Skilled vision in agroecology: Anticipation at the heart of sustainability

Nicolas Loodts | PhD Student, Laboratoire d’anthropologie prospective (LAAP), UCLouvain

ABSTRACT: In this paper, I conceptualise observational practices of market-gardeners as a form of ‘skilled vision.’ I substantiate my work with a detailed study of a small cooperative farm located in Wallonia (Belgium), where gardeners grow approximately 50 varieties of vegetables within 14 different gardens and 10 greenhouses. I also investigate how the market-gardeners’ skilled vision relates to sustainability as practiced on the farm, focusing specifically on the relationship between the market gardeners’ skilled vision and temporality. Time is a central feature in the skilled vision of the market-gardeners, required to manage what I call the “polychrony” (Greek chronos) of a complex agroecosystem. Market-gardening is mainly based on observation and anticipation of the evolution of plants and their ecosystem. Contrary to common belief, the sustainability of food production practices is not only a recipe of techniques, authorised, and unauthorised substances, but relies on the fine management of the temporalities of the field.

Keywords: skilled vision; agroecology; organic agriculture; sustainability; anticipation; temporality; assemblage; farm

Introduction

I could put basil instead of chard because there’s no chard left and it’s cleaner. That’s another possibility. Because there’s basil that comes here and basil that comes there (indicating two beds). Then we have to see what is coming next and when it should be released. It has to be released in week 42. That’s good. It’s perfect. That’s great. Instead of spinach, there’s what? There are some beans that aren’t coming in right away. So, let’s keep these little spinach plants.

Gil, a thirty-five-year-old market gardener, was doing the Monday “field tour,” a review of the different gardens and greenhouses that comprise the plot of Heron Farm, a small organic market-gardening cooperative located in Wallonia (Belgium), when he was thinking aloud in front of vegetable beds. During the weekly field tour, Gil examines each bed, a band of soil about 1.3 metres wide, in each garden or greenhouse, to establish a list of tasks for the week, such as weeding a line of carrots, harvesting a crop of courgettes or planting a bed of spinach. For this exercise, he uses the “cultivation plan,” a 6-page table that represents the whole season of each bed, allowing him to see the history of the bed, i.e., timelines for the start of the current crop, its harvest, and the future of the bed, i.e., what is the next crop. Gil’s weekly examination and the decisions which result from it are crucial to ensure the

1 In this article, all names of persons or places have been anonymised and replaced by pseudonyms.
everyday life of this cooperative and its sustainability. Observation and “skilled vision” (see Grasseni 2004, 2007, 2009) are at the heart of this exercise.

Small-scale market-gardening, particularly as done on Heron Farm in accordance with the principles of organic agriculture and agroecology, carries a strong image of sustainability. Many farmers in small-scale market-gardening are new entrants to agriculture who seek a new way of life in accordance with their values and their will to change society. Skilled vision, I argue, is a pillar of crop management in organic farming and agroecology, yet to date skilled vision in market gardening has not been studied. In this article I ask: “what are the specificities of the market-gardeners’ skilled vision” and “how is this vision related to a farm’s sustainability as understood by market-gardeners?” Furthermore, I apply the concept of skilled vision to a field where plants and living beings, with their own agency and temporality, are central. I thus connect skilled vision to anthropological research on temporality and anticipation, with a focus on more-than-human worlds.

Since first being used to describe breeding practices (Grasseni 2004, 2007, 2009), “skilled vision,” a vision “obtained through apprenticeship and education of attention” (Grasseni 2009: 82), has been studied as a part of diverse professional practices, including medical care (Remery and Filliettaz 2017; Remery and Duret Benou 2020), land surveying (Grosjean 2014), mechanics (Giordano 2020), and many others. Through “skilled vision,” an unencoded landscape gradually becomes a ‘taskscape’ (Ingold 1993: 158; quoted in Grasseni 2009: 77). The field tour performed on the Heron cooperative is particularly suited to analysis using the skilled vision concept, as it entails apprenticeship and consists of a walk through the different gardens to identify the weekly tasks.

This article is based on long-term participant observation fieldwork on the Heron cooperative farm, where I have been conducting research since 2014 (see Figure 1). Six market-gardeners farm at Heron Farm on a 1.5-hectare plot of land, according to the principles of agroecology and organic agriculture. From a field divided into 14 gardens and 9 greenhouses, they produce approximately 50 varieties of fruit and vegetables which are then sold via short-supply chains to city markets and through community supported agriculture (CSA). I took part in the daily farming work such as planting new crops, removing weeds from beds, or harvesting the different fruits and vegetables. I also participated in the meetings between the cooperative farmers and in the sale of the vegetables. I attended the field tour several times, taking the position of an apprentice, and I filmed the exercise about 10 times. Finally, in addition to participant observation fieldwork, I also conducted semi-structured interviews with the farmers. This constitutes the empirical material of this article.

In the following sections, I present my conceptual framework and research methodology. I then turn to a detailed analysis of the field tour. I show that skilled vision, as part of a multi-sensory field and practice, is central to managing the field according to agroecology and respecting the three principles of sustainability that lead agricultural practices in the cooperative. As I demonstrate, time is a central feature in the skilled vision of the market-gardeners. Drawing on the cultivation plan, the gardeners must anticipate the garden’s evolution, managing what I call the “polychrony” (Greek chronos) of a complex agroecosystem. Signs from the nonhuman world are interpreted as giving insights into the future of the crop and thus guide the gardeners in their choice of mitigation actions.

2 In this paper, I only use a citation mark if this term explicitly refers to the work of Cristina Grasseni.
Conceptual Framework: Organic Agriculture and Agroecology

Heron cooperative is an organic and agroecological farm. Despite its history being rooted in the contestation of mainstream agriculture (see Van Dam et al. 2011; Wintz 2011; Guthman 2014), organic farming is today largely institutionalised and regulated at European level (Regulation EU 2018/848) and (sub-)national level (for Wallonia: Arrêté du gouvernement wallon concernant le mode de production biologique et l’étiquetage des produits biologiques). The Regulation indicates for instance, what products and substances (fertilisers, soil conditioners…) are allowed and what are not and imposes the obligation to be controlled by certification bodies.

Agroecology has multiple definitions. It is first defined as “the application of ecology to the study, design and management of sustainable agroecosystems” (Gliessman 1998, quoted in Stassart et al. 2012: 27). The central idea of agroecology is to manage a crop field as an ecosystem, characterised by the same ecological processes as a ‘wild’ ecosystem, such as nutrient cycling, predator/prey interaction, etc. (Altieri 2018). Agroecology is also seen as “the application of ecology to the study, design, and management of agri-food systems” (Buttel 2003; quoted by Stassart et al. 2012: 28). Finally, agroecology, in its third definition:

is defined neither exclusively by scientific disciplines, nor exclusively by social movements, nor exclusively by practices. It is called upon to become a federating concept of action between these three dimensions. (Wezel et al. 2009; quoted by Stassart et al. 2012: 28)

Lastly, more than a strict definition, some researchers identified different principles to characterise agroecology, including good agricultural practice such as biomass recycling, good soil conditions, etc. but also socio-economic aspects such as participation, social equity, etc. (Stassart et al. 2012; Dumont et al. 2016; Dumont 2017). This is the perspective within which Heron Farm is functioning, with agroecological practice not limited to cultivation techniques, and thus the paradigm that I adopt.
Skilled vision and anticipation

Education of attention and apprenticeship are central to “skilled vision” (Grasseni 2009: 82), enabling the novice to learn a ‘visual culture,’ drawing his/her attention to “relevant features of the world,” “according to the standards of a given culture” (Wathelet 2012: 125; quoting Ronzon 2007: 67-89). The presence of the novice changes the usual work regime (Remery and Filliettaz 2017). Thanks to a more experienced practitioner, the novice will acquire, “through the interplay between a domain of scrutiny (…) and a set of discursive practices (…) being deployed within a specific activity (…)” (Goodwin 1994: 606), a ‘professional vision,’ “a way of seeing and understanding particular events that is specific to their profession” (Grosjean 2014: 145, quoting Goodwin 1994: 606).

In other words, apprenticeship leads the novice to see new affordances in his environment. Affordances are elements in our environment that can, after interpretation, guide action possibilities (Gibson 1979; quoted in Crawford 2015: 55). Our perception of these possibilities is influenced by the environment but also by a practitioner’s skills (Noë 2004; quoted in Crawford 2015: 55). As Grasseni summarises: “being able to ‘see’ certain things (…) is the result of a process of ‘education’ of the whole individual, who learns to interact with his/her environment in his/her community of practice” (Grasseni 2009: 84). Apprenticeship, by revealing new affordances to the novice, will transform the landscape into a ‘taskscape,’ “a sensory and social space in which one learns and moves about” (Ingold 1993: 158; quoted by Grasseni 2009: 77). Therefore, it is not just about vision. As Grasseni reminds us: “skilled vision is embedded in a multi-sensory practice, where looking is coordinated with skilled movement, with rapidly changing point of view, or with other senses, such as touch” (Grasseni 2009: 79). According to ‘synesthesia,’ our different senses are not isolated but entangled (Merleau-Ponty 1998: 228-229; quoted by Willersev 2007):

Our sight is, consequently, never just sight—it sees what our hands can touch, our nose can smell, and our tongue can taste. Indeed, all of our non-visual senses are implicated in our vision, and there is no such activity as “just” looking. (Sobchack 1992: 78; quoted by Willersev 2007)

As I mentioned in the introduction, anticipation is a central part of the market gardener’s skilled vision. Stephan and Flaherty show that studying anticipation allows “recognising and tracking how the future manifests across the range of practical and reflective engagements in everyday situations” (Stephan and Flaherty 2019: 4). For them, anticipatory practices and ‘professional vision’ (Goodwin 1994) are intermingled (Stephan and Flaherty 2019: 7). Skilled vision allows anticipating the course of events and the subsequent intervention. However, skilled vision is not just about a skill. It is a door to a worldview that encompasses a “whole cluster of cognitive, aesthetic, and moral stances” (Grasseni 2009: 75). For market-gardeners, as I will show, this worldview implies paying attention to the multiple timelines of nonhumans and moreover, anticipating them. For Kohn, anticipation is based on the signs of multiple nonhuman beings. Kohn, drawing on Peirce’s philosophy, considers that signs “re-present a future possible, and through this mediation they bring the future to bear on the present” (Kohn 2013: 206-207). Through this influence of the
future on the present, signs involve what Peirce (1931) calls “being in futuro” (Kohn 2013: 206–207). Anticipation is deduced from the signs that give an overview of potential futures.

Signs, in the case of Heron Farm, come from a field composed of approximately 50 varieties of domestic plants, surrounded by a lush environment with hedges, woods, fallows, ponds, meadows, and soil life. To describe this pattern of multiple nonhuman temporalities gathered in the field, this “web of more than human agencies” (Puig de la Bellacasa 2017: 171), the notion of “assemblages” is useful. Assemblages have a long history, and many uses in the field of philosophy and social sciences (see for instance, Deleuze and Guattari 1980; Li 2007; DeLanda 2016; Forney et al. 2018; Buchanan 2021). According to Briassoulis:

> Assemblages have been conceived as dynamic, decomposable but irreducible, revisable compositions emerging from processes of diverse, heterogeneous, material and immaterial co-functioning components, or actors, coming together, or assembling, to serve an overt or covert purpose in a milieu. (Briassoulis 2019: 421)

A farm, seen as the result of the interactions of nonhuman elements (soil, crops, infrastructure, climate, farmers…) can be seen as an assemblage (Sutherland and Calo 2020: 533). For Darnhofer, a farm is made of “a tissue of interactions, of dynamic and often unpredictable processes” (Darnhofer 2020: 505). Writing about assemblages, Tsing sees them as “open-ended gatherings” of divergent lifeways, with multiple temporal rhythms and scales (Tsing 2015: 23).

Starting from the qualifier polyphonic that Tsing uses to describe assemblages (Tsing 2015: 23-24), I prefer to use the term polychrony (Greek *chronos*), which to the best of my knowledge, is a term only used in the managerial area to describe the ability of multitasking (HBR 2015), to categorise the multiple temporalities happening simultaneously in the market-gardening field.

**Methods of data collection and positioning in the field**

Heron Farm has been a part of my fieldwork for more than seven years. I started to work there as a volunteer for 6 days in 2014. I then conducted my masters fieldwork there for a few days in 2015 but mainly between June 2016 and March 2017. When I started my PhD in 2019, I returned to this farm which became a part of a larger and still ongoing multi-located fieldwork between Wallonia and Sicily with about 25 producers, mainly organic market-gardeners, but also large-scale farmers and citrus producers in Sicily. At this farm, I have taken part in all the aspects of its activity, mainly agricultural work such as tilling, planting, harvesting, as well as the sale of vegetables and attending meetings between producers.

While I have encountered many different configurations by other market-gardeners, Heron Farm constitutes the reference point of my agricultural practice. It is this long fieldwork in the same cooperative that has allowed me to establish the three principles of sustainability that I present below. Indeed, these principles are not always explicitly stated by the actors in my fieldwork. Certainly, I illustrate them in this article with the field tour, which is both a premise, because it is scheduled for the beginning of the week, and a climax, because it mobilises all the experiences of the practice. But it is mainly my long presence at Heron Farm, which has allowed me to see these principles in multiple actions throughout
the day-to-day activities of the week. For example, it is because a market-gardener pulled a weed out in front of me by reflex during a non-weeding activity that I realised how embodied and omnipresent anticipation was. My participant observation, with regular informal discussions, was completed by semi-structured interviews with the different members of the cooperative once a year, at the end of the season.

Moreover, I made important use of my camera during my fieldwork at Heron Farm with the aim of having data about the different “technical itinerary” of the multiple vegetables grown on the farm as well as to film a crucial exercise in the life of this cooperative, namely the field tour, a weekly review of the different gardens and greenhouses in the field. I participated in this exercise many times and I filmed it about ten times. This field review has been a unique occasion for me to learn to see the relevant signs of the agroecosystem and placed me in the position of the apprentice. Filming this tour, following Grasseni in her study of the daily farming practices in northern Italy (2009), was an occasion for me to learn what to look for, to acquire a “skilled vision” (Grasseni 2009: 82), discover the “relevant objects of knowledge” (Goodwin 1994: 606) and see the ‘affordances’ of the field (Gibson 1979). Gradually my view changed, and the land became populated. The landscape became a ‘taskscape’ (Ingold 1993).

It allowed me, for instance, to associate the different zones of the cultivation plan with the real plots. Gradually I learnt to perceive the field in terms of greenhouses, gardens, half-gardens, beds, and lines. The cultivation area, as a whole, is progressively coded, according to Goodwin's term, and certain relevant elements are underlined to mark this spatial separation. For instance, trees were no longer just trees but markers of space and showed the physical separation of the different gardens. The cultivation plan also helped me to identify the contents of the different beds and to learn to recognise the different varieties and sub-varieties, by comparing the actual bed with its paper equivalent.

As I filmed, the camera helped me both to focus my attention on what the farmer saw or, the opposite, to watch the video after the tour to describe some sequences like, for instance, the use of the cultivation plan during the review. The more I knew where to film, the more I understood I was acquiring some skilled vision (still incomplete today), comparable to the experience of the new entrants in agriculture, or as Max expressed it:

When you start, everything is on the same level. You see. You could consider that everything is a priority. So, at that moment, it’s difficult to distinguish anything. In any case, when I started, I was completely in a mess. And afterwards, with experience, I came to distinguish the necessary from the accessory and, as a result, to see when there was something wrong. That’s the experience.

Filming was sometimes also a disadvantage, because of the importance of other senses in the field tour. Gil, during the tour touches the ground, digs it slightly with his fingers or a small shovel to estimate the humidity or the structure of the soil (compact or not …). When he inspects vegetables to see if they are ripe enough, he will spontaneously smell or taste them. So, my filming was sometimes forgotten to let me dig my fingers into the soil or taste the sugar content of a bean.
Analysis: Inside the field tour

At Heron Farm, the field tour—tour du champ—is a weekly practice consisting of a review of the different gardens and greenhouses that constitute the plot. One or two market-gardeners equip themselves with the cultivation plan that lies on the table of greenhouse number 1. This plan is a six-page table where columns represent the weeks of the year (W1, W2, W3, …) and lines are the ‘beds’ of each garden or greenhouse (see Figure 2). A bed or band of soil of 1 – 1.3 m, is really the unity of measure for small-scale agriculture used for planning the culture, and also for the sale of products.

So, for instance in Figure 3, it can be seen that in greenhouse 1, four beds of tomatoes (yellow) will be cultivated from week 20 (mid-May) to week 39 (end of September).

The cultivation plan thus constitutes a temporal point of reference for the cropping season. At a glance, a market-gardener can see the past, present, and future state of a bed and compare it to the actual one (see Figure 4). What was the previous crop? What will come next in this bed? This plan is made repeatedly, season after season, so it encompasses the experience of the previous seasons in terms of yields, crop rotation, available labour force. It is a guide that cannot ever be fully respected because of the multiple unexpected events that make up a season.
With the cultivation plan in one hand and a notebook in the other, Gil, a thirty-five-year-old market-gardener starts his tour. The field tour follows generally (but not always) the same spatial sequence, as illustrated in Figure 5, allowing the inspection of each greenhouse and garden of the plot. Let’s follow Gil during this tour.

In the first greenhouse, before starting to look at the beds, Gil notices the presence of a Colorado potato beetle and crushes it immediately, almost by reflex. He starts looking at the young tomato plants that occupy four of the six beds (see Figure 6). Noting on a small sheet of paper, he says, “Here the tomatoes must be tutored.” Taking a small shovel, he digs a little hole in the bed to feel with his hand the moisture of the soil.
He continues: “It starts to become dry enough to need some water.” Looking at the adjacent bed with aubergine, he says, “You feel that in its growth, it will soon need to have water.” In another, Gil looks at a bed with beets and takes his little shovel and starts digging. “So, what are they saying?” he says. In greenhouse 4, two beds of strawberries need weeding, notes Gil. In these first few minutes of the field tour, the importance of “skilled vision” (Grasseni 2004, 2007, 2009) is already clear. Gil looks at signs or affordances (Gibson 1979) such as weeds, moisture, plant growth status, that are specific to his profession and interprets them. A novice could not perceive or interpret this easily.

After the first four greenhouses, Gil starts his tour of a series of five gardens. He indicates a bed covered with white canvas:

> There, under the canvas, it’s a mix of flowers that attracts the auxiliaries that are beneficial to fruit trees. (…) It’s to attract a whole series of parasitoid wasps that will come and parasitise this or that pest of the plum trees.

Further on, two beds in garden 4 are dedicated to strawberries. While Gil is looking at the garden, Phil, another market-gardener arrives:

> Phil: Have you ever put anti-slug pellets in the strawberries?
> Gil: Yes. But not this week. (…) Why not? Wouldn’t it be a good idea to put them on this week?
> Phil: Yes, maybe. I don’t know. I see them reddening and it would be a shame if they got eaten.

In the garden, strawberries are associated with garlic (see Figure 7). After his conversation with Phil, Gil explains this peculiar association:
It’s the strawberry-garlic association that has such a good reputation. I don’t know why exactly. I imagine that one protects the other, but from what? Or maybe it’s in the roots. In any case, the association seems to work well.

The tour continues. Gil looks at an entire garden cropped with potatoes:

J4. Here are the potatoes I think we’ll be able to do the mounds again. Here I have sown blue flax, which is probably a repellent for the Colorado beetle, the Colorado beetle that has been eating our potatoes and aubergines for the last few years.

Further along, a bed of kohlrabi is protected against flea beetles by white canvas (see Figure 8).
After that, in front of a garden filled with young onions, Gil asks himself, “Here, is it time to weed? It could well be.” Garden after garden, the task list is filled by Gil with a back-and-forth game between field observation and crop plan observation. In garden 1, Gil notes the need to transplant the lettuces when they receive the young plants from their nursery. Later, in another garden, Gil looks at a bed of fennel, he steps forward, bends down and says:

You see this is an interesting stage of weeding. You can see some of the cotyledons. They're between the white thread and the cotyledon stage. You see the white thread is what we saw with the carrots. There's just the white root thread that's coming out a little bit and that's going to make the cotyledons. So, the plant is very delicate. And at the level of the cotyledons too. So, if you intervene at this point, the plant is too weak to get going again. It's very effective.

Looking at the adjacent bed, carrots covered by white canvas, he says: “At some point we will change the veil (...) to protect them from carrot fly.” In the next garden, dwarf beans occupy the beds. But the soil is covered with a thick grass cover:

I'm going to look at how much time is left because I'm afraid the weeds will be too big for the next crop. (...) There was tillage. We mulched, but not enough, so we're stuck, the weeds are getting through. So, we have to intervene somehow. Otherwise, not only will we have a lot of new seeds, but they will also develop a root system that will be very difficult to remove later on. So, I'm going to look at what comes next.

Gil takes the cultivation plan and considers it:

It's spinach that comes next. Especially direct seedlings. Yes. I think it would be worthwhile to cover with a 50 cm wide or one metre ground cover to limit the weed, but it's still a pretty tedious job with all the things we have to do. I'm going to put it in as an option.

It is important to highlight two elements from this insight into the field tour. Firstly, it is possible to see the importance of the cultivation plan for decision making. The skilled vision of the market-gardener is articulated by this document. The plan provides information that will complement the signs from nonhumans. On the other hand, I would also like to highlight the first principle at the heart of the sustainability at Heron Farm, namely, the optimisation of the day-to-day conditions for plant development to avoid hard mitigation actions. It is about being attentive to the needs of the plants and protecting them from parasites. Of course, some treatments against pests or diseases are authorised in organic agriculture. Nevertheless, the aim of the market-gardener is to use them as little as possible. Having a balanced agroecosystem will contribute to that objective. Plant association, for instance strawberry-garlic, are used. The flowers around the fruit trees are chosen to attract the predators of fruit pests. Irrigation is optimised, as is weeding at the right time. When a disease or a pest appears, it has to be eradicated as quickly as possible to allow slight mitigation plan without chemical treatment. For instance, a sick lettuce will be removed immediately. When Colorado potato beetles appear in a potato bed (see Figure 9), they will
be removed immediately to avoid proliferation. Therefore, the art of the market-gardener is to anticipate any proliferation of pests by detecting them as soon as they appear.

After five gardens, Gil inspects two long greenhouses. In one of them, a bed filled with weeds draws his attention (see Figure 10):

Here, however, I’m going to be annoyed because it’s basil that’s coming. And the problem with basil is that it won’t really tolerate the fact that we’re integrating fresh organic matter into the soil. It’s going to be subject to competition, to the degradation of those elements. On the other hand, the soil structure is great. If there had been large clumps, like peppers, what we would have done is just mow and take advantage of the root system and the soil underneath (...). So, you mow, you leave it on the surface, you open it up with a little shovel, you make your hole and you plant. That’s what we did with the aubergine here. But it works here because you have a plant every 40 cm (...) We put manure plus ground cover. But it’s cool because we didn’t have to till, (...) the soil structure was great. Now I’d like to take advantage of the soil structure, which is good but unfortunately, I won’t be able to plant the basil. (...) This means that you have to come with your little shovel, plant a basil plant every 12.5 cm and on top of that, it will be difficult to weed.
Outside, Gil looks at a garden covered with different tarpaulins against weeds (see Figure 11). Gil looks at the cultivation plan:

Here come the cabbages. When do they come? (He turns over the cultivation plan.) J6. They come in a fortnight. Here what we did is that it’s pre-covered ... There’s already straw and stuff like that. So, we’ll have something clean when the cabbages arrive. It’s a way of not having to intervene heavily, with too much weed. (...) In my opinion, we’ll only till one of the three beds that hasn’t been mulched, but for the rest we’re relying on the life of the soil, on its activity (...) We’re relying on soils natural work because it’s been a fairly long time.
The tour crosses a secondary plot at 400 metres from the main one. A bed is covered with thistles:

A thistle bed. It was a Cima di rapa (broccoli rabe) seedling that has gone to flower. I left it there so that the bees could forage a bit. But we’re going to intervene soon because thistles reproduce so quickly. It’s careless to let the thistles reproduce ... And this is another priority. These are fresh onions that we have ... Out of sight, out of mind here is really what it is. (...) When you intervene late like now, it’s really annoying.

A second sustainable principle can be deduced, namely, the minimisation of soil tilling to preserve soil life. Since the beginning of my fieldwork, soil tilling has seen its practice reducing gradually at Heron Farm. In place of systematic tilling, when installing a new crop, green manure and tarpaulins are used. Green manure, such as rye, vetch, or ray grass, is introduced between two cultures with the aim of decompacting the soil and bringing organic matter. When green manure is mature, it will be cut, crushed, and covered with a tarpaulin to allow its degradation by soil micro-organisms. After this six-week process, the market-gardener will decide if the soil has to be tilled before the new culture. It is often not the case. The use of green manure and tarpaulins involves an accurate planning of different crops.

The tour continues and the task list is now spread on four sheets of paper, covering different topics, from the maintenance of existing crops to the installation of new ones and, of course, harvesting. “I note that there are courgettes ready for harvesting here. There are some nice ones. I note that we can come by on Tuesday,” says Gil. In a greenhouse, three quarters of the surface is filled with mature carrots. Gil explains:

Gil: These are carrots. There’s been nothing coming up for a long time. We could consider sowing oats. (...) It’s planned for week 31 but we could start early if we wanted. We’ll see.

Nico: After your carrots have gone?

Gil: Yes, that’s it. You see there’s a harvested bed here. The second will be harvested there. So, we could consider sowing two buckwheat beds, etc.

Nico: What, on a market that’s a whole bed going away?

Gil: No. But with the veggie boxes, maybe.

Nico: It goes fast.

Gil: Now with the boxes it’s 50 bunches, for the city market it’s 50 bunches, so 100 bunches. That’s not bad. That’s 1,000 carrots. More than 1,000, 1,200 carrots.
In another greenhouse, Gil looks at the different beds:

Gil: I could put basil instead of chard because there’s no chard left and it’s cleaner. That’s another possibility. Because there’s basil that comes here and basil that comes there [designing two beds]. Then we have to see what comes after and when it should be released. [He grabs the plan.] It has to be released in week 42. That’s good. It’s perfect. That’s great. Instead of spinach, there’s what? There are some beans that aren’t coming in straight away. So, let’s keep these little spinach plants.

Again, we feel in this situation the importance of skilled vision, combined with the cultivation plan, for new crops. Gil establishes the future of the spinach bed from the state of the spinach and the planned future of the bed. Anticipation is central in this exercise. Moreover, I would like to propose the third principle of sustainability from these quotations, namely the optimisation of the harvest and crop rotation to avoid product waste or empty beds. At Heron Farm, fruit and vegetables are harvested every Thursday and Friday. Anticipating the amount available for the veggie boxes and the local markets is essential. A regular field survey is made to anticipate the harvest and to order missing vegetables from other farmers. In the same way, during the harvest, each picker has to estimate the growth of the vegetable during the time interval before the next harvest. For instance, a courgette left too long on its plant will become too big and will be less likely to be sold. For tomatoes, the picker has to estimate the future colour of the fruit, because a too ripe tomato will be difficult to transport. Moreover, the crops in the beds have to be harvested at the right time, neither too soon nor too late. The cultivation plan helps decide until when a crop can be kept in the garden without jeopardising the development of the next crop.

To conclude this section, I would like to add that the field tour is more a climax than an isolated event. It mobilises the knowledge and know-how of the different activities that take place at the cooperative from crop installation and maintenance, to harvest and sale. All these practices mostly allow the market-gardener to have access to the features of the plants and their temporalities. Crop installation and maintenance allow to learn the growth pace of the plant but also its main diseases, pests or beneficial association. Weekly harvests help to promote the ripening of the fruit. And finally, the sale experience allows the market-gardener to know the right size of vegetable for the city market. All these activities are deeply entangled and mobilised during the field tour.

Discussion

I can now return to my initial questions: what are the specificities of the market-gardeners’ skilled vision and how is this vision related to a farm’s sustainability as understood by market-gardeners? As discussed earlier, I have identified three practices from my fieldwork that define sustainability at Heron Farm, namely the optimisation of the day-to-day conditions for plant development to avoid hard mitigation actions; the minimisation of soil tilling to preserve soil life; and the optimisation of harvest and crop rotation to avoid product waste or empty beds.’ Each practice involves a high degree of anticipation.

The ‘optimisation of the day-to-day conditions for plant development to avoid hard mitigation actions’ (as plant protection products use hard treatments) involve identifying
problematic early signs of disease, pests, or weeds, and treating them. When disease or pests appear, the problematic insect or the sick plant has to be removed as quickly as possible to avoid spreading the affliction. For instance, a sick lettuce will be removed immediately. Weeds are regularly removed, especially before the production of new seeds. So, the art of the market-gardener is to anticipate any spread of parasites by revealing them as soon as they appear.

Since the beginning of my fieldwork, the ‘minimisation of soil tilling to preserve soil life’ has become more and more present. Soil tilling is less and less practiced in favour of a combination green manure and tarpaulins. As explained in the previous section, this combination will help, with the assistance of soil micro-organisms, to decompact the soil and bring organic matter. Anticipation is central to include this exercise in the planning of the crop year.

Finally, the ‘optimisation of the harvest and crop rotation to avoid product waste or empty beds’ involves an anticipation of the fruit and vegetables available in the field. The field tour aims to determine what is and what will be the state of maturity of the different vegetables. As explained before, combined with the sales schedule (city market…), this information will help decide whether a vegetable should be picked or not. Moreover, the tour allows determining if the vegetables already present in a bed will have enough time to reach maturity before the next crop. It is also the right moment to anticipate the number of vegetables harvested during the coming weeks to see when a bed will be free.

So, anticipation is central to these three practices at the heart of Heron Farm’s sustainability. Skilled vision of the market gardeners is built around this anticipation. Their commitment to agroecology makes time a central aspect of their skilled vision. Farmers have to anticipate the future of their gardens and greenhouses to make their decisions. The field tour consists of an active search of signs from the nonhuman world allowing perceiving possible futures of their field to implement mitigation actions. Maturity of the plants, moisture, diseases, pests, weeds …, the market-gardener must look at the most relevant signs of its agroecosystem to drive it. They are ‘in futuro’ because the future, in their mind, ‘bears on the present’ (Kohn 2013).

This anticipation appears to derive in part from the cultivation plan—the plan constrains/directs the gardeners’ seeing—and in part from the experience of working with plants over time. Firstly, the cultivation plan gives the desired future, that may not ever be fully reached, but which is always desired. The future given by the cultivation plan is a filter to evaluate the pertinence of nonhuman signs from the field. For instance, as we saw, weed cover does not constitute the same sign according to the next crop. It will not imply the same action. As Gil explained, with aubergines, the weed cover is less problematic because the new plants can be transplanted directly onto a mulch constituted with weed cover. It is not the case with basil which needs a cleaner soil. In the same way, a disease like mildew happening in July will require more mitigation action than the same disease in October. In July, the plant has to produce for many weeks involving a chemical, thermal, or manual treatment. In October, the plant is about to leave the bed and the disease will not be a major concern. So, the ‘taskscape’ (Ingold 1993) results from the confrontation of two futures: the future indicated by the signs of the nonhumans and the future of the cultivation plan.

Secondly, working with plants, soil, and climate, often with peer and textbook learning, will allow understanding the multiple temporalities at work in the field and interpret the
related signs. Domestic plants, of course, are predominant, but a field in agroecology cannot be limited to these. Beings in the field are many more than domestic ones. Soil microorganisms, worms, birds, pollinators, insects, are as many as beings present within the agroecosystem, seen as an ‘assemblage.’

Therefore, the everyday life of the farm allows having some knowledge about these multiple beings, their skills and their temporalities. The market-gardener has this knowledge in mind to conduct this assemblage of multiple temporalities, this polychrony. The skilled vision encompasses the polychrony of the different plants, fruit, vegetables, and other organisms in the field. And this juggling between different temporalities is not reserved to organic life. Geological features of the field can also dictate their own temporality and influences the social life of the farm (Pálsson and Swanson 2016: 151). It is known in the cooperative that some gardens will dry out at Spring faster than others according to their soil matter.

The market-gardener’s skilled vision is rooted in anticipation. It is about seeing what has not yet happened. The day-to-day functioning of the farm and the multiple weekly tasks to be carried out for the care of the crops are based on this vision.

**Conclusion**

Organic or agroecological agriculture is generally presented in terms of good practice, rules, principles or recommendations that should ensure sustainability. In this research, I investigated the necessary skills supporting the sustainability of a cooperative that consists of six market-gardeners farming a 1.5-hectare plot with approximately 50 varieties of fruit and vegetables. Gardening on Heron Farm operates according to organic regulations but tries to go further by following the principles of agroecology.

Skilled vision is central in the market-gardening practice. In answering the questions what are the specificities of the market-gardeners’ skilled vision and how is this vision related to a farm’s sustainability as understood by market-gardeners, I have showed that market-gardeners’ skilled vision is built on anticipation. Anticipation allows the cooperative farmers to manage what I call the polychrony of the field, i.e., the multiple temporalities of the nonhumans present in the agroecosystem. Anticipatory skilled vision is crucial to respecting the three principles that characterise sustainability on Heron Farm, namely the optimisation of the day-to-day conditions for plant development to avoid hard mitigation actions; the minimisation of soil tilling to preserve soil life; and the optimisation of harvest and crop rotation to avoid product waste or empty beds. Anticipatory skilled vision involves the use of the cultivation plan, a document that summarises the whole season of each bed in the plot, plus signs from the nonhuman world (moisture content, disease, pests, weeds, etc.) that indicate possible evolution of the crop. Their care for the crops is rooted in anticipation.

Two conclusions can be made from this contribution. Firstly, this article argues against the idea that sustainable agriculture is just a matter of applying techniques or permitted and prohibited substances. There is no recipe for sustainability. Sustainable practices in agriculture would be nothing without special attention to the multiple temporalities of the more-than-human worlds, the polychrony of the field. Sustainable agriculture is a matter of skill and skilled vision. Earning a living as a farmer should not be a problem in a world in need of sustainability if these skills were recognised at their true value.

Secondly, the importance of the temporalities in the sustainability of Heron Farm
makes us think about the ecological crisis in which we live. If this crisis is due to “ruptures in ecological time” (Metcalf and Van Dooren 2012: v, quoted by Puig de la Bellacasa 2017: 176), it is by paying more attention to the nonhumans around us, to their rhythms, that we could shape a sustainable world.

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