Responsible integrated pest management transition pathways: co-creation workshops to shape policy advice

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The uptake of integrated pest management (IPM) practices by farmers faces challenges across Europe. Changes outside the farm level are needed to overcome barriers and maximise opportunities for the adoption of IPM. This modest study reports on a backcasting workshop with strawberry sector stakeholders from business, education and advisory services, along with policymakers, who co-created desirable future visions for strawberry farming in the Netherlands in 2053. To encourage the participants to 'think outside the box', a presentation was given by a practitioner of organic strawberry growing and selling. Although the vision of some stakeholders focussed on high tech while others promoted high nature, both included zero use of chemical crop protection products and incorporated robotics to monitor plant health. These findings suggest that, despite vested economic interests, established routines and agreements that resist change, stakeholders can co-create a radically different and sustainable future when imagining 30 years ahead. We end this paper with a statement that collaboratively constructing a desirable future vision is important for triggering internal motivation for transformative sectoral change. Both internal and external drivers are important when aiming for sustainability transitions.

Keywords: pest management, backcasting, co-creation, farming, strawberries, systemic change

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Purpose: need for policy and sector advice to responsibly scale IPM usage

Integrated pest management (IPM) has the potential to assist farmers in minimising their use of chemical crop protection products, decreasing costs and contributing to the transition to sustainable food systems. Although IPM approaches have been developed for a wide diversity of crops and contexts, their uptake by farmers remains low across Europe (see https://he-support.eu/). Earlier studies show that farmers sometimes feel stuck in a specific farming system due to economic dependencies and the lack of collectively sharing transition risks, among other issues (Hoes et al., 2023; Meuwissen et al., 2020; Siebrecht, 2020; Vermunt et al., 2022; Vrolijk et al., 2020). This suggests that many farmers cannot simply adopt IPM, necessitating changes to be made at the supply chain (processing, distribution, and consumption) and policy levels as well.

The dominant aspects of the current context, including agricultural value chains, policies and mainstream farming systems, are referred to as the 'regime' level in transition studies (Köhler et al., 2019; Geels and Schot, 2007). Regimes are considered to be rather resistant to change due to vested economic interests, established routines, agreements and historically established infrastructures, which is rather problematic when aiming for transformative change. Some transition studies suggest more attention should be paid to the internal drivers for change from within the regime (Runhaar et al., 2020; Grin, 2020), and to gaining insights into how actors that primarily work at the regime level can overcome these change-resistant dynamics (Wojtynia et al., 2023). Backcasting, in which participants start by defining a desirable future vision and work backwards to determine how to achieve it, has been applied in sustainability transition initiatives (Quist, 2007) to avoid entanglement in the current lock-in situations and to imagine more transformative change.

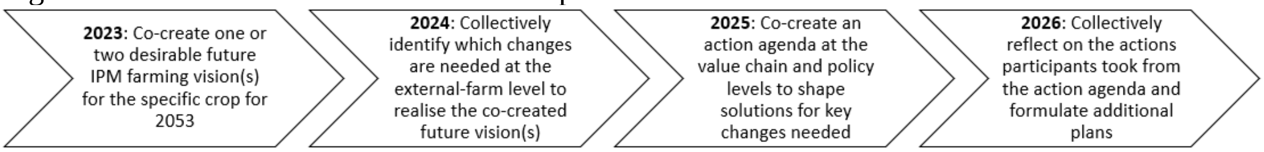
This thinking led to this study, in which backcasting is used to identify changes that are needed at the chain-partner and policy levels to support the scaling of IPM usage among farmers in a responsible way. This study runs from 2023 until 2026, and this paper reports on the activities that took place in the Netherlands in 2023 and 2024. We report on two co-creation workshops on IPM in strawberries, in which farmers, advisors, chain partners and policymakers collectively shaped desirable future visions, an important first step in our applied backcasting approach.

Approach: backcasting to co-create future visions and the required changes

This study analyses two co-creation workshops that took place as part of the Horizon Europe Framework project '**S**upporting **Up**take Integrated **P**est Management and L**o**w-**R**isk Pes**t**icide Use' (the bold letters in the title create the acronym 'SUPPORT', see https://he-support.eu/). These co-creation workshops applied a backcasting approach. Backcasting involves developing a desirable future vision and exploring which changes are needed in the present to move closer towards this goal (Vergragt and Quist, 2011). This approach enables stakeholders to envision more ambitious sustainable solutions than forecasting because they are not starting from the present status quo (Quist, 2007).

Between 2023 and 2026, 32 co-creation workshops will take place: one per year in each of the eight countries involved in the SUPPORT project. Each country focusses on one of the following crops: apple, grape, maize, olive, potato, strawberry, onion, and wheat. Ideally, the same participants would take part in the co-creation workshops each year so that the groups can build on what they co-created in the previous workshop. The goals of the four co-creation workshops are summarised in figure 1.

Figure 1. Goal of each co-creation workshop.

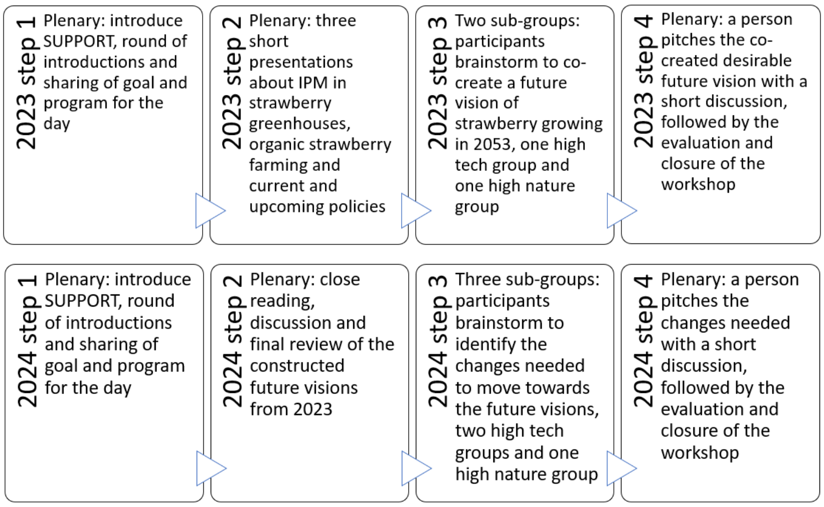


During the writing of this paper, the first co-creation workshops were held in the eight countries (from September 2023 until January 2024). Seven of the workshops were in person, while one was online. They lasted at least 120 minutes. In addition, in the Netherlands, the second co-creation workshop was held in March 2024. For this paper, we focus on the Dutch co-creation workshops and report the co-created desirable future visions. In addition, we reflect on the overall approach.

Strawberry IPM co-creation workshops held in the Netherlands in 2023 and 2024

Two co-creation workshops took place in the Netherlands involving a group of stakeholders active in the strawberry supply chain, policymaking and education (September 2023 and March 2024). The goal of the first workshop was to co-create two future visions for strawberry cultivation in the Netherlands: one high tech and one high nature. These two directions were proposed because strawberries are increasingly grown in greenhouses in the Netherlands (high tech). In addition, demand for organic strawberries is growing, and the number of Community Supported Agriculture (CSA) initiatives that also grow strawberries is expanding. The goal of the second co-creation workshop was to validate the formulated future visions and identify the changes needed for the realisation of the future visions. Figure 2 shows the steps followed during the co-creation workshops.

Figure 2. Steps followed during the 2023 and 2024 co-creation workshops.



The intention was for the same participants to attend both workshops; however, this was not the case. In total, 16 people were present at the 2023 co-creation workshop and 18 people at the 2024 co-creation workshop, with nine attending both workshops. Both workshops lasted 150 minutes. Unfortunately, strawberry growers were absent during the 2023 co-creation workshop and policymakers did not attend the 2024 co-creation workshop. Below, we specify the stakeholders present in 2023, 2024, or both.

- Strawberry growers (two, in 2024 only)
- Business (three): executive director of the Dutch association of manufacturers and distributors for biological crop protection (2023 and 2024), three representatives of the Netherlands Agricultural and Horticultural Association (two in 2023 and another one in 2024) and the head of research and development at a fresh fruits and vegetables trading company (2024)
- Policy (four, in 2023 only): two civil servants from the Netherlands Enterprise Agency (RVO), a civil servant from the Netherlands Food and Consumer Product Safety Authority (NVWA) and a policymaker from the Ministry of Agriculture, Nature and Food Quality (LNV)
- IPM strawberry researcher (one, in 2023 and 2024)
- Education/advice (three): four lecturers from an Applied University (one in 2023 and three in 2024) and three advisors (two in 2023 and three in 2024)
- One chair (2023 and 2024), three facilitators (2023 and 2024), an expert IPM policymaker (2023 and 2024), an expert organic strawberry grower (2023), and two note-takers (2024).

Findings: co-created high tech and high nature future visions of strawberry growing

Participants actively participated and interacted during both co-creation workshops. When imagining strawberry growing in 2053, they formulated creative ideas and built on each other's suggestions. Although one vision focussed on high tech and the other on high nature, both included zero use of chemical crop protection products or chemical fertilisers, climate-neutral production, and the use of robotics to monitor plant health. The text boxes below report the two future visions that were constructed based on the inputs provided during the 2023 co-creation workshop (step 3), which were critically reviewed and slightly adapted during the 2024 co-creation workshop (step 1). To our regret, no farmers participated in the 2023 workshop; therefore, additional attention was paid to ensure their participation during the 2024 workshop. This also meant more time was taken during the 2024 workshop to collectively read, review and discuss the proposed future visions, and the participating farmers suggested some minor adjustments.

In the preparation of the 2023 workshop, much effort was invested in having an organic strawberry expert present. This was an important goal because there is a dominant belief in the strawberry sector that growing strawberries in the field without chemical crop protection products is unrealistic; however, organic strawberry growers and CSA farms sometimes grow smaller plots of strawberries without these applications. To assist the participants of the strawberry sector to 'think outside the box', a presentation was given by an organic strawberry grower who produces and sells their crop while also working part-time as a teacher at a biodynamic farm community college.

Future vision 1: high-tech strawberry cultivation

In 2053, there will be automated greenhouses in the Netherlands where strawberries are planted in high density. The greenhouses will also house beneficial insects that can combat pests. People rarely walk around in these greenhouses, as this can introduce diseases. Robots care for the plants, pick strawberries and monitor the climatic conditions and plant health. These could include, for example, the moth PATS drone, UV light treatment robots, a picking and vine cutting robot, and so on. In addition, robots can move strawberry plants to an area where growers can apply their skills, when needed. This allows the optimal use of greenhouse space for growing strawberry plants rather than providing walking space for humans. The cultivation of strawberries from seed and/or meristem culture takes place in the greenhouse, which prevents the introduction of diseases/pests. They are semi-closed greenhouses, and the air that enters from outside is purified with filters. All these measures contribute to a hygienic environment in the greenhouse. Light-transmitting solar panels are placed at strategic locations and provide the energy needed for cultivation.

The strawberries are more resilient, tastier and nutrient-rich due to breeding and are grown on substrate. The growers supply strawberries all year round and provide the correct dosage of organic fertilisers because they work with precision fertilisation. These fertilisers are supplied by a manure-processing factory.

In addition to strawberry plants, other plants in the greenhouse provide a habitat and food for insects that are used as pest-control agents and pollinators. In addition to strawberries, specific insects that act as natural enemies of pest insects are also bred and housed. These beneficial insects have been deliberately placed in the greenhouse.

Consumers have a choice in the supermarket. The packaging shows which grower the strawberries come from and the unique growing method used. In 2020, consumers had no choice in the supermarket but, just like with eggs, in 2053 there is a choice on the strawberry shelf. Furthermore, local residents are happy with the strawberry growers because they grow in harmony with the environment.

Future scenario 2: high-nature strawberry cultivation

In 2053, the nature-inclusive strawberry season takes place in the summer. These strawberries are a luxury product that, like asparagus, are temporarily available and appear on seasonal menus. These strawberries come from both agro-ecological and strip-cultivation farms, the latter of which use robotics to monitor plant health and harvest strawberries. In addition, citizens can take out a strawberry subscription with local Community Supported Agriculture initiatives. Harvesting these strawberries yourself is an outing for the whole family. Local residents enjoy visiting these farms and nature-inclusive strawberries are a local product.

Breeding has produced tasty and resilient ever-bearing strawberry varieties. Optimal natural fertilisation is applied. The plants are well-rooted and live in harmony with soil-dwelling organisms. The above-ground biodiversity is rich in pollinators, which are also functional for strawberry cultivation, contributing to the natural resistance of the plants. More is known about the connection between nature-inclusive strawberries and the human microbiome.

Animals and insects naturally like to snack on the strawberries. Consumers are aware of this and are not concerned by blemishes on the strawberry, which are considered proof that this strawberry has been grown in a nature-inclusive manner. It is transparent to the consumer who, where and how the strawberry was grown; for example, some companies have a small greenhouse for growing strawberry plants. Furthermore, the strawberry taste differs between growers. Strawberries are not one-size-fits-all but span a range of shapes, smells and flavours. In addition, there is complete transparency about the price structure. The grower receives a realistic price and there are (chain or local) agreements if, for example, a harvest fails.

Practical implications

During the writing of this extended abstract, farmers across Europe were fiercely protesting European regulations, such as the plan to reduce the use of chemical crop protection products by 50% in 2030. Despite these conflicts, stakeholders across the strawberry sector were willing to participate in one or both co-creation workshops in which we applied backcasting. Instead of negotiating sustainability targets, stakeholders co-created a desirable vision of the future 30 years ahead that aligns with the Green Deal and Farm-to-Fork targets. Co-creating a future vision was motivating and did not result in polarised debate.

We recommend applying backcasting approaches more often to constructively work on systemic change for sustainable futures alongside stakeholders across the food system. We also found it beneficial to include participants who work at the niche level to voice alternatives from the status quo.

It was difficult to ensure the same participants were present at these annual workshops. Moreover, key stakeholders were missing at both executed workshops: strawberry growers in 2023 and policymakers in 2024. A practical way to include the perspectives of these stakeholders would be to organise follow-up one-on-one interactions with participants who could not attend.

Theoretical implications

Despite the vested economic interests, established routines and agreements, stakeholders primarily working at the regime level were able to imagine a radically different farming future that was climate-neutral and did not require the application of chemical crop protection products or chemical fertilisers. The first step of the backcasting approach seemed to provide an entry point for stakeholders to let go of the status quo and be more ambitious about the necessary changes.

Moreover, the desirable future visions co-created through backcasting can trigger the internal aspirations of regime-based stakeholders. It is much more motivating to work on change following internal aspirations rather than being driven by external pressures such as stricter regulation. To speed up the transition to sustainability, it would be wise to invest in both internal and external driving forces for change.

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