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Dutch Organic Potato Farmers: Their Perspectives on Challenges, and the Research and Policy Agenda

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Abstract

Organic potato production is a small sector in The Netherlands with a slow gradual growth. This study presents perceptions of organic potato farmers in The Netherlands of their position and future in relation to research and policymaking. We draw on the notion that representation of interests in setting the research and policy agenda shapes technological developments. Data were collected through 16 focused individual interviews in 2024 and additional interviews with experts and stakeholders and professional journals. We found an organic potato farming sector that is small, diverse, and well organised. The potato crop plays a less dominant role on the organic farms than on conventional farms. Farmers perceive the market as the main challenge for their potato production. Their orientation on soil health and system approaches leads them to other research priorities that are not part of a research agenda limited to potato. The farmers do not consider themselves well heard and are sceptical about the way the research serves their farming. Because of the absences of a supporting lobby from an input-sector, organic sector actors are relying on their own engagement with policymakers. They also consider their own farms and value chain as the heart of where innovation takes place. In relation to responsible innovation, this study suggests that "representation at the table" where research problems are defined and priorities are set is not the only change required for opening up other avenues of technology development in the Dutch potato sector: additionally, the types of research pathways and research funding have to be discussed.

Keywords Responsible innovation · Co-construction of technology · Representation

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Introduction

Organic potato production can contribute importantly to a more environment-friendly agriculture in The Netherlands. In the face of climate change, its role may even become more important. However, the growth of this sector is gradual but relatively slow. Organic potato production is a small sector, increasing from 3 to 4% of the total potato production area over the last 10 years (varying between 1100 and 1500 ha for ware and between 400 and 600 ha for seed potato), and 250 farmers, against 9500 farmers in the conventional sector (Nuijten et al.2025). The main market for organic potato is fresh ware potato. In the past *Phytophthora* was considered the main problem for organic potato cultivation. The development of *Phytophthora* resistant varieties and two covenants in 2017 and 2020 that stimulate cooperation in the value chain have helped to stabilise production and market demand. However, market demand remains an important problem for Dutch organic growers in general.

The Action plan for the organic sector in 2022 (Ministry of LNV 2022) was a milestone, indicating recognition from the side of the government and possible turning points in their policy towards the organic agricultural sector. By the time we are writing this (early 2025), the political situation in the Netherlands has changed and the future of government and policy support for the organic sector looks misty again.

In this study, we reflect on the way organic potato farmers in The Netherlands perceive their position and future in relation to research and national and European policies. These perceptions are relevant in the context of responsible innovation. We draw on concepts used in the field of science and technology studies in which technology development is considered a process of co-construction of technical and social factors (MacKenzie and Wajcman, 1999). This thinking also explains how the strong expectations about the potential of new technologies mobilise support and thereby determine the future direction of technology development itself (Borup et al. 2006; van Loqueren and Baret 2009). For responsible innovation, theory assumes that stakeholders have sufficient presence at the table to be heard and considered when setting agendas of research and policy making (Macnaghten 2020). One could see research agendas as reflections of problems that are experienced and recognised. Research agendas determine the direction of the search for solutions in which research invests. In this way, research agendas contribute to the future reality (Borup et al. 2006). Concerns of actors who are not being present in the process of setting the research agenda are easily overlooked and neglected, which affects the type of technologies being explored and developed.

With the intention to explore how climate change might affect the potato sector in The Netherlands, we describe how expectations differ for a smaller group of organic potato farmers as compared to a larger group of conventional potato farmers. We reflect on these differences and the way this relates to the representation of the organic sector in the research and policy agenda. With this description we aim to present experiences in the practical real world that are often not picked

up by science and tend to be a blind spot in the analysis of how technology development can be understood. We used information from an earlier commissioned study in which Dutch organic potato farmers were interviewed, interviews with additional resource persons, regular general professional potato literature and our own knowledge of the sector and the crop.

Material and Methods

In the context of an EU funded programme related to the effects of climate change on potato production (https://foscera.net/crrisp), we planned a case study to explore the perception of organic potato farmers in The Netherlands about their major challenges in the near future. We formulated and commissioned an assignment to the Academic Consultancy Training of the Wageningen University & Research (WUR)-educational programme. The assignment was carried out by a group of master students in November 2023, under the supervision of a team of experts (Nuijten and Almekinders 2025). A list of possible interviewees was provided by two contact persons of the organic farmer associations BDEKO and Vereniging Bio-boeren Zuidwest. Additional farmers were contacted to achieve a better representation of the whole of The Netherlands (see Nuijten and Almekinders 2025). In total, 16 farmers agreed to an interview. Most of the interviewed farmers live in the province Flevoland which is the province with the highest percentage of organic farmers in The Netherlands. The interviews took between 1.5 and 2.5 h and focused on potential challenges, expectations and opportunities these farmers face regarding the future of potato cultivation in the light of climate change. We carried out additional interviews over the period January 2024–March 2025 with key informants: relevant resource persons at WUR, Bionext, and the private sector. All interviews were fully open interviews and not in all cases exclusively meant for this study. The interviews were not meant to be representative for the entire population of organic farmers but to collect opinions and signal trends. In addition, we used professional literature as sources of information and our own professional experiences from working with the sector stakeholders as researchers in different positions over the course of years. When we use the word "farmers", we refer to arable farmers only.

Results

How Organic Potato Farmers and Their Potato Cultivation Are Different

The interviews made clear that organic farmers themselves consider that they are thinking differently as compared to farmers in the conventional sector: a healthy soil is the basis of the farm, the importance of long-term perspectives on solutions are crucial and collaboration is a priority strategy.

Some organic farmers mentioned that organic farmers have a strong pioneering mind, which they consider necessary to be able to farm organically. Farmers themselves often referred to "dark green" and "light green" organic farmers. "Light

green" farmers are those who switched to organic later, more often based on economic motivations, although over time these farmers can also turn into a darker shade of green. Conversion to organic meant for all participating farmers a serious reduction in potato area on their farm: the rotation became wider (from 1 in 3–4 seasons to 1 in 6–8 seasons) to keep and improve the soil health. This smaller area of potato brings an important change to the backbone of the enterprise. The potato crop is thereby less of a priority crop for the organic farmers than for conventional farmers. Because each organic arable farmer organises the crop rotation differently, depending on personal preferences, available market connections and machinery amongst others, organic potato farmers are a diverse group of farmers with different practices. The average organic potato farmer does not exist. Organic farmers also differ in opinion on the current status quo and the further development of organic farming. As a result, the answer to the question if ideas and perceptions of organic potato farmers align more or less with the Dutch potato research agenda also depends on who one talks with.

The organic farmers whom we interviewed considered themselves part of a small but well-organised sector. Not only the farmers are well organised, but the entire chain, with Biohuis and Bionext as the two main organisations facilitating cooperation and communication within the sector and with the outside. Biohuis is the organisation representing the interests of organic farmers in the Netherlands and Europe. Bionext is the overarching umbrella organisation for the whole organic value chain. Some of the interviewed farmers are active within these sector organisations or actively engaging with them. Some look actively for collaboration with policy makers and scientific research, whereas others prefer to stay away from political engagements and collaboration with scientists. Because there are hardly funds for lobbying, much of the efforts to make the sector heard is based on volunteer work. This is an important difference with the conventional sector which counts with many more farmers and involves many commercial companies willing to support financially.

Potato Breeding and the Potato Covenant

Breeding new varieties is an important component of agricultural innovation. For organic agriculture, including potato, this gives way to an important question: to what extent should breeding for the organic sector be different from breeding for the conventional sector? This was studied in the 1990s and 2000s, e.g., by Osman et al. (2008) for onion. To stimulate the breeding of varieties with resistance to late light (*Phytophthora infestans*) for the organic sector, cooperation between conventional potato breeding companies, organic farmer-breeders and pre-breeders of Wageningen University and Research (WUR) was successfully established in 2008. Funding was secured for the project Bioimpulse for a period of ten years (Keijzer et al. 2022). This project allowed smaller breeding companies access to resistance genes against *Phytophthora*. The involvement of farmer-breeders ensured adaptedness to organic conditions. However, uptake of the newly bred varieties by the market proved difficult and various alternative strategies to increase market acceptance had limited success (Nuijten et al. 2018). After the disastrous *Phytophthora* season of 2016, the

entire organic potato value chain felt a high sense of urgency. Some farmers even turned to the application of copper to protect their crop although this is illegal in The Netherlands. In 2016, out of 23 potato varieties available to organic farmers, nine were *Phytophthora* resistant. Breeders were hesitant to invest more into resistance breeding because the first generation of robust varieties had proven themselves, but the market had shown to be reluctant to commercialise them with the argument that their customers do not know these varieties. This changed with the commitment of the supermarkets through the Potato Covenant in 2017 (Anonymous, 2017). The Potato Covenant facilitated collaboration with supermarkets and traders. In the covenant, potato farmers, breeders and seed producers, traders and supermarkets agreed that within 4 years they would produce and sell 100% late blight resistant varieties for their organic potato segment in 2020 (Keijzer et al. 2022). Building a covenant in which all Dutch supermarkets were involved was seen as a real breakthrough.

The past years the number of resistant potato varieties has increased rapidly: In 2024, 29 varieties with *Phytophthora* resistance were available to organic farmers out of a total of 34 potato varieties. The number of varieties for organic farmers that are suitable for processing into fries and chips is still very limited while most of the conventional breeding efforts go into varieties suitable for processing (Van Loon 2019). In the second covenant, in 2022, the focus is on robust varieties suitable for processing. Soon after the start of the first covenant, a covenant on robust varieties was signed in Belgium and in 2023 a follow-up covenant was signed together with French organisations. The involved Belgian and French organisations exchange results and experiences with the organisers of the Dutch covenant. In the UK, a Robust Potato Pledge was launched in 2021.

When further asking organic potato growers about the future needs in terms of breeding, they did not see an easy overlap in breeding for the conventional and organic sector because of differences in priorities that should not be underestimated. The importance of resistance and other robustness characteristics that organic farmers look for (rooting capacity, low N requirements, virus resistance) are in tension with the priority that conventional potato farmers give to high yields and reliance on chemicals to combat diseases. This leads to differences in the prioritisation of traits, and ultimately in the selection of other varieties. Nevertheless, an increasing number of conventional farmers have an interest in the robust varieties because of lower pesticide needs and a conventional sector that increasingly restricts the application of chemicals.

For seed potato producers, export is an important market. But that market still demands traditional varieties and in other EU countries there is not yet an obligation, unlike in the Netherlands, to use organic seed potato for organic ware potato production. The organic seed export market is fairly dramatic according to the farmers we talked with.

The Priority Problems of the Potato Crop on the Organic Farm

Phytophthora is the main disease problem in organic potato farming, although some farmers consider that the availability of the robust varieties with their resistance in

combination with the 2017 Potato Covenant (that stimulated the uptake of the new varieties by the supermarkets; now, 90% of the organic ware potato in those supermarkets are robust varieties) have helped to reduce this concern. The current Hutspot project aims to further increase the sale of organic potato in Dutch supermarkets, in combination with carrot and onion. In recent years, the issue of late blight resistance is however also becoming important for conventional farmers because the number of available and effective fungicides is reducing. This brings the interests of farmers from the two sectors closer to each other. Organic and conventional potato sector collaborate for example in the Taskforce Phytophthora to coordinate research and regulation around Phytophthora because in seed potato quality and disease management, organic and conventional potato farmers have to align to the same regulations.

That genetic modification to develop Phytophthora-resistant varieties does not fit organic farming practices is often seen as a view of exclusively the organic sector itself. However, also conventional potato breeding companies such as Agrico do not see advantages in genetic modification. This differs from the perspective in some WUR research that sees genetic modification through cisgenesis (in the past conducted in the project DuRPh from 2006 to 2015) and more recently through CrisprCas as the way forward.

An additional solution pathway that organic farmers want to explore in relation to late blight is the interaction with soil management. They do not see it as an alternative to resistance breeding but as supportive. Understanding how various factors such as crop rotation, reduced tillage, fertilisation, type of green manure and other farming practices may slow down disease development requires a holistic research approach in which many variables likely interact. This not only applies to potato but also to other crops like onion where wide rotations help to reduce problems with diseases like *Fusarium*.

The priority problem for the interviewed organic farmers is the market, especially for those who started producing more recently and have not yet an established network to reach the buyers. It can be difficult to sell the organic potatoes. Farmers' explanations for the existence of the problem are an overall decrease in the consumption of potato, the higher profit margins that supermarkets place on organic produce, unfair competition through so-called misleading certification schemes, unnecessarily high tuber skin quality requirements, and lack of consumer interest for organic fries and chips. In addition, there is a stagnating export of organic potato because robust potato is not yet known in countries with larger markets and where the popularity of "local" produce—such as in countries like France and Germany- is still dominant, and where domestic organic production is increasing.

Farmers consider that there is little interest to carry out research on the impact of chemicals on human health. As a result, awareness of consumers on this point remains low. Such awareness could stimulate demand for organic produce. Several interviewed farmers consider research on possibilities to increase awareness and influence buying behaviour of the consumer as important. They see the route of increasing demand for organic produce is generally considered to be more effective than stimulating supply, e.g., through subsidising organic production. Increased supply without increased demand suppresses prices and thereby the profitability of organic farming. Having said this, it should be noted that in the past (early 2000s)

the only available subsidy for organic sector was for transforming from conventional into organic. According to interviewed farmers, subsidies for making farming practices more sustainable have been difficult to get for organic farmers as their practices are considered to be already sustainable. Some organic farmers therefore feel they are punished for being frontrunner in sustainable farming. It is recently announced that from 2026 until 2029 an annual budget of € 3.7 million of subsidies will be available for small and medium size enterprises to stimulate market development through setting up local and regional value chains, cooperative product development or enlarging the assortment of organic products with catering companies.

Organic farming is requiring more labour than conventional farming which is perceived as a challenge. Weeding is a major task in vegetable crops such as carrot, beetroot, cabbages, onion, and pumpkin and proportionally, the cultivation of vegetable crops is much larger on organic farms than on conventional farms. Potato, next to cereals, is a crop that can be kept free of weeds relatively easily mechanically. Grown from seed tubers, potato has a head start to weeds and can close the canopy fast, shading out the weeds.

The organic farmers experience that the interest of schoolkids to help during summer has decreased while migrant-based labour has become more expensive, more restricted in regulation (number of working hours) and—according to some—less available. Temporary labour contracts are becoming increasingly difficult. Robotisation is being referred to and rapidly becoming a reliable and affordable alternative although still dealing with growing pains. Robotisation can support both weeding and harvesting. An increase in organic farming would contribute to further scarcity of on-farm labour, although not necessarily in potato as it is not a labour demanding crop. There is also a worry for some farmers how robotisation will affect the human and social nature of organic farming.

Climate change challenges were much less referred to by the interviewed farmers than marketing and Phytophthora resistance. When mentioned, farmers mostly related climate challenges to flooding and drought. Several farmers indicated that they prefer not to irrigate their crops as irrigation can do more harm than good to crop growth, but with the increase of dry periods with warm weather they expect to be forced to use more irrigation, in particular during the establishment of the crop after sowing or planting and to prevent damage during harvesting of organic potato which is during summer, Many farmers in the South West, North and Flevoland have salinised or brackish groundwater, making them dependent on the use of surface water as rainfall is becoming more unpredictable. Where surface water is a common water source for conventional farmers, and thus may contain pesticides, it can be unsuitable for the use in organic farming. For seed potato growers the use of surface water is not allowed because of risk on brown rot.

Overall, farmers expect to be able to adapt to the challenges resulting from climate change. Actually, they see opportunities in showing the benefits of organic farming practices and the importance of a healthy soil. For example, higher water retention capacity and permeability of soils that are managed with organic practices may become a show case of climate resilience. Lower overall disease incidence is another point where organic farmers feel they compare favourably with conventional farmers.

Tensions with the Conventional Sector

In the early days of organic farming, when it still had a bad reputation among conventional farmers, weed control was a big issue and the potential spreading of weed seeds caused tension with conventional neighbours. Over the years organic weed management has improved. Some conventional farmers even adopted mechanical weeding practices developed in organic cropping, for example in onion, as they cause less damage to the crop than herbicides. Open days of the organic sector are visited by small but increasing numbers of conventional farmers to find answers to their soil problems. Several farmers said they see onventional neighbours starting to experiment with "organic" practices like reduced tillage.

Quite some of the organic farmers we interviewed mentioned the relation with their conventional farming neighbours as an issue when talking about Phytophthora. In the years before 2023, summers were dry and Phytophthora was not a big problem and, consequently, tensions eased. However, the seasons of 2023 and 2024 felt for various organic farmers like a setback of 30 years because the high Phytophthora incidence increased tensions with conventional neighbours considerably. One organic farmer mentioned that spraying fungicides increased the virulence of Phytophthora. On the other hand, among researchers there is the fear that not spraying increases the chances that Phytophthora oomycetes evolve and resistance will be broken. A number of potato breeding companies therefore do not want to provide seed of robust varieties to organic farmers anymore and some scientists argue it is better that organic farmers stop cultivating potato for fear of losing the valuable resistance genes and wanting to maintain them as functional resistance genes for conventional potato production.

The Potato Covenant also contributes to building better relations with conventional farmers and with scientists. Scientists who are expert on Phytophthora are invited in workshops and field visits on organic farms to explain disease management that reduces the chances of a break-down of resistance genes. Through interaction with organic farmers, scientists are exposed to the rational of organic farmers. Relationships with conventional farmers improve because organic farmers cultivate varieties with high Phytophthora resistance which reduces the Phytophthora infections. And, as mentioned, also the options for conventional farmers to control Phytophthora are becoming more complicated: the frequency of spraying fungicides is increasing because of increased virulence, some fungicides are forbidden or lose effectiveness while the pipeline with new fungicides is poorly filled and policy increasingly tends to reduced pesticide use. An organic farmer indicated that he understands the frustration of the conventional farmers.

Perpectives on Research and Innovations, Research Needs

The organic potato sector has seen several important innovations when it comes to breeding robust potato varieties and more recently the Colorado beetle slapper. From the interviews transpired that the majority of the farmers consider that

innovation mostly happens on the farms, through exchange of experiences with other farmers, and in collaboration with machine builders or researchers which mostly starts in an informal way. Some farmers are involved in applied research with the WUR and other experimental farms of independent foundations such as Stichting Proefboerderijen Noordelijke Akkerbouw (SPNA) in the north of the Netherlands and Rusthoeve in the southwest. It is, however, difficult to get funding for research specifically targeting organic agriculture. This is not only the experience of organic farmers but also of researchers from Wageningen University & Research and the Louis Bolk Institute. It counts for both support from national and provincial/regional level programmes.

Most agricultural research in the Netherlands, however, is initiated by large companies that organise trials with crop varieties and chemicals as potential commercial products. In this light, bio stimulants are also seen as potential commercial products for the organic sector, but organic farmers are hesitant to go back to what they consider the trap of the input-carrousel: they prefer systemic approaches and to minimise the use of inputs as much as possible. With the current national policy for public funding to be co-financed by the private sector, the organic sector is too small and has too few companies of scale to set up large-scale public-privately funded research projects.

Another route through which research is initiated are the research questions that the Ministry of Agriculture sets out at WUR research departments. The organic farmers and representatives of Bionext see these research questions as less relevant for the organic sector. There are some exceptions, realised through amendments by the Dutch parlement. The Bioimpulse project on organic potato breeding is the most well-known example which started in 2008 with special research funds for organic breeding (Lammerts van Bueren 2010). Farmers feel that the research on organic agriculture (and education) in The Netherlands contrasts with the situation in other EU countries. In Germany, for example, there are nine universities with departments of agriculture that also take organic production into account.

The research that organic farmers consider most relevant is system-based and with a long-term vision. This does not match easily with subsidies granted for 2 to 4 years and research agendas that are crop-based and work on short term outcomes. Practices that support soil health such as crop rotations, mixed cropping practices, different types of manuring and reduced and non-tillage practices require long term research projects and adapted effect-measurements. For research targeting organic potato production this implies that, next to the generally appreciated breeding of robust varieties (robust being not only disease resistance but also tolerance to other system stresses), this research must be embedded in broad-scope and long-term projects. It is difficult to interest the private sector as co-funder for such projects as it is not aiming at developing commercially interesting products. It is also difficult for scientific research agendas and funds as this type of research is considered too applied and does not count as fundamental research.

The current research interest in micro-organisms and soil health opens up interesting opportunities but it remains to be seen to what extent soil amendments will become the main focus of that research and, ultimately, fit the organic agricultural interests. Farmers also had mixed feelings about the robotisation: if not developed

in close collaboration with farmers, these devices may miss their utility and become misfits.

According to the interviewed farmers, their own experimentation remains a very important source of new ideas and innovations. When successful, such experimentation may be picked up by formal research. However, the system approach requires a holistic research mind and knowledge of the farm context, two aspects which are not always easy to find in main stream research.

Organic (Potato) Farming and Policymaking

The interviewed farmers emphasised the importance of actively seeking to influence policies and effectively organising themselves. Policymakers are not coming to their kitchen table. Low external input use makes them less interesting for a supporting lobby by the agro-chemical industry. Thus, they do much of the representation/lobbying by themselves. A relatively large part of the interviewed organic farmers actively participates in a role of representation and policy making. They are chair of a commission or active for a regional farmer association or for Biohuis, the national farmer association. One of the interviewed farmer was also policy maker for the country wide umbrella organisation Bionext which includes also the organic traders and processors.

Overall, the interviewed farmers feel that national policymaking focuses on the conventional agricultural production and that a gap exists between organic farming and policymaking. The 2022 Organic Action Plan of the Dutch Government was felt as a potential turning point. Organic farmers reckoned they were now taken (more) seriously, although they were disagreeing about the strategy laid out in the Organic Action Plan to further growth of the sector. The support to increasing supply of organic products rather than increasing demand for them is, according to many we interviewed, not the logical route. Although the recent change of political parties in government has made the balance swing back again, away from organic, farmers consider there is still more attention for organic than 10 years back. The interviewed farmers are critical about the government policies and farmers had different suggestions f.e. on how to improve regulation in relation with soils and soil classification, or regulations on use of organic fodder as input. While critical on subsidies (because they are not sustainable in the long run, as shown by the early 2000s government subsidies to convert to organic which created surpluses on the market), we recognised a strong desire among the organic farmers we spoke with "to be recognised" for their production of healthier food, maintaining and improving soil quality, maintaining animal health and providing ecosystem services in the form of biodiversity and clean water. Some of the organic farmers referred specifically to the lack of support from local and regional level institutions, e.g., when their interest in water level management is in tension with nature conservation or restoration.

Because EU regulations and directives are adapted to be translated to national policies, there are differences in the national level regulations for organic agriculture between European member states. For example, the obligation of using organic seed and animal fodder, the permission to apply copper in the potatoes (and other

crops) and the use of subsidies vary between countries. Farmers in our study tended to feel better supported by EU policy than by the Dutch policy. They explain this by the higher importance that the other EU countries give to the organic: The Netherlands is among the EU-member states with the lowest percentage of organic production area and the strong lobby of the conventional agricultural sector tends to be more effective in The Hague than in Brussels. The uneven translation of European rules into national regulation can create an uneven playing field between EU countries. Nevertheless, the organic potato farmers tend to support the generally strong regulation in The Netherlands regarding the use of organic potato seed and the ban on using copper to combat Phytophthora. They advocate the wide application of stronger rules in the rest of Europe.

Discussion and Conclusions

There is an increasing body of science that shows how expectations about the future are relevant for the development of solutions to technological and social problems (e.g., Borup et al. 2006). We interviewed 16 organic potato farmers to understand how they perceive the challenges of organic potato production and how they see that these challenges are catered for by scientific research and policy agendas.

For organic farmers in the Netherlands, the potato crop plays a less prominent role in their production system than for conventional farmers because the organic approach relies more on wide crop rotations, crop diversity, soil health and diverse systems. In addition, not making use of chemicals also limits organic farmers in late blight control. Moreover—and in relation—, the organic farmers reckoned that they identify different challenges in the potato sector as compared to conventional farmers. They are more focused on soil-health and system-based dynamics. As a result, also the envisaged research that organic farmers consider relevant is different, which implies that solution pathways look different as well. As a consequence, the research agenda that organic potato farmers pursue is not exclusively potato-oriented—apart from late blight. But also in late blight, the solution pathway looks somewhat different than in conventional potato production. Next to the importance of resistance to late blight in the potato varieties, organic farmers are keen to explore the interaction of late blight with other factors and practices on their farms.

The organic farmers consider climate change as important but manageable because resilience is a key concept in their overall strategy. Some even see organic farming as a solution pathway to deal with climate change in agriculture. Organic farmers consider the market dynamics as the most acute problem, amongst others reducing options for export and uneven power distributions. Some argue that the most effective strategy is to increase consumer awareness, whereas others argue that government also has a role to play.

The organic farming sector is small and diverse, but part of a well-organised organic value chain. The organic potato farmers feel they are not yet sufficiently heard by the policymakers and those responsible for setting the research agendas. Because the organic potato sector is small and does not have a commercial input-sector to support their lobbying, they feel they remain relatively invisible and are

missing out on recognition of their contribution to biodiversity, environment and human health. They feel that more support to make these contributions visible would increase the demand for their produce and put pressure on the supermarkets for fairer margins.

We encountered considerable scepticism among the interviewed farmers in relation to the relevance of scientific research (from WUR) to become relevant for their future, with also prominent exceptions like the breeding programme Bioimpulse. Organic farmers see themselves as frontrunners and innovators. On the one hand this means taking more risks, but it also makes their farming more meaningful because they contribute to the development of a more sustainable farming approach. Such approach, they reckon, can serve as a source of inspiration for farmers in the conventional sector.

In conclusion, with the intention to find out how concerns around climate change of different type of potato farmers in The Netherlands are represented and reflected in the research and policy agenda, we found that climate change is not a point of priority attention for organic potato farmers. Their identification of challenges goes beyond the potato crop itself and are farm, soil and market related. As a consequence, their need for supporting research also goes beyond a potato research agenda. Because the organic potato farmers are a relatively small group without a supporting lobbying power of an input industry, their impact on policy making is also limited. The situation in which a small group of organic farmers has little influence on the research agenda compares with the one described for agro-ecological approaches by van Loqueren and Baret (2009). With little traction and support for research on system-broad and long-term research, this direction of technology development remains closed. This study also suggests that responsible innovation is more than arranging "representation at the table" where research priorities are set. It also asks a collective reflection on the types of research pathways, sources and time-span of research funding in order to open-up alternative avenues of agricultural production and its organisation.

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Declarations

Ethics Approval Not applicable.

Conflict of interest The authors declare no conflicting interests.

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