant funds for tailored biodiversity schemes, around €15 billion per year.	There will be no fixed budget for biodiversity schemes, which are needed to deliver more targeted support for species and habitats that are under threat. If member states do put funds towards biodiversity schemes, they will not be judged or monitored on whether these schemes are effective, leaving ample work for weak or even fake schemes.	
Measures to transition away from intensive practices and away from pesticides and fertilisers.	No binding provision to transition theory away from pesticides and fertilisers, or to boost organic farming. Voluntary environmental schemes like eco-schemes could end up funding very minimal changes. On the contrary, harmful subsidies like inappropriate irrigation expansion, investments in machinery, and support to increase production (coupled support) can continue, driving intensification.	

Widespread pollution		
What's needed	**What's in the new CAP**	**Rating**
Reduce nitrogen and methane pollution by reducing herd sizes, stocking densities and fertiliser use.	No measures to reduce pollution sources, but rather significant opportunities to subsidise livestock farming. These include: couple payments and investment support, and even 'eco-schemes' for animal welfare, which all come without environmental safeguards and can hence go to intensive livestock farms associated with air, soil and water pollution.	
Reduce pesticide use, exposure and residues (i.e. by strengthening conditionality rules like crop rotation).	Weakened 'conditionally' requirements for CAP beneficiaries, which will not address pollution from agro-chemicals. Weak requirements on buffer strips, crop rotation, and space for nature won't be capable of firmly addressing pesticide dependency and exposure. The reform does not even oblige CAP beneficiaries to respect the principle of integrated pest management, enshrined in EU law since 2009.	

A threat to our long-term food security		
What's needed	**What's in the new CAP**	**Rating**
Prevent unsustainable water use.	No new safeguards on public funding for irrigation, despite evidence that investment support for irrigation has exacerbated pressures on water bodies in parts of Europe. Measures to help farmers transition to less water-intensive systems will remain purely voluntary, so no change is secured.	
Foster resilience and risk prevention.	CAP 'risk management' can fund insurance pay-outs for crop failures, with no strings attached (e.g. having taken preventive measures). This encourages risky and unsustainable practices, rather than preventive action to rebuild healthy ecosystems, minimise and adapt to climate change (e.g. water saving), and use resources sustainably.	

Fake performance and a free for all model		
What's needed	**What's in the new CAP**	**Rating**
Specific and quantified EU-level and national targets, at least for the key Green Deal objectives.	The CAP's 'performance framework' is based on vague objectives, lacking quantitative EU targets and no obligation on national governments to set meaningful targets at national level. The Commission can only base its assessment of CAP Strategic Plans on qualitative aspects which will be very hard to benchmark against the needed ambition to deliver on the Green Deal objectives.	
Robust indicators and targets to allow proper performance monitoring.	The 'performance-orientation' of the new CAP is based on Member States setting targets on a set of 'result' indicators. However, rather than measuring actual environmental results, they measure how many hectares a particular scheme (e.g. for climate) has been rolled out on. The easier and less demanding the scheme, the easier it is to reach the target.	
Strong and transparent rules, empowering the Commission to require changes or reject poor CAP Strategic Plans.	Weak provisions on the Commission's power during the approval process and no opportunity for public scrutiny before the plans are approved. The Commission will only be able to assess the consistency of the CAP strategic plans with the general principles of EU law and vague CAP objectives. This will make it extremely difficult for the Commission to reject CAP plans that fall short on environmental and climate commitments.	

9.3 Appendix C: Interview guides

In this appendix the interview guides for the 17 interviews are incorporated, starting with a general introduction that has been used as a start in all four interview guides.

9.3.1 General introduction

Introduction interviewer / anonymization / permission recording

- [Introduction Britt Dragstra and Sanne Jäkel];
- We have planned about [45 to 60 (A)] / [30 to 45 (B/C/D)] minutes for this interview;
- If you wish, you may remain anonymous, this means that we do not mention your name in our theses;
- We would love to record the interview so that we can process it calmly. This recording will be destroyed after handing in the data set at Radboud University for the end version of our master theses. Do you give verbal permission for this? [Depending on the answer: start recording];
- Finally, you should know that you can stop the interview at any time, without giving a reason.

9.3.2 Interview guide A: Fruit farmers

Introduction

- Would you like to give a brief introduction about yourself and the company?
- Why are you doing this job?
- What are the fun aspects of fruit farming for you?
- What are the less pleasant aspects of fruit farming for you?

Change over time

- If you would describe fruit cultivation 5 years ago (2016), what does it look like?
    - *[Continue to ask] The fruit cultivation of the fruit farmer himself.*
- If you would describe the fruit farming of today, what has changed compared to 5 years ago?
    - *[Continue to ask] The fruit cultivation of the fruit farmer himself.*
- Have you taken over the business from a family member?
- To what extent have your choices influenced the way of farming?
- Did your view on fruit cultivation change over time?

Definition / vision of nature inclusive

You probably know the goal of the government to move towards circular agriculture. There is also increasing talk of the need for agriculture to become more nature-inclusive, including fruit cultivation.

- What do you understand by nature-inclusive fruit farming?
    - *Landscape elements?*
    - *Biodiversity?*
    - *Soil quality?*
    - *Social sustainability?*
    - *Substance use?*
    - *Business operations?*
    - *Regional?*
- How do you feel about nature inclusion?
- How important do you find the inclusion of nature? Why?
- Do you know fruit farmers who think very differently about this?

Application to own company

- How can nature inclusion be applied in fruit cultivation?
- Are there specific measures that you already apply to the plot?
- Why did you choose these specific measures?
- Are there any specific problems you have / have experienced implementing these measures? (frames to resist)
    - Knowledge / skills?
    - Information?
    - Society?
    - Economy?
    - Regulations?
- What helped you implement such measures? (frames to empower)
    - Knowledge / skills?
    - Information?
    - Society?
    - Economy?
    - Regulations?
- Do you intend to implement more measures in the future? If so, what?

- What would move you to implement more measures?
    - *What do you need for this?*

Other actors involved

- Which other actors / stakeholders (organizations, companies, individuals) play a role in the field of nature inclusion in and around your company?
    - Rabobank?
    - Knowledge organizations?
    - NFO?
    - Natuur en Milieu Gelderland?
    - The province of Gelderland?
    - Buyers?
    - Consumers?
- To what extent is the involvement of citizens and consumers important in your opinion?
- What is the role of the Fruitmotor in your opinion?
    - *What is the role of other niche actors (that you mentioned before)?*

Transition: Earlier

- Do you have the feeling that there were different (behavioural) rules in place five years ago compared to now?
    - *Another culture?*
    - *Did your mindset change?*
- Do you have the feeling that five years ago other actors were active in fruit cultivation compared to now?
    - *How have the "power relations" between the actors changed?*
- Do you feel there has been a change in the tools to become more nature inclusive in the past five years?
    - *More knowledge? Better techniques available?*
- What do you think is necessary to promote nature inclusion in the fruit farming sector?
- How do you see your role in this transition?

9.3.3 Interview guide B: Interest groups / Companies (purchasers)

Introduction

- Would you like to give a brief introduction about yourself and the company?
- Why are you doing this job?
- What are the fun aspects of being involved in fruit cultivation for you?
- What are the less pleasant aspects of being involved in fruit cultivation for you?

Change over time

- If you would describe fruit cultivation 5 years ago (2016), what does it look like?
- If you would describe the fruit farming of today, what has changed compared to 5 years ago?
- Did your view on fruit cultivation change over time?

Definition / vision of nature inclusive

You probably know the goal of the government to move towards circular agriculture. There is also increasing talk of the need for agriculture to become more nature-inclusive, including fruit cultivation.

- What do you understand by nature-inclusive fruit farming?
    - *Landscape elements?*
    - *Biodiversity?*
    - *Soil quality?*
    - *Social sustainability?*
    - *Substance use?*
    - *Business operations?*
    - *Regional?*
- How do you feel about nature inclusion?
- How important do you find the inclusion of nature? Why?
- Do you know fruit farmers, colleagues or companies that think very differently about this?

Application to own company

- How can nature inclusion be applied in fruit cultivation?
- Are there any specific problems you experience in a more NIF? (frames to resist)
    - Knowledge / skills?
    - Information?
    - Society?

    - Economy?
    - Regulations?
- Are there any specific resources that would help towards a more NIF? (frames to empower)
    - Knowledge / skills?
    - Information?
    - Society?
    - Economy?
    - Regulations?

Other actors involved

- Which other actors / stakeholders (organisations, companies, individuals) play a role in the field of nature inclusion in and around your company?
    - Rabobank?
    - Knowledge organizations?
    - NFO?
    - Natuur en Milieu Gelderland?
    - The province of Gelderland?
    - Buyers?
    - Consumers?
- To what extent is the involvement of citizens and consumers important in your opinion?
- What is the role of the Fruitmotor in your opinion?
    - *What is the role of other niche actors (that you mentioned before)?*

Transition: Earlier

- Do you have the feeling that there were different (behavioural) rules in place five years ago compared to now?
    - *Another culture?*
    - *Did your mindset change?*
- Do you have the feeling that five years ago other actors were active in fruit cultivation compared to now?
    - *How have the "power relations" between the actors changed?*

- Do you feel there has been a change in the tools to become more nature inclusive in the past five years?
    - *More knowledge? Better techniques available?*
- What do you think is necessary to promote nature inclusion in the fruit farming sector?
- How do you see your role in this transition?

9.3.4 Interview guide C: Governmental organisations / Financial institutions

Introduction

- Would you like to give a brief introduction about yourself and the company?
- Why are you doing this job?
- What are the fun aspects of being involved in fruit cultivation for you?
- What are the less pleasant aspects of being involved in fruit cultivation for you?

Change over time

- If you would describe fruit cultivation 5 years ago (2016), what does it look like?
- If you would describe the fruit farming of today, what has changed compared to 5 years ago?
- Did your view on fruit cultivation change over time?

Definition / vision of nature inclusive

You probably know the goal of the government to move towards circular agriculture. There is also increasing talk of the need for agriculture to become more nature-inclusive, including fruit cultivation.

- What do you understand by nature-inclusive fruit farming?
    - *Landscape elements?*
    - *Biodiversity?*
    - *Soil quality?*
    - *Social sustainability?*
    - *Substance use?*
    - *Business operations?*
    - *Regional?*
- How do you feel about nature inclusion?
- How important do you find the inclusion of nature? Why?

- Do you know fruit farmers, colleagues or companies that think very differently about this?

Application to own company

- How can nature inclusion be applied in fruit cultivation?
- Are there any specific problems you experience in a more NIF? (frames to resist)
    - Knowledge / skills?
    - Information?
    - Society?
    - Economy?
    - Regulations?
- Are there any specific resources that would help towards a more NIF? (frames to empower)
    - Knowledge / skills?
    - Information?
    - Society?
    - Economy?
    - Regulations?

Other actors involved

- Which other actors / stakeholders (organisations, companies, individuals) play a role in the field of nature inclusion in and around your company?
    - Rabobank?
    - Knowledge organizations?
    - NFO?
    - Natuur en Milieu Gelderland?
    - The province of Gelderland?
    - Buyers?
    - Consumers?
- To what extent is the involvement of citizens and consumers important in your opinion?
- What is the role of the Fruitmotor in your opinion?
    - *What is the role of other niche actors (that you mentioned before)?*

Transition: Earlier

- Do you have the feeling that there were different (behavioural) rules in place five years ago compared to now?
    - *Another culture?*
    - *Did your mindset change?*
- Do you have the feeling that five years ago other actors were active in fruit cultivation compared to now?
    - *How have the "power relations" between the actors changed?*
- Do you feel there has been a change in the tools to become more nature inclusive in the past five years?
    - *More knowledge? Better techniques available?*
- What do you think is necessary to promote nature inclusion in the fruit farming sector?
- How do you see your role in this transition?

9.3.5 Interview guide D: Experts

Introduction

- Would you like to give a brief introduction about yourself and what you research?
- What are the interesting aspects of doing research on fruit cultivation / nature inclusivity?

Change over time

- If you would describe fruit cultivation / nature inclusivity 5 years ago (2016), what does it look like?
- If you would describe the fruit farming / nature inclusivity of today, what has changed compared to 5 years ago?
- Did your view on fruit cultivation / nature inclusivity change over time?

Definition / vision of nature inclusive

You probably know the goal of the government to move towards circular agriculture. There is also increasing talk of the need for agriculture to become more nature-inclusive, including fruit cultivation.

- What do you understand by nature-inclusive fruit farming?
    - *Landscape elements?*

    - *Biodiversity?*
    - *Soil quality?*
    - *Social sustainability?*
    - *Substance use?*
    - *Business operations?*
    - *Regional?*
- How do you feel about nature inclusion?
- How important do you find the inclusion of nature? Why?
- Do you know fruit farmers, colleagues or companies that think very differently about this?

Application to own work

- How can nature inclusion be applied in fruit cultivation?
- Are there any specific problems you experience in a more NIF? (frames to resist)
    - Knowledge / skills?
    - Information?
    - Society?
    - Economy?
    - Regulations?
- Are there any specific resources that would help towards a more NIF? (frames to empower)
    - Knowledge / skills?
    - Information?
    - Society?
    - Economy?
    - Regulations?

Other actors involved

- Which other actors / stakeholders (organisations, companies, individuals) play a role in the field of nature inclusion?
    - Rabobank?
    - Knowledge organizations?
    - NFO?
    - Natuur en Milieu Gelderland?

    - The province of Gelderland?
    - Buyers?
    - Consumers?
- To what extent is the involvement of citizens and consumers important in your opinion?
- What is the role of the Fruitmotor in your opinion?
    - *What is the role of other niche actors (that you mentioned before)?*

Transition: Earlier

- Do you have the feeling that there were different (behavioural) rules in place five years ago compared to now?
    - *Another culture?*
    - *Did the mindset of actors change?*
- Do you have the feeling that five years ago other actors were active in fruit cultivation compared to now?
    - *How have the "power relations" between the actors changed?*
- Do you feel there has been a change in the tools or policies to become more nature inclusive in the past five years?
    - *More knowledge? Better techniques available?*
- What do you think is necessary to promote nature inclusion in the fruit farming sector?
- What are important roles in this transition?

9.4 Appendix D: Overview of actors in fruit cultivation in the Betuwe

Table 13. Overview of actors in Fruit cultivation in the Betuwe.

Category 1. Property visitors

Sort actor and example companies	*Description*
<u>Representatives of companies for input</u> (Examples: AgroBuren B.V., Agromanager, Garage- en Landbouwmechanisatiebedrijf H. Hol en Zn. (in English: Garage- and farm mechanization company H. Hol and Sons), FruitSecurity Holland and Hermens Fruitsystems (both for supporting materials and covers), Hol Spraying Systems, Plant Health Cure, Tradecorpe nutria-performance, Vlamings Agrarisch Toeleverancier (in English: Agricultural Supplier), ZHE Trading B.V. (for tractors and mowers). And arboriculture companies, like Boomkwekerij Fleuren or Verbeek Boomkwekerijen).	The companies that are visiting the farmers to sell their spraying system, pesticides, fertilizer, or other so-called fruit cultivation support facilities, give advice to the farmers as well. Since they are also selling something to the fruit farmers, the advice seems to be given with the interest of selling in mind (Interview 6; Interview 8).
<u>Advisory organisations</u> There are three prominent advisory organisations that are involved in fruit cultivation in the Betuwe: - Centrale Adviesdienst Fruitteelt (in English: Central Advisory service Fruit cultivation; In short: CAF);	Advisory organisations do projects and research, organise knowledge meetings and give advice to the fruit farmers on topics as crop protection, soil, fertilizers, and cultivation technique. The **CAF** call themselves an 'independent information body' (CAF, n.d.), it is a subsidiary company[1] (in Dutch: dochteronderneming;

[1] Subsidiary company: A company is considered a subsidiary when another company (the parents) has the power, in law or in fact, to exercise a decisive influence on the appointment of the majority of the directors or managers or on the orientation of the policy (FSMA, n.d.).

- Centrum voor Landbouw en Milieu (in English: Centre for Agriculture and Environment; in short: CLM); - Fruitconsult B.V.	Agruniek Rijnvallei, 2020) of cooperative AgruniekRijnvallei Holding B.V., this company sells an extensive range of products. As is stated on their website, they work closely together with the CAF (Agruniek Rijnvallei, n.d.). **CLM** is an independent consultancy that wants to make sustainable agriculture self-evident in the Netherlands (CLM, n.d.). There are two organisations that operate as "CLM" with their own approach: a company and a foundation. The foundation exists through financial contributions for projects from governmental organisations (subsidies), businesses and non-governmental organisations. The company earns money through projects and research, but do not sell products. **Fruitconsult B.V.** is an independent and private consultancy that is also active in the Betuwe. On their website, they sell, next to information: products, like traps, pheromone caps, trimming shears and systems to ward off birds (Fruitconsult, n.d.).
<u>Inspection services</u> - The Algemene Inspectiedienst (in English: General Inspection Service; In short: AID) of the ministry of ANF; - The Nederlandse Voedsel- en Warenautoriteit (in English: Dutch Food and Consumer Product Safety Authority; in short: NVWA);	**The AID of the ministry of ANF** carries out checks on, among others, the use of pesticides, and biocidal- and crop protection products (AGF, n.d.). **The NVWA**, another governmental inspection service, checks the fruit products. This does not always happen on the ground of the fruit farmer, but also at the fruit cooperatives and the processing companies (NVWA, 2016).

- The Sociale Zaken en Werkgelegenheid (in English: Social Affairs and Employment; in short: SZW); - The Skal.	**The SZW,** the last governmental inspection service, supervises that the working conditions are healthy, safe, and honest for the employees on the fruit plot (Inspectie SZW, 2018). Lastly, **Skal** is an independent inspector of organic products, which is only a part (around 3 to 4%) of fruit cultivation in the Betuwe (Skal, n.d.; Interview 8; Natuur en Milieufederatie et al., 2019).

Category 2. Migrant(workers)

Sort actor	*Description*
<u>Labour in the picking season</u> Most of the time, the fruit farmer is not the only one working on the farm. Dependent on the types of business operations, the fruit farmer has employees throughout the year. Other types of business then fruit cultivation would be a stand at the house, restaurant, camping or a so called "landwinkel" (in English: country shop). During the picking season, more labour is needed.	Some fruit farmers organise picking days for citizens, other fruit farmers work with (migrant) contractors. For the migrant contract workers, they often provide housing on the farm. Also, employment agencies, like AB Midden Nederland, may play a role in the recruitment of these workers. Most of these workers are from Poland and Romania, some are from Bulgaria (Interview 12).
<u>Labour for the pollination</u> For the pollination, organisations and individuals with honeybees are being deployed in the Betuwe as well. An example is the Nederlandse Bijenhoudersvereniging (in English: Dutch Beekeeper Association).	These organisations and individuals work – in a way – on the fruit farms during specific moments in the fruit season.

Category 3. Interest groups

Sort actor and specific organisations	*Description*
Specific fruit interest organisation The Nederlandse Fruittelers Organisatie (in English: Dutch Fruit Cultivators Organisation; in short: NFO).	This organisation publishes a trade magazine, publishes news articles on their website, sends newsletters and serves the interests of the fruit farmers in external consultations (NFO, 2019).
Agricultural interest group The Land- en Tuinbouworganisatie Noord (in English: Agri- and Horticulture Organisation North; in short: LTO Noord; LTO Noord, 2020).	This organisation also publishes news articles, provides a so-called 'Innovation-fund', and serves the interests of farmers in the agri- and horticulture in external consultations (LTO Noord, 2020).
Agricultural nature management organisations - The Coöperatieve Agrarische Natuurbeheervereniging Collectief Rivierenland (in English: Cooperative Agricultural Nature Management Association Collective Rivierenland; in short: CR); - The Vereniging Agrarisch Natuur- en Landschapsbeheer Tieler- en Culemborger Waarden (in English: Association Agricultural Nature- and Landscape Management Tieler- and Culemborger Values; in short: VANL-TCW).	CR is the umbrella organisation of smaller agricultural nature management associations, like VANL-TCW. These are organisations in which citizens, farmers and farmers come together to work on conservation and betterment of nature values in landscapes (Interview 16).
Nature interest group - Natuur en Milieu Gelderland (in English: Nature and Environment Gelderland).	This organisation has been working on the protection and reinforcement of the nature in Gelderland and a sustainable environment. They are part of nature inclusive agricultural program team (Interview 10).

Category 4. Governmental organisations

Sort actors	*Description*
Municipalities The municipalities in this region are, also stated in the case study description of the introduction: Buren, Culemborg, Lingewaard, Neder-Betuwe, Overbetuwe, Tiel, West-Betuwe, Arnhem (Zuid), Gorinchem (Oost) and Nijmegen (Noord).	Since the region of the Betuwe is characterized by horticulture, all municipalities play a role to some degree.
Provincies - The province of Gelderland - The province of South Holland	The above-mentioned municipalities are mostly located in the province of Gelderland, except for Gorinchem, which is located in the province of South Holland. The province of Gelderland is therefore the most involved in the fruit cultivation in the Betuwe.
The Water Authority The Waterschap Rivierenland (in English: Water Authority Rivierenland).	Waterschap Rivierenland is another public body and is responsible for the water supply and water levels in the region and operates according to regulations that are established in policies (Waterschap Rivierenland, n.d.).
The national government Especially the Ministry of Agriculture, Nature and Food quality.	They make national policies that also apply to fruit cultivation. These national policies are coordinated with policies that are made on an international level (Interview 12).
The international government The European Union	The European Union has an influence on the fruit cultivation sector as well, through the Common Agricultural Policy (CAP), but also with Biodiversity and Farm to Fork Strategies (European Commission, n.d.).

Category 5. Financial and insurance organisations

Sort actors	*Description*
Financial institutions	The most frequently mentioned financial institution is the Rabobank, especially the Rabobank of the region West Betuwe and Maas en Waal – Oost Betuwe (in English: Meuse and Waal – East Betuwe). Other financial institutions are the ING Bank N.V. (in short: ING) and ABN AMRO Bank N.V. (in short: ABN Amro).
Insurance companies or organisations	Insurance companies or organisations, like Vereinigte Hagel (in English: United Hail) or Onderlinge Fruittelers Hagelverzekering (in English: Reciprocal Fruit Farmers Hailinsurance; in short: OFH) are also important for the financial security and risk management of the fruit farmers.

Category 6. Buyers

Sort actors and examples	*Description*
Auctions - FruitMasters B.V. (largest sized); - Veiling Zaltbommel (in English: Auction Zaltbommel); - Jan Oskam B.V.	Auctions or so-called trading groups are often responsible for sorting, packing, cooling and transport of the fruit. They export the fruit to other countries and sell it to processing companies and retail organisations.
Retail organisations - Jumbo Omnichannel B.V. (in short: Jumbo); - Albert Heijn B.V.	Retail organisations can buy their fruit through an intermediary like auctions or trading groups, but this is not always the case, they can also buy it direct from the fruit farmers. These purchasers are often interacting a lot with the interest groups and the fruit farmers.

The processing companies - Schulp Vruchtensappen (in English: Schulp fruit juices).	Processing companies process the fruit and sell it to retail organisations or other places (like restaurants or country shops).
Cooperatives - The Betuwse Fruitmotor (in English: Fruitmotor in the Betuwe; In short: Fruitmotor).	One cooperative that has been introduced already in the introduction (paragraph 1.3) is the Fruitmotor. This organisation buys fruit with a spot on it, to process it to juices and cider, which are being sold at various places (as seen in figure 15), sometimes directly, sometimes through the wholesale market. The Fruitmotor can also be seen as an interest group for fruit farmers and biodiversity in the Betuwe and is taking different roles, that fit more with the research and education category, in collaboration with others.

Category 7. Citizens

Roles	*Description*
Consumer	Consumers are citizens that buy food, in this case: fruit, in the Netherlands, but also in the rest of the world. Consuming is only one part of the activities of a citizen.
(Active) citizenship	A citizen could also vote, sign petitions and letters, demonstrate, communicate with others about food and fruit, care about nature (or not), and so on.

Category 8. Research (projects) and education

Sort actors or projects	*Description*
<u>Insitutes focused on research and education</u>	Institutes that are mainly focused on research and education are Wageningen University and Research, Radboud University, the Fruitacademie (in English: Fruit academy), Helicon Opleidingen (in English: Helicon Education; Helicon, n.d.)), Aeres Hogeschool (in English: Aeres University of Applied Sciences; Aeres Hogeschool, n.d.) or the new Fruit Tech Campus Foundation. The Fruit Tech Campus Foundation is established through a collaboration between businesses, educational institutes, and governmental organisations. It is a response on the declining interest in a future in fruit cultivation.
<u>Research projects</u> - Bijen in de Boomgaard (in English: Bees in the orchard); - Proeftuin Randwijk (in English: Experimental Garden Randwijk), as part of Proefbedrijf Randwijk B.V. (In English: Experimental Company Randwijk).	In the project of '**Bees in the Orchard**' a few organisations worked together on a workbook for "more biodiversity and a well-pollinated crop" (WUR & Fruitmotor, 2019) that includes a lot of best practices for more biodiversity in the fruit cultivation sector. This project was commissioned and financed by the Ministry of Agriculture, Nature and Food quality as part of the research program "Kennisimpuls Bestuivers" (in English: Knowledge impulse Pollinators). At first, Fruitconsult B.V. was the only shareholder of '**Proeftuin Randwijk'**, but in the beginning of 2020, CAF became the second shareholder. Other partners of the Proefbedrijf are the NFO and the Wageningen University and Research (WUR, 2020). Proeftuin Randwijk has a long list of sponsors, from which a lot of them fall into the

	category of property visitors and sellers, but also some purchasers (Schulp), and some financial (Rabobank) and insurance organisations (Vereinigte Hagel and the OFH) (Proeftuin Randwijk, n.d.).