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Climate Change and the Ethics of Agriculture

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Abstract: Agriculture is one of the dimensions where climate change is having its most devastating effects. As the impact of climate change affects disproportionally those who have contributed the least to it, i.e. the smallholder farmers in the Global South, and who at the same time are the ones with the least disposable income to adapt to these changes, it leads to a major challenge for global justice. This chapter introduces different forms of inequality that are aggravated by climate change, discusses the implication of emphasising on mitigation and adaptation to the new climatic conditions, argues for the need to reduce the multiple wastages in agriculture and food consumption and the importance of building resilient farming systems, presents the challenges of innovating fairly to respond to the climate emergency, and analyses the ethical implication of changing landscapes and land uses. It concludes by listing the main challenges of compensating for climate injustices.

Keywords: farming, food production, social justice, greenhouse gasses, poverty, hunger, land use

Introduction

The impact of climate change on future food production is one of the most urgent problems for ethics and social justice. The range of challenges that are already emerging and which will become more serious and extensive in the future goes far beyond issues of distributive justice (Paavola, 2008). Climate change will reduce harvest yields in large parts of the tropics and increase yields in areas closer to arctic circle (Cline, 2007). Catastrophic disruptions and losses are already occurring with more frequency in the form of hurricanes and tropical cyclones, large-scale fires are likelier to emerge due to reduced precipitations, new pests will move in the areas that become warmer, and crop failure can be expected due to droughts or excessive rainfalls. Farm workers are likelier to be exposed to more diseases, as mosquitos and other disease vectors appear in higher latitudes and altitudes. Rising sea levels are threatening some of the most intensively cultivated land areas by increasing salination. At the same time, areas closer to the poles are exploring new agricultural opportunities that were unconceivable under the older climatic conditions (McMichael, 2017). Climate change obliges to surrender certain ways to relate to the land, restricts what can be done with the land and comes with losses in what can be expected from the land. Yet it does so in highly unequal ways.

In agriculture, the responses to these new conditions have concentrated on two strategies that reveal different priorities: *mitigation* and *adaptation*. Climate change mitigation

recognizes the need to halt climate change to avoid the risk of not being able to grow food and survive in the future. An emphasis on adaption comes with the acceptance of the idea that mitigation alone will not suffice and therefore humanity needs to secure the continuity of agriculture if people want to survive as a large society.

As the overall continuity of agriculture in the future is not the only concern, it needs to be guaranteed that food production has no major shortfalls in the present. This has led to a renewed interest in making food systems *resilient* and thereby make sure that food systems are adapted to the upcoming challenges. Unstable food production causes major social disruptions (Holt-Giménez, Patel, & Shattuck, 2010). Food shortages have also major social justice implications, as they impact regions of the world differently, concentrating hunger and malnutrition among vulnerable groups, particularly persons with disabilities and refugees, as well as women and girls (Shiva, 2009).

Agriculture has however never been about food production alone. As the term already reveals, growing food is also a cultural practice – a cumulative social effort with a history of over 11.000 years (Mazoyer & Roudart, 2006). It is therefore unsurprising that people have a strong interest on how agriculture and rural life will evolve in the future and what kind of food systems will be bequeathed to the next generations (Potthast, 2011).

The strong traditional bond between people and their land leads to a series of demands in relation to social justice to transform existing food systems. After introducing the multiple inequalities amplified by climate change and the importance of building resilient food systems, three major issues will be discussed: *innovation* priorities and strategies, changes in *land use* and changes in *landscape*. To conclude, an assessment of what is owed to those who will suffer adverse effects in agriculture is offered.

Inequalities at five dimensions

While the effects of a changing climate are felt all over the world, climate change is far from being the great equalizer, rather, the opposite is true. Four dimensions can be distinguished where climate change leads to increased global, local, gender, relational and nutritional inequalities (Timmermann, 2021):

Global inequalities

Some regions in the Global North are likely to be better off in the short term (Cline, 2007). Other areas, mostly in the tropics, will be below sea level or affected by droughts. While climate change will become a threat to people in all countries, some areas are already facing some major climate related problems and others are momentarily benefiting from new opportunities due to the milder weather before climate change becomes an issue. Another global justice issue, is that countries of the Global South will end up having to adapt agriculture using imported technologies from the Global North. This is a great economic opportunity for future income by North, but a major issue for global justice (Biddle, 2016). Cash crops that are important export goods for the Global South, such as cocoa, coffee and bananas are particularly sensible to climate change. A likely effect of climate change for the Global South is having less

goods to export while being more dependent on importing agricultural inputs and food (Timmermann, 2020).

Local inequalities

A striking example of climate injustice are the effects of water availability as climate changes. Shorter rain seasons oblige farmers to harvest the same crops during the same time and abstain from planting water intensive crops. Farmers who can afford irrigation can avoid harvesting crops when they are in high supply and additionally risk planting water intensive crops, obtaining in areas where irrigation is a privilege much higher prices (Popke, Curtis, & Gamble, 2016). Climate change thus multiplies the benefits of irrigation systems and thereby increases inequalities between those who can afford such investments and those who cannot. As a consequence, the worse off will end up selling their land and labour to those better off (Thompson, 2017).

Gender inequalities

At a household level, it is women and girls who are most vulnerable to food shortages, with increased levels of hunger and malnutrition (Shiva, 2009). Furthermore, much of agrobiodiversity is stewarded by women. Particularly female farmers possess key knowledge on local horticultural varieties, engage in traditional plant breeding practices and take part in complex seed exchange networks (Glazebrook, Noll, & Opoku, 2020). The imposition of commercially seed varieties to respond to climate change destroys such practices and disempowers them (Nyéléni Forum for Food Sovereignty, 2007).

Relational inequalities

There are strong variations in how people who work the land relate to the surrounding environment. For many, agriculture is much more than an opportunity to generate income. People may grow food despite having abundant means to buy food, in order to gain independence, contribute to the resilience of their community, build networks, exchange knowledge and know-how, maintain biocultural heritage, or just for being in closer contact with nature (Marrero et al., 2021). Continuous declines in harvests and catastrophic losses resulting from climate change will take something irreplaceable to some, while merely taking an important financial opportunity away for others. Relational losses are much more difficult to compensate and affect people in vastly different forms (Jax et al., 2018). These types of losses are seldom recognized as injustices and can negatively affect mental health, as new concepts such as ecological grief aim to visibilize (Cunsolo & Ellis, 2018).

Nutritional inequalities

Climate change does not only lead to food shortages but also changes the type of food that becomes available. Even in cases where total caloric intake is met or exceeded, diets that lack diversity can lead to malnutrition, particularly when people cannot gather the vitamins and

minerals they need. When diverse food systems are replaced by monocultures and imported processed foods, an increase in obesity and malnutrition can be observed. Many traditional farming systems cultivate a broad range of herbs, fruits and vegetables that diversify the diets of smallholders, improving their nutrition (Altieri, 2003). Once farmers are compelled to leave their lands or the cultivation of heritage varieties becomes impossible under the new climatic conditions, a decline in the quality of diets can be observed. Poverty makes it even more difficult to diversify diets as the climate changes.

Setting priorities: adaptation or mitigation

While early climate action concentrated on efforts to mitigate climate change, agriculture has never been given a central role in mitigation and its potential in capturing carbon is still vastly understated. Particularly ecological intensification of agriculture and agroforesty have enormous potential in sequestering massive amounts of carbon in soils and above ground (Altieri & Koohafkan, 2008). Before a decision on research priorities can be made, a careful assessment is needed on how much potential mitigation strategies have and on how much should be already spent on adapting agriculture to the new climatic conditions. What are the ethical implications of prioritising mitigation over adaptation, or vice versa? Depending on how this question is answered it has major implications for issues such as how research attention is distributed, how conservation efforts are to be shaped and financed, and the future of farming for younger and future generations.

Concentrating on mitigation limits long-term damages at the possible risk of failing to meet harvest yields needs in short-term. The promotion of soil conservation and programs to restore degraded soils can play a major role in storing carbon in the ground (Félix, Scholberg, Clermont-Dauphin, Cournac, & Tittonell, 2018). Also, the sustainable stewardship of agroforestry system can play a major role in storing carbon. A major transition towards more climate-friendly food systems will come with a rise in food prices. The negative effect of higher prices can be limited by shifting current agricultural subventions from unsustainable production systems to more environmentally friendly systems. Nowadays countries in the Global North, particularly the United States and the European Union, are spending billions of euro in agricultural subventions with poor environmental protection standards. Redirecting such funds to incentivize more ecologically sustainable practices has huge potential (Tittonell, 2013).

A different emphasis is to take a certain degree of climate change for unavoidable and focus on adapting agriculture to the new climatic conditions. Much of this strategy does not require a major transformation of the food systems, but concentrates on improving irrigation and replacing heritage varieties with new improved and specially adapted varieties, including often the use of genetically modified seeds. So-called climate-ready seeds should be better suited to withstand stress factors such as droughts and higher levels of salinity (Saab, 2015). This approach partly capitulates on the goal of limiting climate change and concentrates on being able to produce sufficient quantity of food at low costs for future needs. This strategy does not fully acknowledge the dependence of food systems on ecological services provided by well-functioning agroecosystems and natural reservoirs and is highly optimistic – or even illusive – about the limitless potential of technological fixes. However, it fully recognizes the immediate catastrophic impact food shortages have on the worst-off.

Furthermore, adaptation has limits. Historically, it needs to be noted that humans adapted to new environmental conditions by moving to more hospitable areas (McMichael, 2017). Droughts and rising sea levels are already forcing large numbers of people to become climate refugees, without regulations on which countries are obliged to receive whom and under what conditions (Biermann & Boas, 2010). Migration is particularly difficult for people with strong bonds to the land and profound knowledge of local flora and fauna (Rozzi, 2012), such as farmers.

Considering immediate and long-term needs, agricultural systems need to be developed that are more resistant to climate change fluctuations and can sequester larger amounts of carbon.

Avoiding wastage: farmer and consumer responsibilities

Another essential step towards climate change mitigation is to reduce wasteful farming practices. At current levels of carbon emissions, consumption of larger amounts of meat and dairy products becomes not only unacceptable from an animal rights perspective but also due to their massive contribution to climate change (Singer, 2004). The consumption of some off-season products, particularly those that have to be transported by air, is also an item that needs to be drastically reduced. The most publicized example are fresh strawberries in the winter. Here everyone has responsibilities as consumers to avoid demanding such goods, and from farmers and retailers in stopping to offer such goods. Much of these demands are bundled under the idea of reducing food miles (Iles, 2005). Consumers need to be aware that in terms of carbon footprint, a substantial amount of emissions does not come only from transporting food to stores, but from unsustainable purchasing habits. Driving by car long-distances – particularly considering the increasing imprudence of acquiring supersized trucks – to purchase single items of locally produced foods may have higher overall impact than getting shipped industrial produce by bike. Sustainable consumption demands a certain degree of food literacy (Voget-Kleschin, 2015).

Another step is to cooperate with farmers in avoiding the wastage of food by adapting consumption patterns to seasonal supply and helping absorbing surpluses (Timmermann, Félix, & Tittonell, 2018). A food as a commons perspective, that goes beyond seeing food as a commodity but as something that should benefit everyone is a particularly helpful concept for stimulating such cooperative behaviour (Vivero-Pol, Ferrando, De Schutter, & Mattei, 2018). Non-farmers need to also cooperating in bringing back organic matter to food production sites. There is a massive metabolic rift, particularly between the city and the country side, and between food producing regions and net food importers (Delgado Ramos, 2013; Schneider & McMichael, 2010). Organic residues need to find their way back into the soils through adequate collection and composting, thereby helping to rebuild soils and reduce methane emissions (Thi, Kumar, & Lin, 2015).

Farmers themselves need to facilitate sustainable consumption by innovating in their business models. Some regions are showing great success with subscription models, where urban consumers commit to purchasing boxes with seasonably variable content that is selected at the farmer's discretion based on available assortment (Torjusen, Lieblein & Vittersø, 2008).

Increasingly, farmers will have to cooperate among themselves to make best use of resources such as water and ecosystem services. Even wealthier farmers need to acknowledge that their farms are often embedded in more complex ecosystem that need to be maintained. For example, when using carelessly water, wealthier farmers may oversee that they are dependent on pollinators harboured in nearby smaller farms and on seasonal wage workers, who also require adequate access to water to grow their food.

Governments need to make a major effort in removing perverse incentives. Tax loops that make it lucrative to export and reimport food need to be removed, practices that transport foodstuffs over long distances for repackaging or cleaning need to disincentivized, and wages need to be adapted to make the consumption of locally produced food affordable.

Ideal: resilience

Climate change comes with major stress factors for food production. These can be related directly to weather events, such as changes in temperature, winds and precipitation, or caused by such changes, e.g. wild fires, floods. New climate conditions also alter the behaviour of species who provide important ecosystem services and lead to the migration of beneficial and harmful organisms, which may come with the propagation of new plagues (McMichael, 2017). Furthermore, food insecurity in one area may cause unrest and disruptions in other areas by rising the prices of foodstuffs and large-scale migration. Moreover, it needs to be recalled that the poor are the least able to absorb production shocks, and most food shortages place an increased burden on female household members. As humanity relies on food systems and disruptions are to be expected, building resilient systems becomes needs to become a political ideal (Kolers, 2016).

To minimize the impact and duration of agricultural production downfalls and improve recovery it has become common to talk about improving the resilience of a farming system. Resilience is understood as the persistence of relationships within a system when absorbing changes and disturbances of different variables (Holling, 1973). Newer interpretations of the concept of resilience in agriculture highlight the need to be able to withstand disruptions and re-emerge in a strengthened state that allows to continue cultivating food (Santiago Vera et al, 2021). The resilience of a farming system can be improved by working on social cohesion, reducing dependency from externally produced inputs and adopting climate-smart farm design principles (Marrero et al., 2021).

Important for the social dimension is that disruptions in the food system are addressed at an early stage and that past mistakes are avoided. Freedom of press and transparency over governmental polices is crucial to allow civic monitoring and increase accountability (Sen, 1981). In this regard, much progress is still required, as environmental activists and journalists are continued to be harassed and even murdered in biodiversity rich countries, particularly in Latin America (Arguedas-Ramírez, 2019). Smallholders should have access to sufficient land and water, and need to be empowered, particularly in their capacity for self-organization without neglecting the active participation of women (Córdoba, Triviño, & Toro Calderón, 2020). Governments need to provide swiftly emergency assistance without discriminating smallholders. Well-connected smallholders can combine the benefits of close monitoring of

farm conditions with knowledge exchange and risk-pooling. To build a resilient agricultural systems inclusiveness and social cooperation becomes a necessity (Civita, 2015).

As climate change comes with extreme weather events, the dependency on externally produced inputs need to be reduced. There are logistic reasons for this, storms may lead to shutdowns of ports and block transportation routes (Marrero et al., 2021). In addition, there are macroeconomic factors. As major crop losses can be expected, particularly poorer countries may face rapid currency devaluation. With reduced purchasing power, imported inputs become inaccessible (Timmermann, 2020).

When it comes to the environmental dimension of resilience, it needs to be noted that agricultural systems can also be made more resilient by farm design. Agroecology, for example, seeks to reduce dependencies on externally produced inputs and mimic ecological processes (Gómez Echeverri, Ríos Osorio, & Eschenhagen Durán, 2017). Reducing dependency from external suppliers makes a farming system less vulnerable to interferences in supply. Farming systems that aim to reproduce ecological processes acquire also some of the natural recovery mechanisms and thereby can recover more quickly. Evidence is adding up that suggests that agroecological farms recover more rapidly from extreme weather events, such as hurricanes (Holt-Giménez, 2002).

Innovation and social justice

Climate change obliges to make changes in the way food is produced. As there are a few alternatives on which future food scenarios can be chosen from, having a social debate on which direction should be headed to becomes central and a demand of social justice (Kaljonen et al., 2021; Loo, 2019).

Both the literature on climate justice and technology assessment demand wider citizen participation in decision-making, as a key demand of procedural justice (Jenkins, 2018) and Responsible Research and Innovation (Stilgoe, Owen, & Macnaghten, 2013). Increasing democratic decision-making is both a demand of justice and comes with benefits for technology developers (Asveld, Ganzevles, & Osseweijer, 2015). By giving people a say on the direction of agricultural research, people are likelier to accept technologies, and thereby the situation is avoided where large amounts of money are spent on technology development with little public acceptance. Yet to align innovation strategies to ideal of justice a broader assessment of the multiple interactions between food production and social justice is needed. Here four dimensions of social justice can be listed that need to be considered when assessing innovation to confront climate change: justice in exchange, distributive justice, contributive justice and intergenerational justice (Timmermann, 2020). This demands that objects of innovation be accessible at fair prices. The outcome where industries situated in the countries with the largest historic emissions end up selling adaptation technologies to countries with the strongest needs and lowest historic emissions is particularly unfair and should not be left as it stands (Biddle, 2016). Further, it demands that innovation is destined to the problems of people all over the world and not only for the richer markets. This calls for a fairer distribution of research attention. There is also a wide demand to facilitate wider participation in innovation efforts. Farmers have continuously innovated to adapt to new social and environmental conditions, select the most desirable crop traits and identify the best places for their crops. Innovation

systems need to recognize this innovative dimension of farmers and allow sufficient room for their creativity. Lastly, innovators need to critically assess the long-term effects of diffusing their inventions in terms of social sustainability and ecological impact. Innovation should not leave people in a position of unwanted unilateral dependency. Such dependency can be exploited and is risky for basic goods. Prolonged states of dependency are particularly dangerous as they lead to losses of crucial skills to live an autonomous life. Once these skills are lost it is particularly difficult and time-consuming to reacquire them.

Landscape changes and social justice

Changes in climate may also affect soils and water availability, affecting the ability to produce food.

A changing climate obliges species to adapt to new environmental conditions. Some species will prevail and other perish, altering ecological equilibria. The disappearance of a species is not only an ecological loss but also the loss of biocultural heritage. Biodiversity reduction is an irreplaceable loss of something of both instrumental and intrinsic value. Particularly people with strong ties to their natural environment lose biocultural heritage as species become rare or extinct and cannot pass on their ancestral knowledge to their offspring (Rozzi, 2012). Here it needs to be recalled that agriculture concerns more than the production of food, it is about maintaining a cultural heritage (Borghini, Piras, & Serini, 2022). Many crop varieties have special cultural values and are important for people's identity, such as local corn varieties for the Mesoamerican indigenous communities (Mullaney, 2014). As certain heritage varieties cannot be grown anymore, a part of cultural identity gets lost. With far reaching climatic change, adaptation will not only be about choosing between important local varieties, but even lead to the loss of whole crops.

Changes in environmental conditions also alter the behaviour of other species and their natural predators. This may lead to increases of outbreaks of plagues that destroy crops, such as locusts, and even to their propagation to new areas.

Land use changes and social justice

Climate change comes also with a substantial pressure to change land use. There are three major drivers: the use of land for energy production, strategies to give back land to nature, and rising sea levels.

In terms of energy production, there is already a longer discussion on the enormous extension of cultivars for biofuels (Toft, 2013). This stresses the availability of land, water and labour, and comes with an ecological and socioeconomic risk due to the extensive use of monocultures. The use of land to build large-scale photovoltaic installations is a new emerging factor.

Designating land for nature conservation is also having a major impact on food production. Such ecological reserves and refuge areas offer a variety of benefits for all, and every nation should do their share in creating and maintaining such areas. Ecological reserves have a public good character, as they provide ecosystem services that benefit adjacent areas, sequester carbon and allow *in situ* biodiversity conservation. There is much pressure on

countries of the Global South to protect natural reserves, without a reciprocal commitment by the Global North in protecting areas under their jurisdiction and recovering or rewilding lost highly biodiverse habitats, such as northern temperate rainforests. This has led to the accusation of green grabbing, as a form of neo-colonialism, which limits the freedom to use land for food production, particularly in the Global South (Corson & MacDonald, 2012).

Rising sea levels are already forcing people out of their traditional lands, particularly in the river deltas and low-lying Pacific islands. Some of these areas, most notably the Nile delta and large parts of Bangladesh, are highly populous regions. These valuable agricultural lands are lost altogether or become unsuitable for agriculture due to higher levels of salinity, forcing people to migrate to other areas and become climate refugees.

These changes in land uses lead to land scarcity for food production, making it even more difficult for farmers to work the land to cover their own needs. Land scarcity often increases tensions and leads to conflicts, which often are fuelled by droughts and water scarcity.

Conclusion: On the challenges of adequate compensation

Climate change raises distributive justice issues for both people in the present and in the future. Particularly famers in the tropical regions will suffer the most while being responsible for the lowest historic emissions (Onyekuru & Marchant, 2012). Today's generations are burdening future people creating an intergenerational injustice with every day of insufficient climate action.

What could count as adequate compensation for excessive emissions? How should such compensation be perceived when continuing to harm the climate vulnerable by failing to take sufficient action? There are a few cases where technological fixes are a form of reasonable compensation. Offering innovations to increase energy efficiency is usually an adequate form of compensation, when farmers for example, can benefit from machinery that consumes less fuel. Another example is refrigeration. By keeping food at lower temperatures spoilage is reduced, which can save valuable resources and make up for poorer harvests. Moreover, refrigeration, particularly for foodstuff that spoils quickly such as fish, allows people to improve their bargaining position by not having to sell immediately their produce when offered low prices (Ariztia & Raglianti, 2020). Despite the potential benefits of compensatory goods, these goods are nonetheless imposed. As climate change may lead to the loss of heritage varieties, droughts and a rise in sea level, compensation would have to counteract the losses of such valuable goods and the relation to land. History has plenty of examples showing that people will not easily accept new areas of land to resettle as a form of compensation.

There are however excellent win-win opportunities. Farmers all over the world can be assisted in the development of agroforestry systems and in ecological intensification. Many farmers struggle to access new seeds and seedlings for their projects. As these types of farming systems produce both local and global ecosystem services, it is in the interest of outsiders to assist in the development of such projects by financing ecological agricultural extension services and seed diffusion programs.

Compensatory goods need to also avoid creating additional problems. One could for instance propose to compensate farmers for reduced precipitation rates by offering irrigation

systems that use desalinated water from the sea. The carbon footprint for creating and maintaining such systems would most likely cause new climate-related problems. A holistic assessment of local advantages and global burdens needs to be made before recommending such projects.

Cross References

- Climate Change and Food Ethics
- Climate Change and Global Health

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