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Does the Common Agricultural Policy enhance farming systems' resilience? Applying the Resilience Assessment Tool (ResAT) to a farming system case study in the Netherlands

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ABSTRACT

The European Commission has emphasised that a more resilient farming sector is required to better respond to current and future economic, societal, and environmental challenges. Consequently, supporting resilience has become an important aim of the proposals of the Common Agricultural Policy (CAP) post-2020. However, interactions between public policies and resilience outcomes have hardly been researched in-depth. This study analyses whether and how the CAP and its national implementations enable or constrain the resilience of farming systems. For this purpose, we introduce the **Res**ilience **A**ssessment **T**ool (ResAT): a heuristic that conceptualises how policy outputs enable or constrain farming systems' resilience. The tool consists of three dimensions (robustness, adaptability, and transformability) with four indicators each. The ResAT is applied to a Dutch case study: the intensive arable farming system in *De Veenkoloniën*. We conclude that the CAP and its national implementation strongly support the robustness of this farming system, but that the policy enables adaptability much less and rather constrains transformability. The article ends with a reflection on how the application of the ResAT allows for new insights into how EU agricultural policies influence the resilience of farming systems.

1. Introduction

The European Commission (EC), when presenting its legislative proposals for the Common Agricultural Policy (CAP) post-2020, emphasised the aim to better support the resilience of agricultural systems in the European Union (EU) (EC, 2018b). Phil Hogan, then Commissioner for Agriculture and Rural Development (2014–2019), declared that the CAP would deliver on *"genuine subsidiarity for Member States; ensuring a more resilient agricultural sector in Europe; and increasing the environmental and climate ambition of the policy"* (EC, 2018a). This strong emphasis on resilience is based on the concern that the agricultural sector should be supported in responding to current and future economic, societal, and environmental challenges and uncertainties. Building on Meuwissen et al. (2019), we define the resilience of a farming system as its ability to manage change by responding and adjusting itself, while maintaining essential functions.

Despite the resonance of the concept of resilience in agricultural policymaking circles, less is known about its concrete implications for the designing of public policy. Previous research focused mainly on how to enable resilience at farm level: in individual farms or in farm management (e.g. Darnhofer, 2014; Darnhofer et al., 2016), or on individual farmers' strategies to anticipate or respond to shocks or uncertainties (e.g. Darnhofer, 2010; García-Arias et al., 2015). These studies acknowledge the role of public policies by describing how they, as part of a broader social context, affect e.g. production processes, decisions about diversification, and farmers' possibilities to adapt (new) strategies, and, therefore, a farm's resilience.

However, a conceptualisation of how policies enable or constrain resilience remains unspecified. The extent to which the CAP and its national implementations support resilience, or even constrain it, is currently unclear. For instance, the CAP relies heavily on various instruments to increase farmers' income in the short term, but less is known about how these instruments affect resilience in the long term. In order to actually contribute to a resilient agricultural sector, a more comprehensive understanding is required about how the CAP affects the resilience of farming systems.

The question of how to develop policies that enable a system's ability to overcome current and future challenges is not specific to agriculture.

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It is also identified as a major knowledge gap by other policy researchers (Swanson and Bhadwal, 2009; Howlett, 2019). As argued by Biesbroek et al. (2017), much of the resilience literature tends to treat policy and governance as black box concepts; the actual causal relations through which policies enable or constrain a system's resilience remain largely uncharted territory. This knowledge gap resulted in various efforts to identify resilience-enhancing characteristics of policies (Hillmer-Pegram and Robards, 2015; Valman et al., 2015; Ojea et al., 2017). The literature, however, focuses mainly on how the policies themselves can become more resilient; an agreed-upon approach to systematically analyse how policies affect a system's resilience is still lacking. Furthermore, these characteristics are not fine-tuned to farming systems.

To address this research gap, this study analyses whether and how the CAP enables or constrains farming systems' resilience. We address the research gap by proposing a new heuristic: the **Res**ilience **A**ssessment **T**ool (ResAT). This heuristic consists of a set of indicators to assess the capability of a policy to support the resilience of a farming system. The tool was inspired by Gupta et al. 's (2010) Adaptive Capacity Wheel, which allows users to assess the capability of governance institutions and policies to enable society to adapt to climate change. Subsequently, we apply the ResAT to examine the perceived effects of the CAP and its national implementation on the resilience of an *intensive arable farming system in De Veenkoloniën, the Netherlands*. Two focus groups with policymakers and stakeholders were organised to discuss and validate the findings of the ResAT analysis. Finally, we discuss several key reflections that emerge from our analysis.

2. Conceptualising the relationship between public policy and farming systems' resilience

2.1. Resilience and farming systems

To analyse how policies affect the resilience of the agricultural sector, we chose a farming system as the level of analysis. A farming system is the system hierarchy level above the individual farm: it is a local network of comparable types of farms and other actors that interact formally and informally and are responsible for private and public goods in a specific regional context (Giller, 2013; Meuwissen et al., 2019). Furthermore, farming systems are open systems and their activities are linked to social networks, economic processes, and the agro-ecological context in which the systems operate. Farming systems serve different essential functions for society through the provision of private goods (e.g. producing food or other bio-based resources, including fuels and fibres; providing employment and income) and public goods (e.g. maintaining natural resources and rural landscapes; protecting biodiversity; ensuring animal health and welfare). However, they may be subject to economic, social, institutional, and environmental challenges that confront the ability of these systems to maintain their functions. These challenges vary from sudden events or shocks to long-term stressors, which both can increase systemic vulnerabilities as well as provide opportunities (Rosin et al., 2013; Maggio et al., 2014; Gertel et al., 2015).

As a next step, we conceptualise resilience in relation to these farming systems. The concept of resilience has become widespread in academic discussions and policy contexts across a diverse set of fields, such as ecology, disaster management, psychology, natural resource management, and agriculture and rural development (Baggio et al., 2015; Davidson et al., 2016; Sinclair et al., 2014; Ashkenazy et al., 2017). Resilience is understood in different ways within these fields. For instance, the understanding that resilience entails the capacity of a system to resist shocks or disturbances with the goal of rapidly returning to a perceived normal is particularly common in disaster management studies (Barr and Devine-Wright, 2012; Scott, 2013). In this respect, key aspects of resilience are a system's resistance to perturbations and its ability to recover without experiencing change to existing functions afterwards (Holling, 1973; Davoudi, 2012; Urruty et al., 2016). While this understanding links resilience to the ability to resist shocks and changes in the short-term, other studies, e.g. in the field of rural and agricultural studies, have suggested that resilience also consists of the capacity to adapt, or even transform, in response to external shocks or stresses (Walker et al., 2004; Davidson, 2010; Folke et al., 2010). For example, Darnhofer (2014) highlights that managing a farm's resilience also includes being capable of dealing with uncertainties through learning and adjusting responses to changing circumstances, and to fundamentally change components of farming systems when these prove dysfunctional. By including change as integral parts of resilience, resilience thinking offers a conceptual lens that accepts that change is omnipresent and often unpredictable in complex systems (Sinclair et al., 2014; Duijnhoven and Neef, 2016; Folke, 2016).

Based on this broad understanding of resilience, we build on concepts rooted in social-ecological systems analysis (Folke, 2005) to conceptualise farming system resilience as the system's capacity to manage and respond to challenges, both foreseeable trends and unexpected events, while maintaining its essential functions of providing private and public goods. We also distinguish between three resilience dimensions (e.g. Folke et al., 2010; Anderies et al., 2013; Knickel et al., 2017; Meuwissen et al., 2019), expressed in three different capacities: (1) *Robustness* is the capacity of the system to resist external perturbations and to maintain previous levels of functionality, without major changes to internal elements and processes (Urruty et al., 2016). (2) *Adaptability* is the capacity of the system to adjust internal elements and processes in response to changing external circumstances. The system can continue to develop along the original trajectory, while maintaining important functionalities (Folke et al., 2010). (3) *Transformability* is the capacity of the system to change fundamentally, particularly when structural changes in the ecological, economic, or social environment make the existing system untenable to provide important functionalities (Walker et al., 2004). Conceptualising resilience through robustness, adaptability, and transformability extends the understanding of resilience beyond only maintaining equilibrium; adjustments and change are also integral to a system's resilience.

2.2. Public policy and resilience

Public policies are sets of interrelated decisions that governmental actors take regarding an issue. We follow Howlett 's (2019) conceptualisation of public policy outputs as consisting of goals and instruments. *Policy output* refers to the direct results of governmental actors' decision-making processes, which take the form of policy programmes, laws, or regulations. Policy output consists of goals and instruments that are interrelated and operate at different levels of abstraction. *Policy goals* are the (stated) aims and expectations that a policy pursues, and *policy instruments* are the means or techniques used to achieve these goals (e.g. rules, prohibitions, subsidies, fines, networks, platforms, training, or partnerships). These policy components interact with one another, leading to synergies, conflicts, or trade-offs that result in complex policy configurations with often unclear means-ends relations. This also means that certain policy components can enable the resilience of the system in one area, while constraining it in another area (Martin et al., 2016; Ashkenazy et al., 2017). The challenge for policymakers is then to discover how policy components can generate synergies and avoid trade-offs to support a system's resilience.

The resilience literature has identified various ways in which policies may enable resilience, particularly in the areas of risk and crisis management, resource management, and city planning. Béné et al. (2016), for example, showed with their systematic literature review on urban resilience that multilevel or polycentric governance is vital for enhancing resilience. Huitema et al. (2009) and Pahl-Wostl (2009) also underline the desirability of polycentric governance and how it enhances knowledge exchange and potentially synergy-enabling adaptations. Other scholars have pointed to the importance of accommodating

self-organisation and knowledge networks (Brink et al., 2013) or the encouragement of learning and experimentation (Baud and Hordijk, 2009; Karpouzoglou et al., 2016).

The topic of resilience has also received attention in the policy literature through questions about how to design policies that are capable of dealing with uncertainties and can support systems to overcome current and future challenges. For instance, Howlett (2019) highlighted that agility, improvisation, and flexibility are important policy features to adapt and to deal with surprising or uncertain futures. Likewise, Swanson et al. (2009) identified specific characteristics for policies to function under complex, dynamic, and uncertain conditions, such as variation through multiple policies to address the same issue to increase the likelihood of achieving desired outcomes in uncertain times, regular policy review processes to evaluate effectiveness and continuous learning, and pilots to test assumptions relating to emerging issues. Moreover, Daedlow et al. (2013) discussed factors that determine the resilience of natural resource governance systems. For instance, they revealed in their case study that external processes of change and disturbances with high uncertainty may prevent decision makers from adapting or transforming the governance system. They showed that the position, influence, and motivation of key decision makers can very much determine the outcome of a reorganisation process of a governance system.

Despite these valuable insights, to date, the policy literature concentrates primarily on how to increase the resilience of policies rather than on how policies can improve systems' resilience. Consequently, a systematic approach to analyse how public policies enable or constrain the three dimensions of resilience of complex systems remains largely uncharted territory. Moreover, there is no specific conceptualisation of how policies enable or constrain the resilience of farming systems.

2.3. The Resilience Assessment Tool (ResAT)

Against this background, we developed a heuristic tool that conceptualises the relation between policies and the resilience of farming systems, enables examination of whether and how policies enhance or constrain resilience, and provides leverage for improvements of these policies. As stated in Section 1, the ResAT is inspired by Gupta et al. 's (2010) Adaptive Capacity Wheel, complemented by new insights from the resilience and policy literatures and takes into account specific challenges to European farming systems. It can be used to analyse both policy goals and policy instruments. Through an extensive literature review, we identified indicators for robustness-, adaptability-, and transformability-enabling policies to further conceptualise each policy type. Fig. 1 shows the tool and below we present the indicators per resilience dimension.

2.3.1. Robustness-enabling policies

Policies that enable robustness support the farming system in maintaining its current functions and the desired level of output while avoiding major changes, despite shocks and stresses (Anderies and Janssen, 2013; Chaffin et al., 2014; Urruty et al., 2016). We identified four indicators:

(1) Robustness-enabling policies focus on the recovery and continuation of the status quo with marginal adjustments within a *short term* (i.e. within months to a year); sometimes shifting the burden to other timescales is tolerated or even encouraged.
(2) Robustness-enabling policies aim to *protect the status quo.* The policy goals and instruments prioritise quick and familiar adjustments to existing practices in order to sustain the current functioning of the farming systems in the case of an uncertain or changing environment (Park et al., 2012; Anderies et al., 2013).
(3) Robustness-enabling policies provide *buffer resources* to mitigate shocks and stresses that affect farming systems or to enhance the system's ability to recover from adverse effects (Folke et al., 2010). These buffer resources reduce the sensitivity of farming systems to perturbations (Anderies et al., 2013). For example, buffer resources involve public compensation funds, drought aid, or mobilisation of additional labour. A specific form of buffer is redundancy: back-up systems are made available that provide the same functionalities in the event of the primary system failing (Weick and Sutcliffe, 2001; Anderies et al., 2013).
(4) Robustness-enabling policies provide *other modes of risk management* that help farming systems to recover from a shock to an acceptable state to prevent further decline (Boin et al., 2013). For instance, these policies include risk monitoring, responses, and evaluation. In addition, the policies provide information and means to avoid, anticipate, or minimise risks (Hood and Jones, 1996; Polsky et al., 2007; Anderies and Janssen, 2013).

Fig. 1. *The Resilience Assessment Tool – The wheel illustrates the in*dicators (outer ring) per resilience dimension (robustness, adaptability, and transformability) (inner ring).

2.3.2. Adaptability-enabling policies

Policies focused on adaptability increase a farming system's capacity to identify, adapt to, and learn from frequently changing conditions. These policies allow adjustments to the system to avoid or withstand future disturbances (Boin et al., 2013; Duit, 2016; Hurlbert and Diaz, 2013; Karpouzoglou et al., 2016). We identified four indicators:

(1) Adaptability-enabling policies focus on enabling and encouraging swift action; however, the aim of adjusting existing structures, policies, and cultures requires a *middle-term focus* (i.e. 1–5 years).
(2) Adaptability-enabling policies allow and encourage farming system actors to respond in *flexible ways* to increased uncertainty and changing circumstances, as overly strict and means-oriented regulations are avoided (Anderies and Janssen, 2013; Karpouzoglou et al., 2016). For example, binding formal agreements that prescribe specific procedures reduce flexibility.
(3) Adaptability-enabling policies allow for *variety* between and within farming systems. This variety can be reached through, for example, broad stakeholder involvement, incorporation of multiple sectors, and connections across jurisdictional levels (Verweij and Thompson, 2006; Pahl-Wostl, 2007; Duit, 2016). Moreover, the focus is also on overcoming a silo mentality between policy

domains and levels, as this mentality obstructs integrative and tailor-made responses (Brown, 2014; Rijke et al., 2013). *Tailor-made responses* are desirable as certain goals or instruments are not appropriate for every context (Anderies and Janssen, 2013). Adaptability means room for context-sensitive policy design to reach the most suitable responses to a shock or stressor.

(4) Adaptability-enabling policies contain policy goals and instruments that enable *social learning*. These goals and instruments focus on adjusting practices to novel circumstances through social processes without shifting paradigms. The practices are adjusted to be better capable of coping with certain shocks and stressors, based on learning (e.g. improvisation, trial and error, reflection, and exploration of new ideas) (Gunderson, 1999; Olsson et al., 2006; Herk et al., 2011; Rijke et al., 2012). In addition, the goals and instruments should encourage social processes in which actors develop, exchange, and preserve knowledge in networks and remove mechanisms that inhibit these processes (Dewulf et al., 2005; Pelling and High, 2005; Pahl-Wostl, 2007).

2.3.3. *Transformability-enabling policies*

Policies focused on enabling transformability aim to increase a farming system's ability to develop new elements and processes or to dismantle existing elements and processes that have become dysfunctional, and thereby to change their operational logic or identity (Walker et al., 2004; Geels, 2014). We identified four indicators:

(1) It is accepted within the policy that transformation requires a *long-term focus* (i.e. a focus of more than 5 years). However, the policy output focuses on immediate and serious efforts to initiate small but in-depth changes (Termeer et al., 2017).

(2) Transformability-enabling policies aim to *dismantle incentives that support the status quo* by intentionally addressing dysfunctional path dependency, structural power, and vested interests in farming systems. Moreover, these policies halt the reproduction of problematic elements of the core regime (Geels, 2011; Turnheim and Geels, 2012). Transformability-enabling policy interventions aim to create windows of opportunity that make it possible to disrupt problematic patterns of behaviour in farming systems (Rijke et al., 2013). These interventions incentivise, for example, target groups' transformative practices.

(3) Transformability-enabling policies enable actors to challenge dominant mindsets and fundamentally adjust them to changing circumstances (i.e. high-order reflectivity) (Brunner and Schönberger, 2005; Folke et al., 2005; Pahl-Wostl, 2007; Huntjens et al., 2012). In addition, the policies support third-order learning, so that actors can reflect on the schemata underlying the system of which they are part (Bartunek and Moch, 1987). These concepts of *in-depth learning* focus on paradigmatic change from within the system.

(4) Theories about transformability emphasise the significance of *enhancing and accelerating niche innovations*, experimentation, self-organisation, and early wins through policy interventions (Termeer et al., 2017). For example, niche innovations are encouraged when self-governance of collectives is enabled through policies (Ostrom, 2005) or when the emergence of 'shadow networks' outside direct government control is tolerated (Olsson et al., 2006). It is vital for innovations that policies connect actors and encourage them to experiment through facilitated access to resources and support (Gunderson, 1999; Olsson et al., 2006; Rijke et al., 2013).

3. Methodological approach

The ResAT is not a classic assessment tool in the sense that it measures the policy's impact on resilience; instead, it allows for a qualitative policy analysis. We systematically analyse and interpret the policy output and its relation to the indicators for robustness-, adaptability-, and transformability-enabling policies in the case study context. The analysis is based on qualitative content analysis (Mayring, 2014; Bengtsson, 2016) and expert judgement, which requires a clear methodological approach that is systematic and transparent (see Yanow, 2000; Gupta et al., 2010).

Resilience always needs to be analysed in relation to a farming system's specific context and challenges. For that reason, we illustrate the use of the ResAT by applying the heuristic to an in-depth case study of intensive arable farming in *De Veenkoloniën* region, the Netherlands (Fig. 2). This case study is part of the Horizon2020 SURE-Farm project, which studies the resilience of eleven farming systems across Europe. For the purposes of this article, we selected this specific case as it faces a range of urgent economic, social and environmental challenges that confront the system's resilience in both the short and long term (see Section 4.1). Moreover, intensive arable farming in *De Veenkoloniën* has been strongly influenced by the CAP in the recent past. Whereas the farming system benefited for a long time from price support provided by the CAP, support has declined due to the CAP's external and internal convergence mechanisms in recent years. These two reasons combined make the intensive arable farming system in *De Veenkoloniën* a suitable case for illustrating the application of the ResAT to analyse whether and how the CAP enables or constrains farming systems' resilience.

Our policy analysis was conducted in two consecutive rounds. In the first round, we started by identifying and analysing the challenges that confront the farming system's resilience. This is an essential step as the resilience of a system should always be analysed in relation to its challenges (Section 4.1). Then, using the ResAT, we conducted a qualitative content analysis of relevant EU, national, and regional agricultural policy output. We analysed CAP policy documents, national CAP implementation plans, and other relevant regional agricultural policy documents to assess how their policy goals and instruments enable or constrain the resilience of *De Veenkoloniën*. We retrieved 13 relevant policy documents (see Appendix) from official governmental websites

Fig. 2. *Map showing the location of De Veenkoloniën region (shaded) in the Netherlands.*

using the following search terms: [Common Agricultural Policy], [CAP] (or in Dutch: [Gemeenschappelijk Landbouwbeleid], [GLB]); [Landbouwbeleid AND Veenkoloniën]. Documents were considered relevant when they: (1) reported about CAP goals and instruments adopted during the implementation period 2014–2020; (2) described national implementation decisions regarding the CAP made by the Dutch government during the implementation period 2014–2020; or (3) explained the agricultural agenda of the provinces or the case study region. The policy documents provided a comprehensive overview of the CAP-related goals and instruments at EU, national, and regional level that have affected the studied farming system.

To analyse the collected policy documents, we conducted a qualitative content analysis (see Mayring, 2014) using the ATLAS.ti program. We developed a codebook with 24 codes, containing the 12 ResAT indicators per type of policy output (goal or instrument), and used them to indicate enabling or constraining policy goals and instruments. We then manually attributed a score to each goal and instrument on its capacity to enable or to constrain its respective policy key characteristic using a 5-point Likert scale (Table 1). Subsequently, these separate scores were brought together to formulate an overall score (0–5) per indicator. These overall scores were manually entered in two ResAT wheels (one for policy goals and one for policy instruments), which were created outside the ATLAS.ti program, by following a 5-point traffic-light rating system for visualising the results (Fig. 3). The arguments for given scores are documented and were based on literature (e.g. evaluations of economic regulations), the researchers' expertise, and frequent discussions within the research team. We reviewed and discussed the coding and scoring decisions and made revisions on several occasions. Finally, we translated the collected data and our arguments into a synthesis of the CAP's enabling and constraining effects on the farming system's robustness, adaptability, and transformability.

In the second round, we held separate focus groups with policymakers and stakeholders to discuss the usefulness of the ResAT for analysing the resilience-enabling and resilience-constraining capabilities of policies and whether the results of our analysis resonated with participants' experiences. The focus groups served as a way to validate and enrich the findings of the ResAT analysis. The first focus group was organised at the Dutch Ministry of Agriculture, Nature, and Food Quality (LNV) in September 2018. Four policymakers involved with the future of the CAP in the Netherlands participated. A second focus group was organised in Brussels in September 2018, which nine stakeholders and policymakers attended. Whereas the first group focused mainly on validating preliminary findings of our analysis, the second group engaged in a broader discussion about the relationship between public policies and farming systems' resilience, and the usefulness of the ResAT. We noted the participants' opinions and arguments in the minutes of the meetings and integrated them in the findings and discussion sections.

4. Findings

4.1. Main challenges to the farming system in De Veenkoloniën

De Veenkoloniën is a region in two north-eastern provinces of the Netherlands – Drenthe and Groningen – that developed into a large-scale agricultural and agri-industrial production area during the twentieth century (Immenga et al., 2012; Smit and Jager, 2018). The region's peat soils contained high amounts of organic matter, making them highly suitable for arable farming (Smit and Jager, 2018). Consequently, intensive arable farming – the farming system central to our analysis – has become the largest agricultural sector in the region, producing and processing a relatively limited set of crops, particularly starch potatoes, sugar beet, and cereal grains. The region's landscape is defined by large-scale agricultural monocultures, with few natural and landscape elements. Only 19% of the farming businesses in the region engage in one or more types of agri-environmental management supported via the CAP (Smit and Jager, 2018).

Compared to systems in other farming regions in the Netherlands, this system entails a relatively small number of large-scale intensive arable farming businesses (Immenga et al., 2012; Kuhlman et al., 2014; Smit and Jager, 2018). Many of these farms produce for, and are members of, co-operative processors situated in the region, most notably *AVEBE* (handling starch potatoes) and *Cosun Beet Company – Royal Cosun (*formerly known as *Suiker Unie)* (handling sugar beet) (Immenga et al., 2012; Karel, 2012; Smit and Jager, 2018). Consequently, most farmers sell their crops to these co-operatives at prices that are determined in advance. The co-operatives have traditionally played an important role in the sector's development by stimulating specialisation and innovation, by providing their members with opportunities for risk sharing, and by reducing processing costs.

Arable farmers in *De Veenkoloniën* historically received high CAP direct payments thanks to the historic entitlement system that was adopted after the MacSharry reform in 1992. After the Fischler Reform (2003), these payments were decoupled from the quantity produced and have changed into Single Farm Payments based on entitlements linked to eligible hectares of land. Because of the external and internal convergence of payments per hectare after the most recent CAP reform (2013), the direct payments per hectare decreased significantly for the starch potato farmers in *De Veenkoloniën* (Kuhlman et al., 2014; Smit and Jager, 2018). In addition, the abolition of the sugar quota in 2017 resulted in declining sugar prices. Both developments have had a significant impact on the income of farmers in *De Veenkoloniën*.

Apart from these direct challenges to farmers' incomes, *De Veenkoloniën* faces socio-economic challenges that are typical for peripheral rural areas, such as population decline, limited employment possibilities, and a loss of public services (Smit et al., 2005; Februari, 2009; Karel, 2012; Ministery BZK, 2018). These developments make it more difficult to find suitable farm successors (Provincie Groningen, 2012; Rook, 2014; SPG, 2018) – a situation that is reinforced by relatively high land prices, high farming business value, and lack of available labour.

In terms of environmental challenges, intensive farming practices have led to a rapid decrease in the amount of organic matter in soils (Smit and Jager, 2018). Moreover, starch potatoes are vulnerable to nematodes and fungi, which cause e.g. potato blight (NVWA, 2018; Smit and Jager, 2018). Soil and crop quality have also been affected by volatile weather patterns, including periods of both drought and extreme precipitation (Prins et al., 2011). These extreme weather situations are expected to worsen as the result of climate change (KNMI, 2014).

Table 1
Likert scale used to score the policy goals and instruments.

Assessment	Score (colour)
To what extent does the policy goal/instrument enable or constrain the indicator?	
Not clear	0 (None)
Constraining/not enabling	1 (Red)
Fairly constraining/slightly enabling	2 (Orange)
Partly enabling/partly constraining	3 (Yellow)
Fairly enabling/slightly constraining	4 (Light green)
Enabling/not constraining	5 (Dark green)

4.2. Analysis of policy goals

4.2.1. Main goals of the CAP and relation to the farming system

Since 1957, the CAP has had five main objectives, as set out in Article 39 of the Treaty on the Functioning of the European Union: i) increase agricultural productivity by promoting technical progress and by ensuring the rational development of agricultural production and the optimum utilisation of the factors of production, in particular labour; ii) ensure a fair standard of living for farmers; iii) stabilise markets; iv) assure the availability of supplies; and v) ensure that supplies reach consumers at reasonable prices. In the most recent reform, these

objectives were reconfirmed, as shown by the emphasis on continuing income support (EC, 2013B, 2016, 2017A, 2017B; Henke, 2015), to mitigate the impacts of sudden shocks resulting from e.g. geopolitical events, price volatility, or extreme weather and to improve the competitiveness of the agricultural sector (EC, 2013B, 2016, 2017A, 2017B).

In addition to these main objectives, various sub-goals can be identified in the CAP legislation for the period 2014–2020. First, there is an emphasis on a more *equitable* distribution of direct payments, both domestically and across Member States (EC, 2016). Second, the CAP has become more aligned with environmental and climate objectives through the 'greening' of a share of first pillar payments. Greening requirements include: i) *crop diversification* to increase the variety of crops grown to halt soil degradation and erosion, thereby improving production capacity; ii) *maintenance of permanent grassland* for carbon storage and to protect grassland biodiversity; and iii) *creation of ecological focus areas* (EFAs) on arable land to protect and improve biodiversity in rural areas (Dijksma, 2013; EC, 2017B). Member States may introduce equivalent measures as alternatives to the proposed greening requirements.

Policy documents relating to the Dutch implementation of the CAP include various goals that are considered particularly important in the Dutch context. First, the Dutch government aimed for the internal convergence of direct payments, as differences arising from historical entitlements were no longer considered justifiable and resulted in a high dependence on these payments in some sectors (Dijksma, 2014A). To allow potato farmers to adapt and maintain their output levels, the government opted for a gradual convergence, with full harmonisation in 2019 (Dijksma, 2013, 2014a; EC, 2016). Moreover, the Dutch government wanted to compensate the potato starch sector in *De Veenkoloniën* by continuing its support for a multi-annual regional innovation programme (*Innovatie Veenkoloniën*). For this goal, the Dutch government used financial means available under CAP Pillar II – co-financed by the provinces – and reserved an extra budget in CAP Pillar I by redeploying the available funds (Dijksma, 2014A). Second, the national and provincial implementation of the CAP placed a strong emphasis on knowledge production and exchange, e.g. relating to disease detection or increasing yields for starch potatoes via collaboration between farming system actors (Dijksma, 2013; Innovatie Veenkoloniën, 2014; EC, 2016).

4.2.2. Robustness

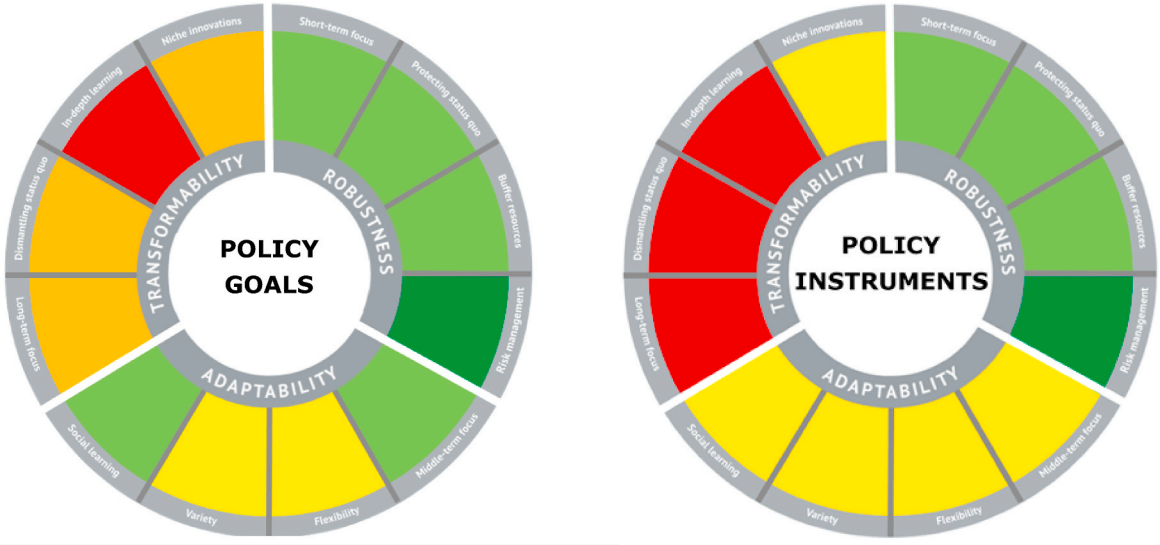
The CAP's goals target robustness to a considerable extent; there is a strong emphasis on assisting farming systems to bounce back to original states in the event of disturbances. Fig. 3 provides an overview of the various ResAT indicators and the associated scores. Below, we elaborate the main insights emerging from the analysis.

The CAP's main goals are clearly characterised by a ***short-term focus*** (score 4). This is evident, as the main goals prioritise quick recovery after a shock over initiating adjustments to make farming systems less susceptible to shocks, thus emphasizing short-term robustness. Also, the goal of providing farmers with a guaranteed annual, hectare-based income initiates a short-term focus, because it encourages farmers to continue established farming practices, even when these practices are hardly profitable. The greening requirements introduce conditionalities for receiving income support; however, these conditionalities at best require marginal adjustments to current farming practices in *De Veenkoloniën.* The CAP's emphasis on promoting a short-term focus was confirmed by focus group participants.

The CAP's goals are geared towards ***maintaining the status quo*** (score 4). The goals at both EU and domestic level are focused on maintaining a stable, varied, and safe food supply (EC, 2013B, 2016, 2017A, 2017B) and on improving the competitiveness of the agricultural sector (EC, 2013B, 2016). The goals legitimise state support for the sector by framing farmers as very important strategic and economic players who are responsible for ensuring food security (EC, 2017A, 2017B). The Dutch government explicitly prioritised starch potato farmers' survival after the decrease in income support (Dijksma, 2013, 2014A). This goal very much prioritises ensuring that the arable farming system is preserved despite this policy-induced challenge.

Additionally, the CAP goals stress the need for ***buffer resources***. One of the main justifications for continuing income support is that it allows farmers to mitigate the income effects of shocks and stresses (EC, 2013B, 2017A, 2017B):

> *Agriculture is more dependent on the weather and the climate than many other sectors. Furthermore, in agriculture there is an inevitable time gap*



Legend ResAT wheels						
Colour	None	Red	Orange	Yellow	Light green	Dark green
Score	0	1	2	3	4	5
Assessment	Not clear	Constraining / not enabling	Fairly constraining / slightly enabling	Partly enabling / partly constraining	Fairly enabling / slightly constraining	Enabling / not constraining

Fig. 3. *ResAT wheels for policy goals (left) and policy instruments (right) for intensive arable farming in De Veenkoloniën.*

between consumer demand and farmers being able to supply (…) These business uncertainties justify the important role that the public sector plays in ensuring income stability for farmers. (EC, 2017A)

Moreover, the green payments aim to remunerate farmers for the public goods they supply, as the market prices do not reflect the work involved (EC, 2017B), thus functioning as a compensatory buffer resource.

Lastly, the CAP and its Dutch implementation contain goals that emphasise the importance of ***other modes of risk management*** (score 5). For example, the CAP prioritises *"the creation of mutual* funds *and insurance schemes to allow farmers to respond better to market instability or fast-falling prices"* (EC, 2017A). Stabilising markets, mitigating risks, and preventing further escalation of shocks are core values of the CAP; income effects of shocks and stresses should be confined.

4.2.3. Adaptability

The CAP policy goals' emphasis on the farming system's adaptability is recognised (Fig. 3). The goals promote adaptation by focusing on interactive knowledge exchange and promotion to diversify agricultural practices towards managing public goods. The key insights are further elaborated in the following paragraphs.

The various identified sub-goals and national goals are mainly characterised by a ***middle-term focus*** (score 4). The CAP is implemented for a period of seven years, so these goals generally have a corresponding time horizon. Goals to adapt farming practices should be attainable within a relatively short time span, although the policy documents show some awareness that it may take longer for changed practices to have an effect, e.g. the aim of the greening requirements. The middle-term focus aims mainly to ensure that adaptations fit within the farming system. A clear example is the reasoning behind the Dutch government's decision about a gradual transition towards more equal direct payments – the government's aim being that: *"the transition towards a system of equal hectare payments happens gradually and predictably, allowing businesses to prepare and adapt"* (Dijksma, 2013).

Both the ***flexibility*** and the ***variety*** of farming systems are partly supported by the policy goals (score 3). We observed a balance between maintaining EU-wide policy goals and allowing tailor-made goals at national level. An example is the EU goal to allow Member States to introduce equivalent measures as alternatives to the proposed greening measures. At the same time, Member States are restricted by the EU legislative framework in their possibilities for – potentially more effective – tailor-made responses (Dijksma, 2013, 2014C; EC, 2013A, 2016, 2017B; Henke, 2015).

Many of the goals that support variety in farming systems aim mainly to encourage diversified agricultural practices – for instance, by integrating agri-environmental management schemes that benefit biodiversity, soil quality, or the regional landscape, as emphasised in the following statement:

To develop a plan that meets the Greening requirements of the new CAP in a way that fits the agricultural structure of De Veenkoloniën. This plan ties in with and/or shapes important secondary objectives regarding regional water systems, biodiversity, and landscape quality. (Innovatie Veenkoloniën, 2014Innovatie Veenkoloniën, 2014)

However, most of these variety-oriented goals remain rather generic, lacking concrete (intermediate) objectives.

The Dutch national implementation of the CAP includes goals with a relatively strong emphasis on ***social learning*** within the farming system (score 4), stressing the importance of social interactions between a variety of farming system actors to develop and exchange knowledge. For instance, the Dutch government aims to further stimulate knowledge sharing through training, demonstrations, and practitioner networks (Dijksma, 2013), and the Province of Groningen supports so-called frontrunners to disseminate their knowledge and experience, possibly resulting in a diffusion of adaptive practices (Provincie Groningen, 2012).

4.2.4. Transformability

The goals of the CAP and the Dutch national implementation were found to hardly address the transformability of the farming system (Fig. 3). The goals do not promote altering the operational logic of the arable farming system, and dominant mindsets are hardly challenged. These findings are explained below.

The CAP contains few goals with a ***long-term focus*** (score 2). Those goals that *do* imply a longer timescale relate mainly to reducing the environmental impact of the agricultural sector. For instance, the CAP aims to tackle climate change and to encourage sustainability by remunerating farmers for agricultural practices beneficial to the climate and the environment through components of the direct payments and the RDP. Whereas the objective shows that long-term environmental concerns are included in the CAP, these concerns remain largely secondary to short-term objectives that emphasise farm income and production support. Moreover, the regional innovation platform sets the ambition that agriculture in the future will have "*closed mineral cycles at the regional level. This will lead to a major reduction of CO_2 emissions*" (Innovatie Veenkoloniën, 2014). Similarly, the Province of Groningen (2012) states that *"in the long term, the goal is to have a CO_2 neutral agricultural sector."* Organisations recognise that these goals require large adjustments and are not easily realised. That said, there are hardly strategies or intermediate steps to realise the required transformative change, leaving these goals rather abstract.

The policy goals hardly express any intention to ***dismantle incentives that protect the status quo*** (score 2). During the focus group, participants confirmed this finding, arguing that changes were incremental and hardly driven by the CAP. This is in line with the strong emphasis in the CAP's goals on protecting the status quo. One of the scarce goals in this respect was the intention to reduce the dependence on direct payments in the starch potato sector. However, this effort was driven by an ambition to make the distribution of payments more equal, rather than to initiate a transformation of the system (Dijksma, 2013, 2014A). The goals focus on continuing business-as-usual practices instead of addressing problematic patterns in the current farming system, such as the increasing intensification of arable farming that causes loss of soil quality and, therefore, of long-term production capacities.

The CAP's policy goals do not include a focus on ***in-depth learning*** (score 1). Whereas there was some emphasis on *social learning*, aiming for knowledge exchange *between* farming system actors, no attention was paid to possibilities for including actors and ideas from outside the farming system to challenge dominant mindsets. This was confirmed by focus group participants.

The only transformability orientation that was found in both EU and national CAP goals was support for ***niche innovations*** (score 2). The Dutch government, for example, stated that it aimed:

To support any necessary physical investments for farmers to develop new prototypes, which need to be tested in practice, and for the roll-out of innovations in agriculture and horticulture such as precision farming. (Dijksma, 2013)

This example clearly shows the aim to support technical progress and innovation. For *De Veenkoloniën*, there is a particular emphasis on the development of new fertilisation systems, monitoring systems, and early detection systems for diseases. However, these types of innovations would primarily reinforce the existing regime; the scope for transformative change resulting from these innovations is dubitable. We therefore assessed these goals as only slightly enabling an acceleration of niche innovations.

4.3. Analysis of policy instruments

4.3.1. Main instruments of the CAP and relation to the farming system

The CAP's instruments are divided between Pillar I, which is fully funded by the EU, for income support and market management, and Pillar II, which requires co-funding from Member States, for rural development (EC, 2013A, 2013B, 2016, 2017A). Member State governments have the option to transfer 15% of funds between both pillars. The Dutch government decided to transfer 4.3% of the budget from Pillar I to Pillar II, thereby increasing the budget for rural development measures (Henke, 2015; EC: European Commission, 2016).

The direct payments under Pillar I consist of three compulsory elements that every Member State is required to implement: the basic payment scheme, greening measures, and young farmer payments (EC, 2013A, 2013B, 2016, 2017A, 2017B). The basic payments scheme works on the basis of hectare-based payment entitlements for all farmers engaged in agricultural practices. The 2013 CAP reform introduced the internal convergence instruments to adjust the basic payments towards a national uniform rate per hectare, instead of being calculated on historic entitlements (EC, 2013A, 2013B, 2016, 2017B). The Dutch government decided to gradually introduce the internal convergence mechanism, with full convergence by 2019. The reason for doing this gradually was to alleviate the impact of internal convergence on agricultural sectors, specifically the starch potato sector (Dijksma (2014A)). The greening payments are also hectare-based and conditional on three generic requirements that are considered beneficial to the environment: crop diversification, maintenance of permanent grassland, and provision of EFAs, for which members states can propose additional equivalent measures. The Netherlands supports a wider set of catch crops, in particular nematodes controlling catch crops, to create EFAs, and has introduced an equivalent package for EFAs in the form of a sustainability certification scheme based on alternative agri-environmental management practices (Dijksma, 2014A, 2014C; Henke, 2015; EC: European Commission, 2016). The young farmer payment scheme is a top-up hectare-based payment for farmers younger than 40 years to support farm take-overs and new investments. This extra payment is meant to support generational renewal in the farming system so that the system can continue to function in the future. The young farmer payment accounts for 2% of the total national direct payment allocation (Dijksma, 2014A; Henke, 2015; EC, 2016).

Member States can also decide to introduce optional measures under Pillar I, such as coupling hectare-based payments to specific products, additional support for farmers located in areas with unfavourable natural conditions, and redistributive payments that increase payments for the first hectares (EC, 2016, 2017B). The Netherlands has implemented voluntary coupled support only to a very limited extent (up to 0.5%), through premiums for grazing animals; thus, not covering starch potatoes, sugar beet, and cereals (; Dijksma, 2014A, EC, 2016).

The market management mechanisms under Pillar I leave almost no room for national implementation choices. In terms of production constraints, the EU decided to abolish all quotas, including for sugar (EC, 2013A, 2013B). The CAP's market management mechanisms further provide safety net measures and options for crisis management by investing in market measures that allow for short-term recovery in the event of market disturbances caused by economic or weather-related shocks (Dijksma, 2013; EC, 2013A, 2013B, 2017A, 2017B).

Pillar II instruments are implemented through the Dutch multi-annual rural development programme (RDP), which is co-financed by the EU and the national and provincial governments (EC, 2013A; Dijksma, 2013, 2014B). The RDP was developed in collaboration with the Provinces of Drenthe and Groningen, which are responsible for its practical implementation in *De Veenkoloniën*, and allows for financial support along five main priorities: i) enabling innovation, knowledge exchange, competitiveness; ii) young farmers; iii) sustainability and nature and landscape management; iv) improving water quality; and v) rural development through the LEADER programme (Dijksma, 2014B).

The Dutch government included a small budget in the RDP to reduce the risks and barriers for new (niche) innovations entering the market (Dijksma, 2013, 2014A). Also, additional national funding for young farmers has been made available to support innovation. The Dutch government also continued to support private weather insurance through a subsidy rate on the insurance premium, using RDP payments. Participation in weather insurance is voluntary (Dijksma, 2013, 2014A, 2014B).

Furthermore, the RDP includes funding for the multi-annual regional innovation programme *Innovatie Veenkoloniën* (Dijksma, 2014A). The programme brings together regional stakeholders that have set up their own agenda and have access to a CAP-supported financial budget. The programme facilitates innovative projects that support the production of starch potatoes in the region (e.g. experimenting with precision agriculture and investing in new potato varieties) and contributes to knowledge exchange through events, dialogues, and training sessions (Dijksma, 2014A; Innovatie Veenkoloniën, 2014).

4.3.2. Robustness

The CAP's instruments address the farming system's robustness to a considerable extent (Fig. 3). Mainly the instruments of Pillar I provide buffer resources and are very much focused on protecting the status quo of the farming system. The key insights are elaborated upon below.

The CAP's instruments enable ***a short-term focus*** in the farming system (score 4). For example, like across the EU, the direct payments are disbursed annually to farmers in *De Veenkoloniën*. The current set of conditionalities (e.g. greening requirements) hardly require these farmers to change their current practices (EC, 2017B). Furthermore, the market recovery measures offer only temporary solutions when "normal market forces fail – for example, if there is a sudden drop in demand because of a health scare or a fall in prices because of a temporary oversupply on the market" (EC, 2017B). These instruments are solely in place to recover the farming system's income functionality quickly, without tackling the causes of these disturbances.

The CAP instruments provide the farming system with financial ***buffer resources***, especially through the hectare-based direct payments (score 4). By offering farmers a secure source of income, the CAP enables them to cope better with price volatility and to preserve their farming business even in the face of very low market prices. The convergence of direct payments reduced these buffer resources for arable farming in *De Veenkoloniën.*

Similarly, the direct payments contribute to ***protecting the status-quo*** of arable farming in *De Veenkoloniën* (score 4). Direct payments offer *"a stable source of income that is independent of market fluctuations, making a very important contribution to overall farm income for many farm households"* (EC, 2017B). However, this guaranteed source of income also enabled the prolongation of otherwise less competitive agricultural business models, preserving business-as-usual and discouraging business model adaptations.

During the focus group, stakeholders confirmed that the CAP hardly incentivises change, as the direct payments do not require an adjustment in farming practices to maintain incomes. Internal convergence could have put some pressure on the status quo in *De Veenkoloniën*, but the Dutch government limited constraining effects with a transition phase. Furthermore, the young farmer payments promote earlier hand-over within the family rather than the influx of newcomers, further supporting the current functionalities and mode of operation of the farming system.

Other modes of risk management are very much emphasised through the market management measures introduced in Pillar I of the CAP (score 5). Market management is now primarily targeted at mitigating emergencies, e.g. through public intervention and private storage aid, and through safeguard clauses funded from a crisis reserve fund at EU level (Dijksma, 2013; EC, 2013A. 2013B, 2017A, 2017B). These market management instruments are used primarily to allow for short-term recovery in the event of economic and weather-related shocks. Risk

management is further supported by the possibility of voluntarily taking out private weather insurance in the Netherlands, supported by the Dutch government through RDP payments. The policy instruments are used to make sure that the shocks do not escalate further and to help the system to move back quickly to its initial state.

4.3.3. Adaptability

The CAP's instruments prove fairly enabling for the farming system's adaptability (Fig. 3). The instruments allow for some adaptation through their focus on the middle-term, by enabling flexibility and variety, and providing possibilities for social learning. These findings are explained below.

Several instruments focus to a certain extent on **the middle term** (score 3). For instance, the young farmer payment is granted for up to five years, allowing young farmers to plan decisions regarding e.g. take-overs or investments. Another example is the gradual convergence mechanism implemented by the Dutch government to provide arable farmers in *De Veenkoloniën* a middle-term time period to prepare and adapt to the reduced basic payments. Also, the Dutch government continued its financial support for agri-environmental management through the RDP to reduce the decline of biodiversity in rural areas. Lastly, various monitoring instruments are in place for multiple years to provide insights into experiments, projects, or policy effects (EC, 2013, Dijksma, 2014A, Innovatie Veenkoloniën, 2014).

The CAP's instruments foster ***flexibility*** and ***variety*** to a considerable extent (both score 3). The CAP allows for flexibility by giving Member States some leeway in policy implementation, e.g. by proposing equivalent greening measures.

> *Member States may allow farmers to meet one or more greening requirements through equivalent (alternative) practices. This means that some practices can replace one or several of the three established greening measures.* (EC, 2017B)

This allowed the Dutch government to adjust the greening measures to better fit the national context. However, leeway provided by the CAP is limited by strict requirements constraining tailor-made solutions. For instance, there is no room for national decisions regarding crop diversification, and Member States can only choose from a set of predetermined options for how to implement EFAs.

Variety is introduced mainly through instruments that promote diversification through general agri-environmental and rural development activities, e.g. the RDP and three of its five priorities (sustainability and nature and landscape management, improving water quality, and rural development through the LEADER programme) (Dijksma, 2014B). Moreover, the greening measures may in principle result in adaptation, but their specific calibrations induce little change to arable farming in *De Veenkoloniën.*

The CAP contains various instruments that enable some degree of ***social learning*** (score 3). These instruments are all part of Pillar II. The RDP provides financial resources to organise events, such as training sessions or dialogues, to foster knowledge exchange, and especially the LEADER approach, which enables partnerships to be formed at regional or local level to contribute to rural development (Dijksma, 2014B; EC, 2017A). Moreover, *Innovatie Veenkoloniën* provides a well-functioning platform for actors to engage in knowledge exchange through interaction. However, the question remains as to whether these instruments, which are focused on social interaction, indeed lead towards the integration of adaptive practices.

4.3.4. Transformability

The CAP instruments hardly target the transformability of our case study farming system, except for the promotion and acceleration of some niche innovations (Fig. 3). These findings are explained below.

The CAP contains few instruments that ***focus on the long-term*** or ***dismantle incentives that support the status quo*** (both score 1). On the contrary, the instruments focus on maintaining the status quo, thereby constraining structural change. Stakeholders participating in the focus group confirmed this finding, arguing that CAP instruments were hardly focused on the long-term, as a direct need for structural change was not yet felt. They argued that the CAP did not anticipate change and contained few elements to considerably alter the current system's functionalities. Instead, most new instruments, such as the greening measures, were designed to maintain the farming system in its current state. Whereas some measures are introduced for environmental reasons in both Pillar I (greening measures) and Pillar II (voluntary agri-environmental-climate schemes), their environmental effects are questionable as farmers are barely required to change their practices in order to be eligible for these payments (see ECA, 2017; Dupraz and Guyomard, 2019; Matthews, 2020), making these measures rather symbolic. However, the abolition of the sugar quota *did* disincentivise the status quo as it indirectly affected the income of arable farmers in *De Veenkoloniën*. Nevertheless, sugar beet production and processing remained a core functionality of the farming system.

Additionally, the CAP and its implementation in the Netherlands do not facilitate ***in-depth learning*** in and beyond the farming system (score 1). Despite the existence of various instruments designed to enable learning (e.g. supporting training sessions, workshops, or networks that exchange knowledge on innovation competitiveness through RDP financing or *Innovatie Veenkoloniën*), these instruments mainly enable *social* learning within the sector, but do not encourage the introduction of new knowledge and perspectives from outside the farming system. Consequently, these instruments do not challenge dominant mindsets. The absence of in-depth learning instruments was confirmed by focus group participants.

The ***enhancement and acceleration of niche innovations*** is the only transformability characteristic that is supported to some extent (score 3). The RDP provides multiple financial resources for innovation, and the multi-annual innovation programme *Innovatie Veenkoloniën* contributes to initiating innovative projects and experiments in the region (Dijksma, 2014B, Innovatie Veenkoloniën, 2014). That said, the instruments' effect on the transformability of intensive arable farming in *De Veenkoloniën* is restricted, as most innovations involve adaptations of existing agricultural practices, rather than enabling the emergence of genuinely new practices.

5. Discussion

In the case study, we applied the ResAT to analyse how the policy output of the CAP and its Dutch implementation during the period 2014–2020 enabled or constrained the resilience of the intensive arable farming system in *De Veenkoloniën.* In this section, we discuss four key reflections that emerge from the analysis.

First, our analysis shows that there are clear differences between the extent to which the CAP's policy outputs enable the robustness, adaptability, and transformability of intensive arable farming in *De Veenkoloniën.* Whereas the CAP strongly supports the robustness of the arable farming system in our case study, it focuses less on enabling adaptability and hardly on transformability. The CAP's support for robustness resonates strongly with ideas that legitimise specific state support for farming to provide resources for established farming practices and to continue business-as-usual (e.g. hectare-based direct payments and market management measures of Pillar I). This finding fits with other analyses of the CAP (e.g. Feindt, 2010; Lowe et al., 2010; Alons, 2017; Greer, 2017), in which it is argued that the CAP is characterised mainly by *agricultural exceptionalist ideas* that justify and legitimise the EU's special treatment of the agricultural sector (see Skogstad, 1998; Daugbjerg and Feindt, 2017); and that the CAP 2013 reform hardly introduced substantive change in the CAP but reinforced policy elements that focus on retaining the status quo (see Swinnen, 2015). The CAP's almost exclusive focus on robustness arguably affects the system's capability to overcome all its challenges, especially

challenges that require a more long-term approach, or that are simply too forceful to maintain the status quo. For example, this robustness-oriented approach might be suitable for arable farmers in *De Veenkoloniën* to recover from damage inflicted by extreme weather events in the short run. However, devoting too much attention to robustness might neglect possibilities for farmers to adapt their practices to a changing climate in the long run. It is likely that the strong focus on robustness is the result of policy trade-offs between the resilience dimensions within the CAP. These kinds of complex relationships between the three resilience dimensions leading to possible trade-offs have already been pointed out frequently in the resilience literature (e.g. Béné et al., 2012; Clarvis et al., 2014; Anderies et al., 2013). Moreover, Ashkenazy et al. (2017) even found that strategies focused on enabling persistence [robustness], adaptability, or transformability may undermine one another, making it difficult for a single strategy to amplify all three resilience dimensions. The ResAT's distinction between the three resilience dimensions provides possibilities to systematically analyse trade-offs in policies.

Second, we observed that, whereas policy goals covered all three resilience capacities, instruments were largely restricted to enabling robustness and, to a much lesser extent, adaptability and transformability. For instance, the CAP aims for various middle-term environmental goals – improvements to soil quality, carbon storage, and biodiversity – that help farming systems to adapt. Yet, the proposed greening measures, which invoke these goals, hardly require farmers to adapt their current farming practices and have been criticised for their ineffectiveness in reaching environmental goals (e.g. ECA, 2017). These types of mismatches show that the CAP's policy goals and instruments do not complement one another. Previous research suggests that policies that evolve over a long period of time – such as the CAP – often have weaker policy consistency, coherence, and congruence, which are regarded as important for integrative and effective policies (see Howlett, 2019). Mismatches between policy goals and instruments may very well affect the CAP's capability to enable resilience.

Third, although the insights of our case study cannot be generalised to other EU farming systems, we expect that various findings may apply in other contexts as well. For instance, we found that the robustness of intensive arable farming in *De Veenkoloniën* is promoted through the hectare-based direct payments, revealing the importance of owning land for the CAP to have a robustness-enabling effect. The same might be true for other land-based farming systems in the EU. In contrast, this robustness-enabling effect of Pillar I of the CAP would be less relevant to non-land-based farming systems (e.g. horticulture or intensive livestock and poultry farming). Furthermore, on leased land, the hectare-based payments are often passed on to the landowner, who might have little other relation to the farming system, thereby minimising the contribution of these payments to its robustness. Nevertheless, one should be cautious with generalising ResAT findings of a single farming system case. We reason that the CAP's resilience-enhancing or resilience-constraining capabilities are very dependent on the farming system's characteristics, such as its functions, its regional context and the specific challenges that it faces (see also Ashkenazy et al., 2017). For instance, *De Veenkoloniën* faces challenges that are specific to the system (e.g. the shock caused by the convergence mechanisms largely affecting starch potato farmers' incomes, the loss of soil quality due to increasing intensification of starch potato farming, or the sensitivity of the peat soils to droughts caused by climate change), which require specific policy interventions to be able to strengthen the system's resilience. Farming systems across the EU vary widely in their characteristics and are exposed to different economic, social or environmental stresses and shocks. It is therefore unlikely that the results of *De Veenkoloniën*, with its own specific characteristics and challenges, translate directly to other farming systems. Moreover, Member States vary significantly in their CAP implementation choices, resulting in different goal priorities and configurations of instruments, both in Pillar I and Pillar II. These implementation choices of Member States will determine how the CAP enables or constrains the resilience of farming systems. A logical follow-up study would, therefore, apply the ResAT to multiple different EU farming systems to compare results, leading to a more complete picture of the CAP's enabling and constraining effects on the resilience of different farming systems.

Fourth, the ResAT's top-down approach appeared to be useful for examining systematically the different extent to which the outputs of public policies are suitable for enabling or constraining the robustness, adaptability, and transformability of complex systems. However, it is important to keep in mind that, if a policy appears to enable resilience, this does not automatically imply that the farming system uses this improved capacity. Therefore, a recommendation for follow-up research is to conduct an in-depth bottom-up case study on how farming system actors experience the influence of policies on the resilience of the system. Such follow-up research would complement the top-down findings and could help to create more empirical evidence on the relationship between policy outcomes and resilience.

Last, the ResAT and its coloured wheels proved to have a discussion-initiating character, which was emphasised by the extensive reflection among the focus group participants on the current way of thinking about resilience and policies. This implies the tool's usefulness for stimulating discussion with policy practitioners about the resilience effects of public policies. It is important for these discussions to stress that the ResAT does not measure the policy's actual impact on resilience and that the traffic-light coloured wheels do not imply a normative judgement of the policy. The ResAT should, therefore, always be accompanied with an explanation of the analysis and the results that specifies the purpose of the tool.

6. Conclusion

This article started with the question of how to analyse whether and how the CAP enables or constrains farming systems' resilience. We introduced the ResAT as a heuristic to examine how policies affect farming systems' resilience. The ResAT provides a systematic set of indicators for resilience-enabling policies per resilience dimension (robustness, adaptability, and transformability). We applied the ResAT to the case of the intensive arable farming system in *De Veenkoloniën*. Our results show that the CAP and its Dutch implementation strongly support the robustness of the arable farming system, but that they focus less on adaptability and hardly on enabling transformability.

At the time of writing, the CAP post-2020 reform process is in full swing. The current CAP proposals already move towards more flexible and context-sensitive policy design as Member States can indicate their national priorities and implementation choices via National Strategic Plans. Also, the proposed eco-schemes would allow Member States to develop more performance-based schemes that incentivise farmers to undertake agri-environmental or climate activities. Despite these promising changes, it seems that the proposed CAP post-2020 will not differ significantly from its current form as it will largely continue to keep following a robustness-oriented approach, for instance, by maintaining hectare-based payments. Furthermore, the European Commission presented its Farm-to-Fork Strategy on May 20, 2020 in which it introduces its plan for the transition towards a sustainable EU food system. Whereas previous CAP reform rounds have proven to result in incremental change only, it seems that the National Strategic Plans and the CAP post-2020 reform will need to adhere to the European Commission's longer-term vision. It remains to be seen whether and how this will affect the overall reform outcome.

Small incremental changes to the CAP will not suffice this time if the EC truly wants to deliver on its ambitious goal of ensuring a more resilient agricultural sector in Europe. Continuing a robustness-oriented approach within the CAP would neglect the capability of farming systems to adapt to long-term stresses, e.g. climate change, soil degradation, or rural out-migration. Our findings suggest the need to integrate a broader perspective on resilience into the CAP, one that moves beyond

quick adjustments to withstand shocks in the short run and embraces a more long-term approach that allows for adaptations and change. This approach would entail more supportive measures for farmers and farming systems to develop their adaptability to changing conditions and their capacity to transform mainstream agricultural practices where needed to preserve the provision of food, other bio-based resources, and ecosystem services, now and in the future.

Overall, the ResAT is a useful analytical tool for policy practitioners who aim to investigate and reflect on how policies address the resilience of farming systems. The tool may help policy practitioners who want to compare resilience-oriented policy choices, especially in relation to the three resilience dimensions of robustness, adaptability, and transformability. The tool, or an adaptation, may also prove useful in other policy areas. The results of a ResAT analysis are valuable inputs to stimulate discussion with relevant actors about policy design choices to address identified resilience challenges. These features make the tool suitable to aid the search for resilience-enhancing policy improvements that take into account an appropriate balance between robustness, adaptability, and transformability. The ResAT thereby contributes to a more extensive understanding of how EU agricultural policies, and public policies more generally, affect the resilience of complex systems.

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CRediT authorship contribution statement

Yannick Buitenhuis: Conceptualization, Methodology, Investigation, Formal analysis, Data curation, Writing - original draft, Writing - review & editing, Visualization. **Jeroen J.L. Candel:** Conceptualization, Methodology, Investigation, Writing - review & editing. **Katrien J.A.M. Termeer:** Conceptualization, Methodology, Investigation, Writing - review & editing. **Peter H. Feindt:** Conceptualization, Methodology, Investigation, Writing - review & editing.

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Appendix. List of analysed policy documents

CAP policy documents.

1. EC: European Commission (2013A). CAP Reform – an explanation of the main elements. http://europa.eu/rapid/press-release_MEMO-13-937_en.htm
2. EC: European Commission (2013B). Overview of CAP Reform 2014–2020. Agricultural Policy Perspectives Brief no 5*. https://ec.europa.eu/agriculture/sites/agriculture/files/policy-perspectives/policy-briefs/05_en.pdf
3. EC: European Commission (2017A). Agriculture: A partnership between Europe and Farmers. The EU's common agricultural policy (CAP): for our food, for our countryside, for our environment. Luxembourg: Publications Office of the European Union. https://publications.europa.eu/en/publication-detail/-/publication/f08f5f20-ef62-11e6-8a35-01aa75ed71a1/language-en/format-PDF/source-search
4. EC: European Commission (2017B). CAP Explained: Direct Payments for Farmers 2015–2020. Luxembourg: Publications Office of the European Union. https://ec.europa.eu/agriculture/sites/agriculture/files/direct-support/direct-payments/docs/direct-payments-schemes_en.pdf

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Appendix A. Supplementary data

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