Triodos Bank

Towards ecologically and socially resilient food and agriculture systems

Triodos Bank's vision paper on food and agriculture systems, June 2019

Contents

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Executive summary

Towards ecologically and socially resilient food and agriculture systems

In line with our essence, Triodos Bank aims to support a society that protects and promotes the quality of life of all its members and that has human dignity at its core. Food plays an important role in people's everyday lives as it nourishes us, connects people with others and with nature and is an important element in many cultures and traditions. Agriculture is the oldest profession on earth and essential to the development of humans as well as the planet. As food and agriculture are closely connected to the essence of Triodos Bank, it has historically been, and will continue to be, an important theme within our organisation.

In order to redefine our focus in relation to Triodos Bank's food and agriculture activities, we conducted some analysis to better understand the workings of food and agriculture systems. This vision paper contains the findings of this analysis and comprehensively describes the challenges of systems as well as possible solutions. It aims to provide direction and focus for co-workers and spark a dialogue with external actors in food and agriculture systems such as consumers, businesses, knowledge institutes, financiers and policymakers.

We believe the redefinition of our focus was necessary, because the current system has reached its limits regarding its negative impact on people and planet. Thankfully, the momentum for systemic change is building. The challenges facing food and agriculture systems are high on the agenda, on both global and local levels. It is increasingly recognised that systemic transformation requires economic, socio-cultural and institutional changes that reinforce each other.

People are becoming more aware of the challenges and urgency in relation to food and agriculture systems, and many positive trends are already visible in society as a result. In the Netherlands, for example, considerable improvements have been made during the past 10 years in the field of animal welfare. Furthermore, a rapid growth can be seen worldwide in organic agriculture as well as in organic and local consumption. Coinciding with this is the decrease in meat consumption in western economies in favour of plant-based diets. Triodos Bank aspires to be a catalyser for these positive developments through lending and investments as well as through thought leadership.

Setting the scene

Both Thomas Malthus (in 1798) and the Club of Rome (in 1972) predicted that the continuous growth in world population would, at some point in time, be limited due to restraints on growth of food production.

Food plays an important role in people's everyday lives as it nourishes us, connects people with others and with nature and is an important element in many cultures and traditions.

Despite significant growth in world population this has not happened yet, partly because we managed to simultaneously increase global food production. Production growth started around 1950 with the 'Green Revolution', a term describing the large-scale agricultural reforms, driven by the slogan 'No More Hunger'. Countries, primarily western ones, started to industrialise their agriculture production systems, introducing high yielding crop varieties and monocultures for efficiency gains, higher inputs of fertiliser and pesticides, improved irrigation techniques and mechanisation of farming equipment. These developments led to the modern food and agriculture systems we know today. These can produce immense quantities of low-priced food. Although they did not end hunger, they did enable an incredible boom in population growth and achieved considerable results in providing food security worldwide. However, we now know that they also generate significant negative outcomes for ecosystems, health and prosperity. It is widely recognised that modern food and agriculture systems are untenable as they exceed planetary boundaries, cause severe health issues, and support inequality.

Negative outcomes are already visible worldwide, and the world population is expected to continuously grow during the coming decades to 10 billion by 2050. Most of this growth will occur in Africa and Asia; two regions that also expect to see the largest increase in urban population. Simultaneously, dietary patterns are changing worldwide through income growth and globalisation, increasing the demand for animal protein and processed food products. The increase in both world and urban population and the shift in dietary patterns, will put additional pressure on the earth's resources and communities, especially in those regions where the highest growth is expected.

The Triodos Bank perspective

Triodos Bank calls for a radical systemic transition from the current production-focused systems towards one that is ecologically and socially resilient and based on balanced ecosystems, a healthy society and inclusive prosperity. This will require a thorough redesign, a renewed connection between consumers and the food they eat and a revaluation of our food and ecosystems. This new paradigm is shown in figure 1.

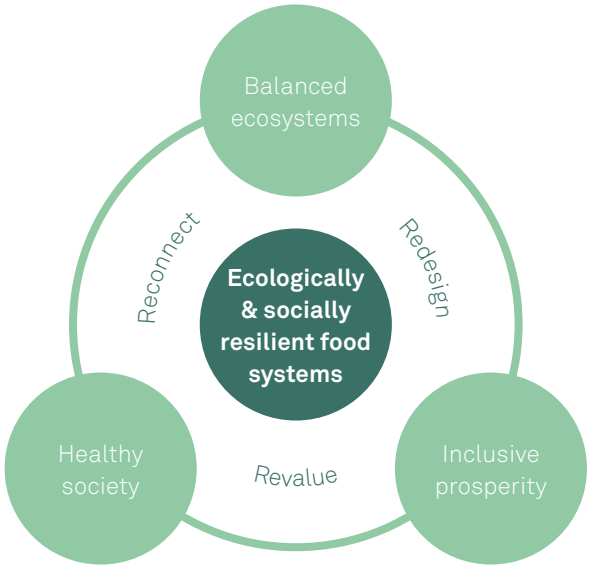


Figure 1: Triodos' conceptual model of sustainable food systems

Balanced ecosystems, a healthy society and inclusive prosperity are closely related and all essential for well-functioning food and agriculture systems. However, they are often dealt with in isolation. We need to start looking at it from a holistic, systemic perspective, recognising the complexities and interdependencies. A transition is urgently needed to safeguard healthy nutrition for future generations without damaging the natural systems and without marginalising the millions of smallholder farmers in emerging economies who produce food for increasingly globalised food markets. We need to rethink the way we produce, store, trade, transport, process, market, and consume (or dispose of) our food.

New paradigm: ecologically and socially resilient food and agriculture systems

Below, we describe the status of our current food and agriculture systems, and how a transition could be made towards sustainable and resilient alternatives.

1) Balanced ecosystems as a basis for resilience in food production

Modern farming systems, currently dominant in western economies, have serious negative consequences. They cause severe soil degradation: over 50% of global arable land is degraded. Biodiversity loss is a major issue as indicated by the 75% decline in flying insects over the past three decades according to research conducted in Germany. Water depletion occurs with agriculture accounting for 70% of global freshwater withdrawals. And farming has high greenhouse gas (GHG) emissions where between 20-30% of global GHG emissions are related to agriculture. This is because modern farming systems depend heavily on synthetic inputs, adopt limited diversity, produce for global markets and have a high weighting towards livestock. They threaten the very ecosystems they depend on.

Triodos Bank believes it is essential that farming practices return to an approach of working with nature rather than against it. We want to achieve a transition towards agricultural practices that sustain both ecosystems and humans. The Principles of Organic Agriculture of health, ecology, fairness and care should be guiding. Through this approach, resilient farming methods evolve, adapted to local circumstances and sustaining local ecosystems.

Organic certification is a useful instrument but should not be a rule-based, box-ticking exercise focused on minimum requirements. Not all organic certified farmers adopt the above-mentioned Principles of Organic Agriculture and not all sustainable farmers are organically certified.

Another element for concern is that about a third of global food production is wasted at some point in the value chain. Resilient food and agriculture systems reduce food waste throughout the supply chain and serve local markets with seasonal products wherever possible. Furthermore, they adopt circular solutions based on the principles of reduce, reuse and recycle, and the conscious use of resources. Lastly, they reduce their reliance on finite fossil fuels, both at farm level (synthetic inputs) as well as beyond (transportation, packaging, etc).

2) A healthy society consuming sustainable and nutritious diets

Despite huge increases in food production over the past decades, modern food and agriculture systems have not been able to provide food and nutrition security for all. About 800 million people still suffer from chronic hunger while 1.9 billion people are either overweight or obese. Simultaneously, more than 2 billion people suffer from the hidden hunger of micronutrient deficiencies (lack of vitamins and minerals). Increasingly prevalent is the 'double burden of malnutrition', where two types of malnutrition co-exist in a country or even affect one individual. This means that one is overweight due to food consumption high in macronutrients (proteins, carbohydrates and fats) but lacking in necessary

50%

Over 50% of global arable land is degraded.

500.000.000

500 million farmers producing food on less than two hectares supply 70% of the world's food. They represent the poorest and hungriest people in the world.

micronutrients resulting in deficiencies. These worrying trends are caused by lack of access to affordable, nutritious food, a decreasing diversity of food supplies and a dietary shift towards western diets dominated by processed foods and meat.

The challenge is therefore not only about producing food in sufficient quantities, but rather about achieving sufficient quality. This means that food and agriculture systems should transition towards sustainable diets; diets with a low environmental impact (which includes lower meat consumption), that are nutritious (contain all essential nutrients including minerals and vitamins), safe and healthy as well as culturally accepted, accessible and affordable. More specifically diets that focus on quality, not only quantity, that are diverse, and preferably local.

3) Inclusive prosperity through transparency and fair distribution of prosperity

There is a growing disbalance in our food and agriculture systems, where a select few have disproportionate power over others and use that power for short-term, personal gain. An emphasis has been placed on the production of large quantities of food products for low prices, aided by the view that resources such as land and water are infinite. This singular focus on volume and price leads to the exploitation of those producing and processing these products and the exclusion of environmental concerns. Farmers are ever more reliant on a handful of suppliers and buyers, squeezing their incomes and eroding their ability to choose what to grow and for whom. Furthermore, although multinational corporations make high investments in research and development, the scope of innovation is narrow and is driven by corporate strategy rather than incorporating the needs of others.

In emerging economies, 500 million farmers producing food on less than two hectares supply 70% of the world's food. They represent the poorest and hungriest people in the world. Power disbalance within value chains, but also between countries, threatens their very livelihood and local ecosystems. Only a fraction of the prosperity generated by international trade is received locally, with the largest share going to western actors, supplying western consumers. This absence of a level playing field has resulted in an underinvested agricultural sector in emerging economies, that is unable to meet local needs for development. By providing raw materials for western markets, some countries are unable to provide for their own population, making them reliant on food imports from the counties they supply.

In western economies, the continued pressure on farmers to produce large quantities of homogenous products for low prices has led to upscaling and intensification of farming practices. Governments support his through subsidy schemes and agricultural policy. High investment costs, and insufficient remuneration for services rendered, have left farmers with limited space to manoeuvre and led to a loss of farm sovereignty. Environmental concerns and the essential societal roles that farmers fulfil (with regard to the landscape, ecosystem services etc) are not accounted for.

There is an urgent need to transition to food and agriculture systems in which all parties in the value chain receive a proper proportion of the prosperity generated, based on transparency, equality as well as fair power balances. Smallholder farmers should receive access to assets (i.e. land and seeds), capital, education, infrastructure and information to intensify and scale up their production and realise their immense potential for worldwide production growth. Industrialised farmers should be given the opportunity to transition away from monocultures and intensive farming through government support (subsidy and regulation), standards focusing on quality not quantity, and conscious consumers. Lastly, farmers should be rewarded for their capital investments and labour as well as their societal roles, promoting sustainable farming practices integrated in the local landscape.

Call to action

The transition towards food and agriculture systems with balanced ecosystems, a healthy society and inclusive prosperity needs the effort of many different actors. We see a clear role for governments, businesses including the financial sector and consumers. Therefore, Triodos Bank calls for a societal agreement on how to achieve the transition to ecologically and socially resilient food and agriculture systems.

To start with Triodos Bank itself, we support this transition towards balanced ecosystems, a healthy society and inclusive prosperity through our role as an enabler and activator. By financing agricultural initiatives that work with nature rather than against it. By improving ecosystem elements such as biodiversity and soil quality. By supporting initiatives that provide nutritious and quality food products, promoting a healthy society. By financing projects that improve livelihoods of many through income growth and support.

We have defined 17 subthemes which are essential for the transition towards sustainable food and agriculture systems. These subthemes can be seen in figure 2.

For each theme, statements have been defined conveying the position of Triodos Bank, thereby providing a sense of direction for the branches, subsidiaries and business-lines that will integrate the vision in their daily activities. Although single-topic initiatives such as waste reduction can be supported by Triodos Bank, it is important to always take a holistic perspective and consider the impact in the context of the larger systems. Therefore, all co-workers are encouraged to adopt a systems thinking approach, recognising the complexity of the systems and interconnectedness of all aspects. Systems thinking will be a learning by doing process which provides opportunity to invest in systemic

Balanced ecosystems	Healthy society	Inclusive prosperity
Healthy soils	Food security	Transparent / fair business practises
Biodiversity	Food quality	Rural development
GHG emissions	Food safety	Sustainable livelihoods
Water	Consumer awareness	Equal rights
Conscious resources use	Sustainable diets	Climate change mitigation and adaptation
Animal welfare	Culture and traditions	

Figure 2: vision's main and subthemes

change, thereby supporting the transition towards ecologically and socially resilient food systems.

We advocate consumer awareness, reconnecting consumers with farmers to adopt local and sustainable diets. We are strongly in favour of improving transparency within food and agriculture systems, decreasing the growing disbalance visible in value chains. Triodos Bank promotes dialogue between different actors within food and agricultural systems, learning from each other and finding innovative solutions through cooperation, for example in the field of circularity. Lastly, we strive to influence policy decisions that benefit the transition towards sustainable food systems.

The upcoming revision of the European Union's Common Agricultural Policy (CAP) is an important moment for a fundamental redesign of the agricultural and trade framework. In addition to the CAP, the EU trade policy, competition regulation and national policies can play an important role in redesigning food and agriculture systems.
The transition to sustainable and inclusive food and agriculture systems should be at the heart of the CAP at EU level. The CAP should enhance the transition of agricultural land to organic and make conventional agriculture sustainable. This can be done by increasingly basing the subsidies of the CAP on principles of organic farming, creating incentives for farmers to adopt sustainable agricultural practices. Raising legal requirements and industry norms can help rule-out particularly unsustainable practices. Furthermore, income support should be maximised by farm and competition regulation should be reformed to strengthen the position of small and medium size farmers. The size of the herd in EU countries should be reduced. Land-based animal husbandry on the basis of organic principles should become the basis of EU and national regulation, which will also impact the EU's trade policy. Also, as ecological processes are not restricted by the borders of farms, area planning should be part of national policies and the CAP. Lastly, in order to redesign food and agriculture systems, the CAP should not focus on agriculture only. To foster real change, the CAP should take a more systemic approach and broaden its reach to food systems as well.

True pricing can be a tool to revalue the natural systems our food provisioning depends on and the contribution it makes to a healthy society and fair trade relations. Successful implementation of true pricing will require governments to recognise the societal roles that farmers play and to adopt true pricing policies in order to create a level playing field. Governments can recognise the societal roles of farmers by paying farmers for their ecosystem services that support sustainable and resilient food and agriculture systems. For true pricing to be reflected in market prices, it will require governments to levy taxes accordingly. For example, taxes could be levied on meat, use of nonrecyclable or nondegradable packaging, heavily processed food, food with high levels of sugar, or on transport. On the other hand,

The upcoming revision of the European Union's Common Agricultural Policy (CAP) is an important moment for a fundamental redesign of the agricultural and trade framework.

a reduction of tax rates for organic products could support demand. A shift from taxes on human capital (labour) towards materials, resources and environmental aspects is a possible direction for governments to revalue the importance of economic action on our environment.

Businesses should take responsibility and produce the food in a responsible and sustainable manner. Financial institutions must play a significant role by innovating their investment criteria, pricing models, investment horizons and their reporting. Their criteria and investment decisions should encourage long-term and holistic strategies as well as sustainable innovation both by mature businesses and early-stage companies.

Citizens can vote daily with their wallets. (Re)gaining consumer trust requires businesses to take the responsibility of being transparent about their value chain footprints and provide clear nutritional information. Furthermore, increasing knowledge (e.g. about nutrition and food production) and improving food skills (e.g. meal planning and cooking) of consumers can strongly influence their food-related behaviours and attitudes. Therefore, food education for children and adolescents is increasingly promoted as a pathway to improve healthy and sustainable consumption and to reconnect citizens with food and agriculture systems.

1. Introduction

Triodos Bank's aim is to make a positive contribution to the development of a healthy society that can flourish within planetary boundaries[1]. Food and agriculture systems are an essential part of society and strongly connect humans to nature. Therefore, investing in food and agriculture offers a huge opportunity for Triodos Bank to contribute to its ambition to promote environmental conservation, people's quality of life, and human dignity.

Developments in food and agriculture over the last decades have hugely increased global food production and reduced prices. However, this success comes at a cost. Our current food and agriculture systems are untenable. They generate significant negative outcomes on multiple fronts: from environmental degradation and climate change to unhealthy nutrition and livelihood stresses[2]. These challenges are increasingly complex and interconnected. A narrow production-oriented approach to food and agriculture is unfit to respond to these challenges[3]. A growing and more affluent world population puts increasing pressure on natural systems and global resources. Global trends such as climate change and soil degradation threaten the long-term sustainability of food and agriculture systems themselves. At the same time, prosperity is not equally shared across the food supply chain. Power positions between large multinational companies and farmers are unequal. Land grabbing practices of governments and firms, as well as dumping of western subsidised food in emerging economies, worsen the positions of smallholder farmers in their local markets. As a result, farmers are struggling worldwide to make a living.

These trends complicate the goal of reaching food and nutrition security for all. Especially since geographical drivers, such as population growth, urbanisation and increasing incomes, will continue to put further pressure on food and agriculture systems. In 2050, the world's population is expected to reach 10 billion. Simultaneously, worldwide demand for food is changing because of urbanisation and shifting dietary patterns through income growth and globalisation. Demands for animal protein and processed food products are rising and will, together with a growing population, put additional pressure on the earth's resources and communities.

The challenges and needs of current and future societies call for a transition towards food and agriculture systems that contribute to balanced ecosystems, a healthy society and inclusive prosperity. Moreover, for these systems to be sustainable in the long-term, they should be resilient: having the capacity to deal with change and continue to develop[4].

The challenges and needs of current and future societies call for a transition towards food and agriculture systems that contribute to balanced ecosystems, a healthy society and inclusive prosperity.

Food systems are complex social-ecological systems in which humans and nature interact. A food systems approach encompasses the web of actors, processes and interactions involved in keeping us fed, from production and processing to consumption and discarding of food. Food systems are characterised by complex interactions and feedback loops between diverse actors and processes. They are shaped not only by transactions between actors in supply chains, but also by rules and power balances.
The global agroindustrial food system is the most common food system. There are also local and regional food systems.
(IPES-Food, 2015; FAO, 2018)

As described in this vision paper, food and agriculture, consumption and health, and prosperity and well-being are all interconnected and complex subjects that cannot be viewed separately. Instead they require a systems approach that respects their interconnectivity. These subjects are part of food and agriculture systems, which are hugely complex and multi-dimensional with many different actors, processes, interactions and interdependencies.
In the transition towards resilient food and agriculture systems, it is important to consider them as complex social-ecological systems in which people and nature interact[5,6]. Furthermore, they are inextricably linked to economics, politics and culture. Complex problems cannot be solved by simple solutions. They require a holistic approach based on systems thinking.

Systems Thinking is the ability to think about a system as a whole, rather than considering the parts individually. It perceives the world as a complex system and supports the understanding of its interconnectedness and interrelationships. (McGraw-Hill; Systems Thinking and Modelling for a Complex World, 2000)

Because the subjects of ecology, health, and prosperity are all closely connected, Triodos Bank felt it was necessary to base our vision on systems thinking and describe what we feel is required to transition towards ecologically and socially resilient food and agriculture systems. While Triodos Bank has been active from the start in financing clients that contribute to this goal, we believe that optimisation of current systems is not enough. A true transformation is required to steer away from current lock-ins and mobilise systemic change towards environmentally and socially resilient food and agriculture systems.

The UN Sustainable Development Goals clearly recognise the interconnected nature of global challenges and reinforce the importance of resilient food and agriculture systems. Of the 17 goals identified, 10 directly relate to food and agriculture.

This vision paper aims to contribute to the much-needed transition by providing background information as well as directions for building alternative food and agriculture systems from Triodos Bank's perspective. This paper can be used to guide strategy development and decision-making internally. Moreover, it can help to forge partnerships and empower actors in Triodos Bank's network to join forces in driving the transition.

First, we provide an overview of food and agriculture systems challenges as well as possible solutions and our related vision in chapter 2. This chapter is broken down in three areas of food and agriculture systems: 1) ecosystems, 2) health and 3) prosperity. In chapter 3, we describe root causes underlying current systems as well as possible systemic interventions. We highlight which kinds of initiatives, activities, and policies should be stimulated in the transition and by whom. In chapter 4, we discuss the role of Triodos Bank in encouraging and financing this move towards resilient food and agriculture systems. We conclude with the vision statements which offer guidance for the vision's practical implementation.

2. Challenges and solutions for food and agriculture systems

2.1 Background

Before we examine the challenges and solutions for food and agriculture, let us first look back at the conception of modern food and agriculture systems and some of the drivers behind these systems.

2.1.1 The green revolution

Global agroindustrial food systems, commonly called 'modern' food and agriculture systems emerged after World War II with the purpose of alleviating hunger in the world. The Green Revolution started around 1950. This saw unparalleled production growth through intensification and specialisation, increasing use of synthetic fertilisers and pesticides in the production process and the development of high-yielding crop varieties. Simultaneous with the Green Revolution, exponential growth in world population occurred. Much has been achieved since then including a 50% drop in the proportion of hungry people as well as improved food safety. Furthermore, without higher yields per hectare through intensification and specialisation, more land would have been needed for agricultural purposes at the cost of natural areas. However, the other side of the story, now widely recognised, is that these food and agriculture systems generate significant negative outcomes[7].

2.1.2 Drivers of change

Food and agriculture systems are ever changing as they are influenced by different drivers. A well-known driver is climate change: rising temperatures and changing weather conditions affect which crops and animals we produce where in the world. Other drivers can be of political nature, such as armed conflict, but also geographical or social. The last two in particular influence global, modern food and agriculture systems. Therefore, they are discussed in further detail below.

Population growth

Modern food and agriculture systems allow us to produce large amounts of food to sustain the growing world population, which went from 2.5 billion in 1950 to 7.2 billion in 2018. Based on current statistics, population growth is expected to increase to 10 billion in 2050. Most of this anticipated growth is expected to occur in Africa and Asia, in countries that often do not possess adequate financial resources, infrastructure, or stable and strong governments to eradicate poverty, reduce malnutrition, improve education and ensure health and well-being for all inhabitants[8]. Population increase in these regions will put pressure on local food and agriculture systems, increasing their dependence on food imports. To make matters even more pressing, these countries will also bear the brunt of climate change related issues, further impacting food and agriculture systems. Feeding a fast-growing population, while simultaneously managing the consequences of climate change, requires investments in local communities to create resilient local food and agriculture systems.

Urbanisation

Coinciding with world population growth is urbanisation. By 2050, 68% of the world population is expected to live in cities, compared with the current 55%.

10.000.000.000

Based on current statistics, population growth is expected to increase to 10 billion in 2050.

68%

By 2050, 68% of the world population is expected to live in cities.

This increasing percentage, combined with population growth, would add another 2.5 billion people to urban areas by 2050 and 90% of this increase is expected to take place in Africa and Asia. The increase of urban population logically coincides with the creation of 'megacities' - cities that have more than 10 million inhabitants. By 2030, the world is projected to have 43 megacities, most of them located in emerging economies[9]. This level of urban growth introduces a range of challenges, many of them food related. A major challenge related to growing urban environments, especially in emerging economies, is a healthy diet. The provision of nutritious food products to urban environments is difficult as they have limited shelf life and require additional facilities, such as cooled storage, making them more expensive. Shortages are already visible in many urban areas, where food supply consists predominantly of processed food products. Urban areas, where almost no fresh food is available, are fittingly labelled as 'fresh food deserts'[10].

Changing diets

Coinciding with population growth and increasing urbanisation, is the rise in global income. This trend, together with an increasingly connected world through globalisation, influences and changes dietary patterns. A dietary shift linked to worldwide income growth and the establishment of an affluent middle class, is the increased consumption of animal protein, primarily beef and pork. Unfortunately, animal protein requires a high resource input, which means that a consumption increase will further strain the earth's resources. In western economies, a contrary trend is visible regarding meat consumption, as it decreases in favour of plant-based protein. Another visible shift in dietary patterns, resulting from both income growth and globalisation, is the increased consumption of processed food products. Processed food products are the main product of modern food and agriculture systems, and as more people worldwide are connected to this system, consumption increases. Processed food products cater to both higher and lower incomes as they are tasty, convenient, have a long shelf life, and are also cheap[8]. The increase in processed food consumption is a major contributing factor to the global obesity epidemic, which has increased the prevalence of non-communicable diseases, primarily cardiovascular disease. Cardiovascular disease can result from an unhealthy lifestyle, with overweight being an important factor and is the number one cause of death worldwide.

Although modern food and agriculture systems were able to produce enough food to alleviate hunger to a certain extent and enable explosive population growth, they have not succeeded in providing healthy nutrition for all. Sustainable food and agriculture systems demand a transition in food production focus, from quantity to quality, and should be able to provide not only food, but nutrients to all worldwide.

2.2 Sustainable food and agriculture systems

We need to transition towards sustainable food and agricu lture systems. The UN High Level Panel of Experts, a leading research group on the subject of food and agriculture systems, defines a sustainable food system as follows[11]:

> "A sustainable food system is a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised"

In the Triodos Bank vision, sustainable food and agriculture systems are characterised by ecological, social and economic resilience. They should deliver healthy nutrition to all without damaging the ecosystems they depend on (safeguarding access to food for future generations) and deliver inclusive prosperity for those active in the food and agriculture value chain.

To have a clear view on how a transition could occur we first need to understand the challenges of modern systems and the root causes leading to these outcomes. We describe the negative outcomes of modern food and agriculture systems and discuss solutions in three different subject areas 2.3) ecosystems, 2.4) health and 2.5) prosperity.

Because challenges are multifaceted and strongly interconnected between the three subjects, it is important to consider the root causes of the challenges, rather than focusing only on the outcomes. The root causes of the challenges are discussed in chapter 3.

The aspects of ecosystems, health and prosperity provide structure to the complex subject of food and agriculture. However, they are strongly interrelated and should never be viewed in isolation. Solutions should be formulated from a systems perspective, adopting new holistic approaches that meet the challenges of sustainable and equitable food production and consumption.

2.3 Ecosystems

Well-functioning ecosystems are vital for human wellbeing. Agriculture is an important driver of global environmental changes. These changes in turn endanger the sustainability of our food and agriculture systems. Domains that are already beyond a safe operating space for humanity are: land use change, climate change, changes in biochemical flows of phosphorus and nitrogen, and biodiversity loss[12]. These are all vital to our food and agriculture systems. Figure 3 illustrates these domains, defined as the nine planetary boundaries.

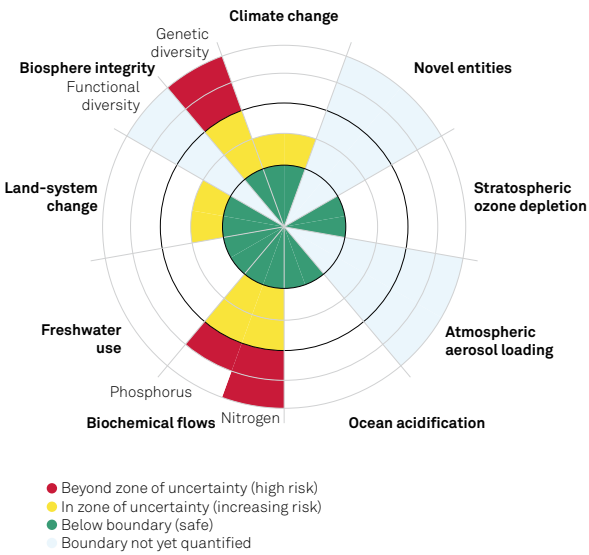


Figure 3: Steffen et al. (2015). The nine planetary boundaries

2.3.1 Challenges

Currently around one-third of the world's total available land is used for agriculture[13]. Of this land, one-third is suitable for cropland and the remaining land is fit for grazing. Of the remaining land, half is unfit for any kind of cultivation, mainly because of climatic constraints, and the other half produces forests[14]. To make space for human needs, natural grasslands and forests have been converted into agricultural land and urban areas[15]. The opportunities to expand agricultural land further are limited without causing additional damage to natural areas.

Soil degradation

Land use change and agricultural activities have a major influence on soil quality. Healthy living soils are essential for food security and nutrition as 95% of food production directly or indirectly relies on our soils[16]. Furthermore, healthy soils provide other ecosystem services such as carbon sequestration and water purification. Over the past decades human activities have pushed soil quality and resources to critical limits. It is estimated that 52% of global agricultural land is currently degraded and vast areas of fertile soils are lost each year[17]. Besides land use change and climate change, pollution and unsustainable soil management practices are the main drivers of soil degradation. Intensive agricultural processes with high synthetic inputs or animal manure contribute to soil and water pollution by adding large amounts of nitrogen and phosphorus, as well as pesticides, to the environment. In emerging economies, most notably sub-Saharan Africa, continued cropping with inadequate agricultural inputs can lead to nutrient mining[18]. This threatens soil fertility and its productive capacity as nutrients deplete. Sustainable soil management is urgently needed to safeguard healthy and productive soils for future generations.

Water pollution and depletion

Pollution and depletion of water resources are another major challenge. Agriculture accounts for 70% of all freshwater withdrawals in the world today[19]. Inefficient use and pollution of freshwater resources poses great challenges to agricultural production and human health[20]. At the other end of the food chain, single-use plastic food packaging and low levels of reuse and recycling contribute to plastic pollution in the oceans[21]. Microplastics do not only endanger marine ecosystems, but also human health, as they re-enter the food chain through sea food, drinking water, and products like salt and honey[22].

Greenhouse gas emissions

Next to soil quality and water use, climate change is one of the major challenges influencing food security. It has both direct and indirect effects on yields including droughts, flooding and the distribution of pests and diseases[23]. Low-income regions already vulnerable to undernutrition are particularly affected by these climate-induced challenges. Of all greenhouse gas emissions attributed to human activities globally, today's food and agriculture systems contribute between 19% and 29%, of which over 80% is associated with agricultural production[24].

95%

of food production directly or indirectly relies on our soils.

A highly-publicised German study reported a 75% decline in flying insects in protected areas within the past three decades.

It is estimated that nearly two-thirds of these emissions are related to livestock, primarily cattle through ruminal methane emissions and inefficient feed-to-meat conversion ratios[25].

Furthermore, the conversion of ecosystems, such as forests, to agricultural land is a major source of carbon emissions in the atmosphere. Other emissions from food and agriculture systems result from pre and post-agricultural activities such as production of inputs, transport, processing, packaging, and waste disposal[20]. From producing synthetic fertilisers to the use of agricultural machinery and refrigeration, our food and agriculture systems rely on high fossil energy use. Lastly, the widespread use of synthetic nitrogen fertiliser and increasing manure inputs in agriculture are driving nitrous oxide emissions, which is a potent greenhouse gas[26]. These challenges underline the need for resilient agricultural systems and efficient supply chains that can both keep carbon in the ground and adapt to climate-induced challenges[27].

Biodiversity loss

Farming, of all human activities, also poses a major threat to biodiversity through destruction of habitats, climate change and pollution. For example, since the 1970s, there has been a 58% decline in population abundance of vertebrate species on land and water (i.e. birds, mammals, amphibians, reptiles, and fish) . Moreover, a highly-publicised German study reported a 75% decline in flying insects in protected areas within the past three decades[29]. These losses in turn put pressure on the provision of ecological services that food production depends on. For example, at least one-third of global cultivated crops depend on pollination provided by insects and other animals. The total worldwide economic value of this ecological service was estimated at EUR 153 billion in 2005. In the Netherlands, the estimated value amounts to EUR 1.1 billion[57]. Another ecological service is natural pest control as many pest species are or can be controlled by their natural enemies . Fisheries also put pressure on marine populations. In 2015, one-third of the world's marine fish stocks was overfished, and almost 60% was at a level of being maximally fished within sustainable levels[31].

Loss of species diversity

Uniformity in monocultures and intensive livestock systems is a central characteristic of modern agriculture. A reduced range of plant varieties and animal breeds are cultivated and domesticated for food production, as traditional and indigenous species are replaced to fit standardised needs of modern food and agriculture systems. This has resulted in a loss of genetic diversity, which is also the domain the world has moved furthest beyond a safe operating space. Of the 30,000 edible crop species found in world, only about 150 are commercially grown[32]. Limited agrobiodiversity reduces ecological resilience and generates vulnerability to shocks. One illustrative example is the Cavendish banana: nearly all commercial banana plants are clones so they are extremely vulnerable to epidemics.

Linear systems and resource use

Farming was originally a perfect example of a circular system, where food was produced with local inputs for local customers. In such a system, nutrients are returned to the land they were extracted from. However, with the rise of industrial farming operations, especially livestock, farming has become increasingly more linear. There is no closed nutrient cycle, as feed is grown far away from the production of animal protein. Due to the intensive nature of production and the number of animals, there is a surplus of manure, which is transported elsewhere. Another example is the use of synthetic fertilisers.

Food waste is the largest waste stream of resources in food and agriculture systems, putting further pressure on food and nutrition security. While enough food is produced in the world, one-third is wasted each year. Annually, consumers in rich countries waste almost as much food as the total production of sub-Saharan Africa[33]. While food waste in western economies mostly happens at retail and consumer stages, losses in emerging economies often occur at post-harvest, storage, and processing stages. These latter losses are often linked to financial and technical constraints. With all wasted food, natural resources and everything else that was needed to produce it are lost as well[34]. While not all waste is avoidable, it's clear that the amount of waste currently produced in our food and agriculture systems is unacceptable. Moreover, smarter solutions are needed to recover the nutrients in unavoidable food waste into the system again.
The largest source of non-biodegradable waste generated in food and agriculture systems is derived from food packaging. Food packaging is important for food safety and can prolong shelf-life, while safeguarding quality and preventing food waste. However, packaging practices often go beyond this aim and are mainly implemented to support economic efficiencies and marketing goals[17].

Another example of inefficient use of resources was the rise of biofuels, where energy crops are specifically grown to produce fuel and so decrease the reliance on conventional fossil fuels. Biofuels were considered sustainable and supported by many countries, but sciencific research shows that carbon emissions barely decrease or in some cases are even higher. Furthermore, in some regions, energy crops competed with food production, hence the discussion 'food vs fuel'[57].

Animal welfare and health

Industrialisation within the animal husbandry sector has structurally neglected animal rights in favour of efficiency and cost-effectiveness. While these types of operations do provide cheap animal products, they cause stress and many dangers to both animal and human health[35].

Animals are not able to express their natural behaviour in industrial type operations which causes stress. Chronic stress results in pathologies such as a decreased immune system or altered metabolic system that could impact growth. Consequently, this results in lower production percentage and higher use of antibiotics because animals have lower resistance against diseases[36]. Another issue of industrial animal husbandry operations is that they form a breeding pool of viruses and bacteria due to their sheer size and number of animals housed. In case of sick animals, the entire group is often administered antibiotics, which may result in resistant bacteria leading to difficulty in treating infections. Due to the size and number of genetically uniform animals, industrial type farming systems are susceptible to disease outbreaks. Highly contagious diseases can have disastrous impacts, especially in the Netherlands where animals are tightly packed together. Lastly, industrial type operations emit fine dust particles that are harmful for human health as it can damage the lungs[57].

In conclusion, modern food and agriculture production systems endanger the interconnected ecosystems it relies on, thereby posing an existential threat to itself.

“If we can’t afford to take good care of the land that feeds us, we’re in an insurmountable mess.”

- Wendell Berry

2.3.2 Solutions

Ideally, agriculture systems support adequate farm production, actively sustain or build healthy soils, regulate and balance nutrient flows, have a low or positive carbon footprint, and limited dependence on fossil fuels. They make efficient use of natural resources, such as water and land, and human labour. Moreover, model agroecological systems conserve biodiversity, maintain and regulate species interactions, and are able to adapt to dynamic conditions[37]. Finally, they do not pose a threat to the health and wellbeing of humans and animals.

Organic Agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of synthetic inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.

Farming systems are incredibly diverse[38]. While aspiring to meet the above-mentioned goals, it is essential to appreciate the complex and context-dependent nature of agriculture. Agriculture is embedded in natural, social, and economic systems, which influence the success of the farming system. Rather than generalising and suggesting there is a one-size-fits-all solution, we propose to focus on principles over practice.

Principles of Organic Agriculture

Organic Agriculture is based on the principles of health, ecology, fairness and care. These four principles are in line with Triodos Bank’s view that agriculture needs to be seen within the context of ecosystems and should respect and support human and animal welfare. These principles are explained in the definition of Organic Agriculture by IFOAM[39]:

Organic production systems offer a way to contribute to balanced ecosystems. With organic entering mainstream markets, certification in some cases has become a matter of meeting minimum requirements. However, farming according to these principles should be much more than practicing conventional agriculture without synthetic inputs63. Taking an approach that is not solely based on reaching certification standards can better include those who are organic by default and others following the principles without certification. Triodos Bank believes that the Principles of Organic Agriculture should be at the heart of sustainable production. This view is in line with the Organic 3.0 strategy put forward by IFOAM, the International Federation of Organic Agricultural Movements.

The Organic 3.0 Framework

The organic movement has grown and achieved a lot since its foundation by visionary pioneers around 100 years ago (coined Organic 1.0). With the development of certification schemes, the organic sector has established itself globally with a market value of almost USD 90 billion a year[40] (Organic 2.0). Organic products have found their way into virtually every supermarket and the number of organic producers grows each year. Nevertheless, the share of organic agricultural land was still only 1.2% of the global total in 2016.

IFOAM itself is entering a new phase: Organic 3.0[41]. It recognises that the 2.0 phase of 'norming and performing' faces several challenges. The 3.0 framework seeks to be more included and more inclusive in the acceleration of food and agriculture systems change[42]. Its aims are 1) to expand the organic sector (both certified and non-certified) while making it more sustainable and 2) to inspire global agriculture to adopt organic principles not only in relation to ecology but also in relation to society, culture, accountability and economy as reflected in the flower depicted below, developed by IFOAM.

Figure 4: IFOAM (2017). Organic 3.0

"The overall goal of Organic 3.0 is to enable a widespread uptake of truly sustainable farming systems and markets based on organic principles and imbued with a culture of innovation, of progressive improvement towards best practice, of transparent integrity, of inclusive collaboration, of holistic systems, and of true value pricing"[68].

Other approaches to sustainable farming

The organic movement is no longer the only actor that advocates stronger connections between the way we produce and consume our food, and the health of people and the planet. There is a wide variety of agricultural systems and farming practices in the world that require diverse approaches adapted to local conditions, as recognised in the definition of Organic Agriculture.

There are currently many names for holistic alternatives to uniform industrial production systems. Examples are agroecology, ecological intensification, diversified agroecological systems, nature inclusive agriculture, regenerative agriculture, agroforestry, permaculture, biodynamic agriculture and circular agriculture. The principles behind these definitions of sustainable farming overlap to a certain extent, however emphasis can vary. What they have in common is that they all aim to work with nature, rather than against it. They share the goal to intensify ecological processes for agricultural production. Ecological concepts and functions and biodiversity are managed and applied in the design of these agricultural systems to improve their environmental impact, efficiency, resilience, and farmers' livelihoods[43,44]. They are therefore less dependent on external inputs such as synthetic fertilisers and pesticides and produce more diverse outputs.

Some of these concepts are a set of sustainable farming practices and principles, or a strategy, others are also social movements or have become scientific disciplines themselves. Some are more focused on alternative and local food and agriculture systems, while others aim to change mainstream agriculture[45].

“Intensify in the South, extensify in the North, detoxify everywhere.”

- Pablo Tittonell

Some movements are driven by practical concerns, others, such as biodynamic agriculture, have spiritual roots. Most of these concepts are not like Organic Agriculture, institutionalised with certifications and regulation.
A unified framework of foundational principles can allow these different alternative approaches to collaborate and develop[64]. Despite differences in approach, it could be helpful to gather forces given the urgency of the situation at hand.

There will be different priorities in different parts of the world. In some places there is overproduction and overconsumption, while there are yield gaps and hunger elsewhere. Hence, food should be produced primarily where it is needed. The basic principles of Organic Agriculture, as specified in its definition, can guide the development and management of sustainable agriculture systems. This is in agreement with Triodos Bank’s view that meaningful sustainable developments come from principle-based decision making rather than from rule-based compliance and ‘box ticking’[1].

Aquaculture (and fisheries)

Fisheries and aquaculture are critically important in the provision of food, nutrition and employment for millions of people worldwide. Although global marine catches have been stable since the 1980s, annual growth in fish consumption has been twice as high as population growth[29]. Since a large part of fish stocks has been maximally exploited, the growing demand for fish has been largely met by developments in aquaculture. Fish farming now accounts for almost half of global fish production. Aquaculture is particularly growing in Asia and Africa. Moreover, almost all seaweed is produced with aquaculture. Seaweed production has more than doubled since the 1990s.

Nevertheless, aquaculture is not a simple solution to overfishing. Environmental, health, and social problems must be addressed in this so-called “blue revolution” and include water pollution, ecosystem degradation, animal welfare, and labour issues[46]. Broader ecosystem interactions need to be considered for aquaculture to be sustainable.

There are currently at least 30 certification schemes, promoted by various actors related to these different issues in aquaculture[47]. These include schemes with organic standards, although these are still in development[48]. A set of conditions proposed by Greenpeace can be used to evaluate the sustainability of aquaculture[49].

While aquaculture is, without a doubt, an important part of household diet and income in many regions, it is not a focus point of Triodos Bank at this moment and therefore not discussed in detail in this document.

Renewable sources and circularity

When it comes to food packaging, especially plastic, smart solutions and social incentives should aim to reuse, reduce, and recycle. Furthermore, refusing the use of single-use plastic and reminding customers to bring their own reusable alternative (e.g. cups, bottles and grocery bags) should continue to be promoted. Smart solutions such as Natural Branding[50] and the use of compostable bioplastics can further reduce plastic waste.

As the recycling of plastics is currently limited, improved design for waste separation and investment in recycling should continue to be promoted as well to tackle the issue of waste produced in our food and agriculture systems.

In line with Triodos Bank's vision on Energy and Climate, food and agriculture systems should move away from their dependency on fossil fuels and reduce their greenhouse gas emissions. This transformation requires promotion of renewable energy sources (e.g. wind, solar and geothermal), energy saving, electrification, and improving energy efficiency. Innovations to support the energy transition should be applied to all energy-requiring processes along the food chain, including the production and use of agricultural inputs and machinery, processing, transport, storage (including refrigeration) and cooking. Moreover, this requires a critical consideration of products with a high carbon footprint.

In addition to a transition to renewable energy, agriculture can be an important source of renewable materials. Bio based materials such as fibre, bioplastics and bio-based packing materials can be made from natural products which are sometimes specifically grown for that purpose, but often waste streams or by-products can be used. Increased use of renewable materials helps to reduce the environmental footprint of human activity.

Lastly, farming practises, aided by policy and subsidies should strive to create closed resource loops in a regionally acceptable area. In such a system, nutrients are returned to the soil they were extracted from, thereby maintaining the nutrient balance and soil quality. Animals play a crucial role in circular production systems, as they can process waste into fertiliser and utilise arable land that is not suitable for human food production (grassland). In such a system, meat, dairy, eggs and other animal products become by-products of the ecosystem services delivered. In such a system the number of animals should be in balance with the ecosystem.

Creating closed organic material loops poses a challenge and will require interdisciplinary cooperation from a holistic perspective, finding innovative and smart solutions.

Fighting food waste

Reducing food waste is important to limit pressure on natural systems and to reach food and nutrition security. Food waste has a variety of causes and occurs in different parts of the food supply chain for different reasons. Therefore, diverse solutions are needed to cut it back. Technological as well as social innovations can contribute to this goal. In western economies, awareness campaigns, clear information on packaging, smaller portion sizes and smart cooking can help to limit wastage. Redistribution and sharing surplus foods with other consumers can also contribute. Making smart use of unavoidable waste streams, for example by composting or producing animal feed, can recover valuable nutrients to re-use them in the production system. These examples show that the fight against food waste requires new collaborations between food system actors at all levels, from field to fork[37]. Moreover, some of these solutions require a change in regulations around aesthetical standards of agricultural products and the recycling of waste. In emerging economies, where most food waste occurs before it reaches the consumer, better storage facilities, infrastructure and farmer to market connections can reduce food losses.

2.3.3 Vision: Balanced ecosystems

Modern food and agriculture systems are destroying the very ecosystems they depend on. Biodiversity decreases, and soils erode, through intensive production practices, deforestation and widespread use of agrochemicals. Furthermore, expanding monocultural production systems and focusing on a handful of production crops and animals, causes genetic erosion of plant and animal DNA, decreasing diversity and resilience. Additionally, agriculture is a major contributor to GHG emissions, especially livestock, and is highly dependent on fossil fuels.

Modern food and agriculture systems are destroying the very ecosystems they depend on.

Agriculture is also the world's largest user of worldwide freshwater sources. Lastly is the tragic fact that we waste 30% of our annual food production.

There is, undoubtably, an urgent need for change. Triodos Bank envisions this change as the transition towards resilient food and agriculture systems that maintain "Balanced Ecosystems".

Triodos Bank contributes to this transition by supporting:
Initiatives that incorporate sustainable forms of agriculture which develop healthy soils and safeguard biodiversity. Initiatives that use renewable energy sources and actively decrease their fossil fuel consumption. Initiatives that apply circular thinking, creating circular solutions that regionally close material loops and efficiently use earth's resources. Initiatives that fight food waste throughout the value chain. Initiatives that work with nature, rather than against it.

Balanced and resilient ecosystems are vital for human well-being as they provide the food we eat, the water we drink and the environment we live in.

More detailed information about Triodos Bank's vision statements on each individual subject can be found in the vision statements in chapter 4.3.

2.4 Health

The many advancements in agriculture in the past decades have increased food production tremendously, keeping up with a growing world population. Since the 1990s there has been a 50% drop in the proportion of hungry people in the developing world[51]. Although modern food and agriculture systems deliver large enough quantities of food, they fail to provide healthy food for all. Food and nutrition security remain a substantial challenge.

2.4.1 Challenges

The rise of modern food and agriculture systems and increasingly globalised diets has introduced a unique set of challenges. Where diets were once highly dependent on local conditions and production systems, consumers now have access to a ready supply of worldwide food products.

Balanced and resilient ecosystems are vital for human well-being as they provide the food we eat, the water we drink and the environment we live in.

"People are fed by the food industry, which pays no attention to health, and are treated by the health industry, which pays no attention to food."

- Wendell Berry

Furthermore, modern food and agriculture systems have introduced cheap, convenient and tasty food products, which are energy dense and unhealthy. These products have contributed to the worldwide obesity epidemic. Despite increases in food production, chronic and hidden hunger are still widely prevalent, and remain a challenge. Furthermore, expansion of modern food and agriculture systems and its products, replaces traditional foods leading to a loss in food diversity and food culture.

Malnutrition

Food and nutrient security remain substantial challenges, afflicting every nation worldwide and leading to a plethora of health-related issues. Three dimensions of malnutrition and their associated diseases coexist: over 800 million people still suffer from chronic hunger and two billion people are afflicted by the 'hidden hunger' of micronutrient deficiencies, while over 1.9 billion people are overweight or obese[52]. These problems are further complicated by the fact that different forms of malnutrition can occur at the same time in different groups, and sometimes even in the same individuals[53].

Chronic hunger relates to a lack of access to daily required macronutrients (i.e. protein and fats) and is often related to extreme poverty and natural or political disasters, such as drought or conflict. Hidden hunger, as the name implies, presents a difficult challenge as people may have access to enough food, but not nutritious food, resulting in micronutrient deficiencies (lack of vitamins and minerals). Lack of access to nutritious food is often caused by a lack n diversity of food supply, for example in secluded rural areas or urban areas. Furthermore, nutritious food tends to be more expensive and therefore not available to the poorer populations. A growing occurrence is the 'double burden of malnutrition' where an individual can be both overweight and have micronutrient deficiencies, or if a population experiences both overweight and underweight individuals, which is a growing problem in emerging economies.

Overweight is a growing problem worldwide. In many countries, obesity has been dubbed an epidemic and a public health issue. Primarily caused by unhealthy diets consisting out of energy dense and processed food products, containing large amounts of fats, salt and sugar, it is a direct result of modern food and agriculture systems. Widely available, low priced and tasty unhealthy products in combination with uneducated consumers, inaccessibility to healthy food products, and reduced physical mobility, have sparked a global obesity epidemic. Obesity is an important factor in chronic diet related diseases, such as cardiovascular disease, which is currently the number one cause of death worldwide.

Ultra-processed food

The challenge of feeding the world is often framed as: producing enough food for everyone.

However, the notion that this food should also be healthy, safe and nutritious is often not mentioned. Feeding the world can only be achieved by providing food that can supply the body's daily nutritional needs, defined as 'quality food'.

A typical product of our modern food and agriculture systems is 'ultra-processed' food, such as soft drinks and fast food. Food processing is in itself not necessarily negative and is often required for consumption. It can even enhance nutritional value. However, ultra-processed food products have undergone extensive processing steps, extracting and destroying complex nutrients (vitamins and minerals), while adding unhealthy ingredients (salt and sugar). Generally, they are energy-dense, high in unhealthy types of fat, refined starches, sugars and salts, and poor sources of protein, fibres and micronutrients.

Ultra-processed food products are made to be hyper-palatable and attractive, generally have a long shelf life, and can be consumed anywhere, any time. Through industrialised production systems, and because they often require no cooled storage, they are extremely cheap and can be sold anywhere. Additionally, often produced by multinational food companies, they are marketed relentlessly to consumers. Studies show that ultra-processed food products dominate food supply in western economies, while being increasingly prevalent in emerging economies. Furthermore, a visible trend coinciding with the expansion of modern food and agriculture systems is the increase in consumption of highly processed food products at the cost of minimally processed foods and freshly prepared dishes. Studies show that the consumption of ultra-processed food products is directly related to overweight and micronutrient deficiency, as well as other diet related diseases such as cardiovascular disease[54].

Loss of food diversity

Crop diversity has narrowed over the past 50 years, and consequently the composition of the diet at global level has become more uniform at the expense of regionally important crops as shown by a mega-study across 150 countries. This lack of dietary diversity is an additional threat to food security and human health[33]. Major cereals and oil crops (such as maize, soy and palm oil) have gained importance relative to other commodities such as vegetables and fruits[55]. Food and agriculture systems that provide sufficient calories, but not an adequate diversity of essential nutrients compromise nutritional status and health and contribute to malnutrition[56].

Food safety

Modern food and agriculture systems have greatly reduced the number of food-borne illnesses resulting from microbial contamination. Improvements in hygiene and sanitation, combined with new packaging materials, have reduced contamination risks throughout industrial food value chain. However, contamination risks are higher in countries that lack proper safety regulations and control, and where food is produced, processed and consumed without modern infrastructure and machinery. Especially the lack of cooled storage at retail and consumer level elevates the risks[58].

800.000.000

800 million people still suffer from chronic hunger and two billion people are afflicted by the 'hidden hunger' of micronutrient deficiencies, while over 1.9 billion people are overweight or obese

The challenge for future food and agriculture systems is not only about producing food in sufficient quantities. The focus should be on producing food of sufficient quality: food that is nutritious, safe, and healthy.

Furthermore, industrial scale livestock farming contributes to air and water pollution and increases the risk of the spread of diseases and resistant bacteria. Antibiotic resistance, through preventive use in animal husbandry, especially poses a high risk in emerging economies that lack any sort of regulative framework. These are major risks to animals, farmers and public health .

Loss of food culture and traditions

During the 70s, 80s and 90s western consumers slowly lost their intimate connection with food and food preparation, as the supply was increasingly influenced by speed and convenience, fuelled by increasingly global and industrialised food and agriculture systems. This meant that the cultural dimension and traditional knowledge slowly eroded as food became something industrial[59]. Furthermore, the expansion of modern food and agriculture systems saw a decrease in plant and animal diversity as farmers switched to cash crops, abandoned local varieties and adapted intensive production methods[33]. However, these local varieties and traditional farming methods were often better suited to local ecosystems, contained essential traditional knowledge for sustainable food production and defined local food culture.

In conclusion, while modern food and agriculture systems provide sufficient food, they do not provide sufficient nutrition or promote healthy and sustainable diets.

2.4.2 Solutions

Resilient food and agriculture systems can deliver healthy nutrition for all. The challenge for future food and agriculture systems is not only about producing food in sufficient quantities. The focus should be on producing food of sufficient quality: food that is nutritious, safe, and healthy. If possible, food should be produced in regions where it is needed[50]. Parallel to stimulating sustainable production, a shift in consumption patterns and food habits is essential. Current diets and food habits are not compatible with sustainably using global natural resources. Therefore, an integral systems approach is needed that bridges the gaps between agriculture and nutrition, nature and health.

Food quality

As explained above, modern food supply is dominated by ultra-processed, energy dense and unhealthy products that fail to nourish the body. Feeding 10 billion people in 2050 requires effective use of the earth's arable land, through the production of nutritious food that can feed the world population. This means that the percentage of ultra-processed food products in daily diets should decrease in favour of food products that are minimally processed or freshly prepared. In doing so, the ingredients retain their nutritional compounds, especially micronutrients and fibres, and contain less additives commonly associated with ultra-processed foods (salt, sugar and fats).

These additives are major contributors to diet related conditions such as obesity and diabetes, meaning that lower consumption will have positive health effects[60].

However, realising this dietary transition also requires a realignment of the food industry to the needs of the 'healthy' consumer. Food companies will have to develop new products that fit a healthy lifestyle and diet, thereby preventing current food-related health problems and providing for a healthy society.

Providing quality food while putting less strain on earth's resources can be achieved by shifting to sustainable diets, explained in the next paragraph.

Sustainable diets

The concept of sustainable diets recognises that the health of humans cannot be isolated from the health of ecosystems. Sustainable diets are defined by the FAO as:

> *"diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy, while optimizing natural and human resources".*

Sustainable diets should have benefits in multiple domains. However, not all healthy diets are sustainable and not all sustainable diets are healthy. Nor do healthiness or sustainability of foods ensure affordability or cultural acceptability. Although there can be trade-offs between the health of humans and of the planet, there are also synergies. Those should be highlighted in the shift towards sustainable diets. In general, sustainable diets are 1) largely plant-based, and 2) diverse.

1) Plant-based

Feeding the world with organic farming, or with conventional farming will be impossible without rebalancing the proportion of animal-sourced foods in our diets and reducing food waste[63]. A 2017 study shows that only under these conditions, can agriculture based on organic principles provide sufficient food while improving both environmental and health impacts[61]. Transitioning towards more plant-based diets has dual environmental and health benefits. Lowering the amount of meat and other animal-sourced foods (e.g. dairy and eggs) in diets reduces pressure on land and water use, greenhouse gas emissions and pollution. Moreover, shifting western diets towards largely plant-based would result in reduced risk of diet-related chronic diseases, such as cardiovascular disease[62].

Europeans on average consume 104g protein per day which is sourced from plants and animals in roughly a 2:3 ratio (43.4g plant protein and 60.5g animal protein)[63]. With an average recommended intake of around 60g of protein per day[64], the protein transition

Feeding the world with organic farming, or with conventional farming will be impossible without rebalancing the proportion of animal-sourced foods in our diets and reducing food waste.

in Europe is not only about shifting to other protein sources, but also about reducing total protein intake.

Shifting to more a plant-based diet requires that alternative protein sources are available, culturally acceptable and affordable. For example, meat and dairy substitutes based on grains and/or legumes (e.g. beans, peas, lentils) can familiarise people with alternatives and ease a dietary shift. Novel protein sources with a low environmental impact are another option. Edible insects, for example, can be nutritious alternatives to meat. Although they are a traditional food in many cultures, wide-spread consumer acceptance, primarily in western economies, needs to be established to adopt this new protein source in daily diets.

Changing diets will require not only that alternatives are available, but also that consumers have the knowledge and skills required to adopt a healthy and sustainable diet. It is important, for example, to safeguard the intake of essential micronutrients such as zinc, iron, and vitamins A, D, and B12, which naturally occur in animal-sourced foods.

Of course, changes in consumption must be in line with changes in production and vice versa. The goal of the protein transition is, after all, downsizing global livestock production to gain environmental and health benefits. At the same time, production of alternatives must be increased. This includes increasing the production of legumes which, besides being an alternative protein source, can bring biologically fixed nitrogen into farming systems which can replace nitrogen fertiliser.

There is a role for animals in agroecosystems delivering sustainable diets. Integrating crops and livestock is important for nutrient recycling on farms or within regions. In a redesigned circular system, animal feed does not have to compete with human food for land and other resources. Animals can be fed with co-products of (plant-based) food production, food waste, waste-fed insects, and grass from land unsuitable for growing crops . In this model, one-third of recommended protein intake can be sustainably sourced from livestock (i.e. 21g, much less than in current western diets).

2) Diverse

With a diverse diet being at the core of a healthy diet, food and agriculture systems require diversified production systems. Agricultural biodiversity is necessary to sustain the key functions in farming systems[66]. Moreover, it has the potential to contribute to food and nutrition security by providing a rich source of nutrients and reducing vulnerability to shocks[30]. Species diversity has also been shown to stimulate productivity, stability, ecosystem services, and resilience in natural and in agricultural ecosystems[67].

Rather than a uniform diet based on a limited number of staple crops, such as wheat and maize, food and agriculture systems should deliver diversified foods. Diversifying diets can reduce micronutrient deficiencies by providing nutrient-rich foods such as vegetables and fruits, legumes, and some animal-sourced foods, including fish[35]. Especially in emerging economies increasing the quantity, quality, and diversity of foods in diets is needed to improve nutrition. In western economies, a higher proportional intake of diverse plant-based foods would improve the health of many people as well.

"Eat food. Mostly plants. Not too much."

- Michael Pollan

Rather than a uniform diet based on a limited number of staple crops, such as wheat and maize, food and agriculture systems should deliver diversified foods.

At the same time, promoting diets with limited intake of processed foods and drinks that contain high levels of fats, sugars, and salt reduces the risk of over-nutrition and its associated diseases. Promoting diversity in diets may include reintroducing local traditional foods and varieties as well as introducing novel nutritious foods such as seaweed.

Local and seasonal diets

Local diets reduce the need for transportation and can have a positive ecological effect, if produced sustainably. Additionally, local consumption supports the preservation of traditional food and agriculture systems and food culture. Producing and consuming locally strengthens regional markets, especially in emerging economies. In western economies local consumption reconnects farmers with consumers, increasing awareness. Farmers may receive fair prices for their products that reflect the costs of sustainable production practises and other services, such as landscape management. Because consumers actively interact with their surroundings, which provides their diet, there is a sense of responsibility, as consumption directly impacts local landscape. If, together with consuming local, seasonal availability would also be considered, the need for cooled storage and transportation could further be decreased. However, this transition does require an aware and responsible consumer that makes conscious food acquisition choices.

2.4.3 Vision: Healthy society

Modern food and agriculture systems have significantly decreased hunger and realised unparalleled production growth. However, food and nutrient security remains a problem. Hundreds of millions still suffer from chronic hunger, and even more from 'hidden hunger' of micronutrient deficiencies. Simultaneously, overweight is an ever-growing problem, worsened by an advancing western diet of unhealthy, processed food products and decreasing diversity and nutritional value. In some cases, both forms of malnutrition can exist in a population or even in the same person. All the while rapid worldwide expansion of the modern food system causes the loss of local food cultures, traditional food types, and invaluable knowledge present in traditional farming systems.

There is, undoubtably, an urgent need for change. Triodos Bank envisions this change as the transition towards food and agriculture systems that provide healthy and nutritious food for all and shift towards sustainable diets, thereby working towards a "Healthy Society".

Triodos Bank contributes to this transition by supporting:
Initiatives that work towards a healthy society by improving food security and safety for all, eradicating all forms of malnutrition. Initiatives that provide and promote sustainable and diverse diets, decreasing meat and increasing plant-based protein consumption. Initiatives that provide local and seasonal products to consumers, preserving food culture and traditional production systems. Initiatives that actively try to spread awareness,

contributing to responsible and conscious consumers. A transition towards sustainable diets that nourish the body is necessary to provide nutrition for the growing world population and support a healthy and resilient society.

More information about Triodos Bank's vision statements on each individual subject can be found in chapter 4.3.

2.5 Prosperity

Modern food and agriculture systems realised unparallel production growth, gave rise to large and powerful transnational corporations, and created a sector worth billions. Unfortunately, this wealth ends up in the pockets of a select few, with those at the bottom of the food chain struggling to generate an income.

2.5.1 Challenges

While farmers are key in safeguarding natural systems and producing healthy food, they receive a disproportionately small share of the prosperity generated in our food and agriculture systems. In emerging as well as western economies farmers struggle to cover their production costs and generate a living income. Sustainable food and agriculture systems ensures a livelihood for farmers and equitable access to seeds, land, water etc. The current reality unfortunately is different.

Concentration of power
Market consolidation through mergers and acquisitions, part of the growth strategy for agrofood companies, has been a consistent trend accompanying the rise of modern food and agriculture systems and can be seen in figure 5.

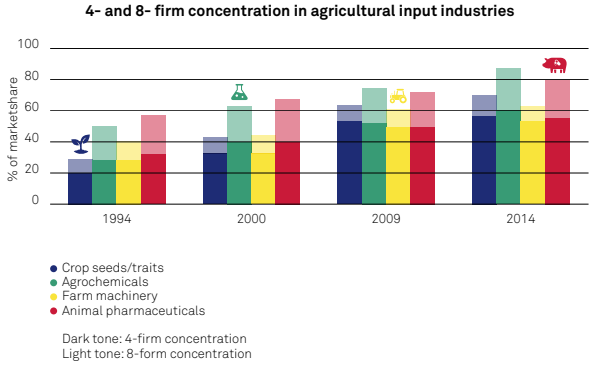


Figure 5: IPES Food (2017). Too big to feed.

Especially in recent years, so-called 'megamergers' provided multinational firms with unparalleled power. The recent megamergers in the agrochemical sector for example (Dow and DuPont USD 130 billion, Bayer and Monsanto USD 66 billion, ChemChina and Syngenta USD 43 billion), will place 70% of the industry in the hands of three merged companies. The same trend is visible in all agrifood sectors, emphasising the severity of the problem[68].

This has placed the power in the hands of corporations who profit from, and maintain, unsustainable food and agriculture systems. These are systems with globalised supply chains, producing low priced and convenient food products, exploiting those producing and processing the products and do not account for environmental damages. Farmers are ever more reliant on a handful of suppliers and buyers, squeezing their incomes, and eroding their ability to choose what to grow and for whom. Patents regarding genetic material as well as the control of farm inputs by a handful of companies, has decreased farm sovereignty.

In emerging as well as western economies farmers struggle to cover their production costs and generate a living income.

Farmers are ever more reliant on a handful of suppliers and buyers, squeezing their incomes, and eroding their ability to choose what to grow and for whom.

Furthermore, although multinational corporations make high R&D investments, the scope of innovation is narrow and focused on their own gain. This had led to excess knowledge of certain crops, animals and production systems, but left smallholder farmers working with traditional species out of the equation[79].

What these companies do bring the (primarily) western consumer is an exceptional inventory of products and luxury items originating from all over the world, for low prices. This expansion of trade has resulted in the luxury tastes of the richest part of the world being allowed to compete against meeting the basic needs of the poor[69]. Ultimately, this creates a highly worrying competition for the natural resources needed for food production, particularly land. In this system, only a fraction of the prosperity generated in the international market, predominantly by western players, is returned to where the resources originate from.

Smallholder farmers

Worldwide, 500 million smallholder families (farming on less than 2 hectares) in emerging economies depend on agriculture for their subsistence and income. More than 2 billion people depend on smallholder agriculture for their livelihoods[70]. While these farmers produce 70% of the world's food, they also represent the poorest and hungriest people in the world[71]. Hence, there is an important role for smallholder farmers in emerging economies in sustainable food and agriculture systems. Many of them are left behind though, because they lack the resources to improve efficiency, income and resilience of their businesses and communities. Many smallholders are therefore stuck in poverty traps, as they are unable to benefit from development in urban areas and agricultural innovations due to limited access to land rights, markets, financial resources, education, and good infrastructure[72]. Moreover, many smallholders' soils are in poor condition. Continuously producing crops without sufficiently bringing nutrients and organic matter into the soil further degrades the land14. As soils become less responsive to inputs of labour and fertilisers, producing sufficient yields is a huge challenge. With the lack of capital to invest in developing productive soils, these farmers are further trapped in poverty.

The exploitation of smallholder farmers and the ecosystems they produce in, enables the supply of cheap raw materials to produce food products for western markets. For example: Ghana and Ivory Coast are together responsible for 60% of the worlds cocoa output but receive only 6% of the product's global market value. Furthermore, cocoa is a slash and burn crop which means that production contributes to rapid deforestation, to the point where 90% of West Africa's original forests are gone. All the while, the multinationals profiting the most from the cocoa trade have not succeeded in paying a living income, introducing better production techniques or eradicating child labour, in the favour of a cheap cocoa supply[73].

While the total number of farms in the global north is dropping, the age of farmers rises. In 2013, only 21% of European farmers were under the age of 45, and about a third were over 65.

Where land is scarce, population pressure leads to a decrease in farm size, threatening farm viability. Furthermore, rural-to-urban migration accelerates as a future in agriculture is unattractive for many young people. Farming involves hard physical work for a low income and offers few opportunities for improvement[74]. Rural labour, on which smallholder systems are highly dependent, is vanishing with this urbanisation trend.

These challenges make it difficult for smallholders to meet private standards and participate in global agrifood supply chains[75]. Due to a disbalance in power in these supply chains, with large multinationals buying from smallholder farmers, they don't receive fair payment considering the time invested and inherent risks taken. Gender inequalities further cause social exclusion. Female smallholder farmers typically face more challenges than male farmers while they have the potential to greatly contribute to combating food insecurity[76]. Women, especially in emerging economies, are primarily responsible for food preparation and diets in a household. This means that educating women on better preparation techniques and healthy diets would logically benefit the entire household.

Environmental and social changes resulting in extreme weather events and food price spikes are major risks in these vulnerable areas and can have a big impact on people's livelihoods. With increased globalisation, emerging economies suffer from western economies dumping cheap and often subsidised foods in these regions. Furthermore, in providing raw materials for western markets some countries are unable to provide for their own population. The dependence of emerging economies on food imports is dangerous, as illustrated by the 2008 food price spike that saw many, especially African, countries without a stable food supply.

Investing in smallholder agriculture is essential to move communities out of subsistence farming. Trapped in poverty, however, there are limited opportunities to invest in the environmentally sustainable practices that are needed to safeguard the ecosystems vital for human wellbeing. Social justice and environmental sustainability can only be achieved together[77]. They are closely linked and depend on each other.

Industrialised farmers

Rural livelihoods and culture are also increasingly under pressure in western economies. In general, income in agriculture is lower than in other economic sectors due to power imbalances and continuous pressure on food prices. In 2017, the income of European farmers was only 46.5% compared to average wages in the EU economy[78].

Because of increasing economic pressure and sunken investments, many farmers choose for scale enlargement and intensification[79]. Other farms decrease in size or disappear. There is limited space for farmers to switch to an alternative business model. Increasing land prices are part of the problem.

In the Netherlands, the average price of agricultural land has doubled in the last decade, while farmers' incomes have stayed the same[80].
This means that farmers can hardly cover the costs related to the land they work with. Moreover, farmers report that overregulation inhibits their opportunities for entrepreneurship and innovation[81]. These trends, amongst others, keep an agricultural business model in place that is aimed at producing large quantities of cheap food[82].

Moreover, finding successors has become more difficult. While the total number of farms in the global north is dropping, the age of farmers rises. In 2013, only 21% of European farmers were under the age of 45, and about a third were over 65[83]. This raises concerns about the future of agriculture; who will be the next generation of farmers to supply our food and deal with the increasingly complex challenges of farming?

In conclusion, addressing issues of social exclusion, power imbalances, and viable business models is no light task and real transformation is needed.

2.5.2 Solutions

Farmers should receive a fair share of the prosperity that food and agriculture systems generate. A better and more stable income is essential for improving livelihoods in rural areas, releasing farmers from poverty traps and unviable business models. Moreover, this can create more opportunities to invest in environmentally sustainable practices that can improve the resilience and environmental impact of farming systems.

Providing access to...
Although agriculture is still a leading source of employment and income in emerging economies, it is an under-invested sector. Improving social and economic resilience of smallholder farmers in emerging economies requires a wide range of solutions for which investments are needed. Increasing productivity of farms requires improvements in research and extension services tailored to the needs of farmers, better access to inputs, technologies, credit and insurance, and access to local and international markets and to secure tenure of land[41]. Local food and agriculture systems can be rebuilt through appropriate investments in infrastructure, processing and packaging facilities, distribution channels, and by allowing smallholders to organise themselves in ways that yield economies of scale and allow them to move towards higher-value activities in the food supply chain. Agricultural improvements, together with rural development could reduce rural poverty, and slow down rural-to-urban migration[80]. Moreover, building equitable food and agriculture systems requires improvements in gender equality and education, and ensuring labour rights[84] as well as land rights.

Technologies should be tailored to the needs of farmers and offer opportunities to improve smallholders' market position and farm management. Smartphone applications, for example, can enable individual smallholders to gain market knowledge and to interact better with traders and each other. This can make them more independent by improving their pricing and negotiation power and can increase their adaptability to price volatility and other shocks[85].

In conclusion, addressing issues of social exclusion, power imbalances, and viable business models is no light task and real transformation is needed.

Other applications can help farmers gain knowledge about agroecological factors on their farms such as soil or weather and help them manage their farms accordingly.

Fair and transparent value chains

There is a growing movement calling for the implementation of inclusive business models and inclusive value-chain development[86]. Besides investments for building local capacity to respond to challenges and opportunities, action is also required on the side of buyers and retailers to engage more effectively with their producers[87]. Improving the performance of agricultural value chains as a whole can benefit large numbers of people. This requires collaboration between various stakeholders to find mutually beneficial pathways for development that can establish equitable redistribution of prosperity in the value chain. Examples include forming farmer cooperatives and investing in technologies that can improve productivity, quality and shelf life of products.

Farm entrepreneurship

In western economies, there is an over-investment in agriculture based on intensification and high production, which keeps prices low and unsustainable business models in place. To move to more resilient food and agriculture systems strategies such as adding value to products, diversifying production or broadening farm income should receive more attention. One example of such a strategy is multifunctional agriculture, where alternative on-farm activities such as healthcare, childcare and agritourism are a way to improve farm income while reconnecting with society[88]. Another strategy is to produce for niche markets where a farmer receives value for quality rather than for quantity. Transitioning to such business models will require support for accessing the required capital, knowledge and social networks.

To ensure that there will be a future farming population that can deal with the challenges of this century, young and new farmers need support to start and run their businesses. Generational renewal is not only about lowering average age of farmers but requires the empowerment of an entire new generation of farmers to farm for the future. Young European farmers report that what they need most is financial support (subsidies), access to credit and sufficient qualified labour[89]. Other barriers to be overcome are high land prices and unfair competition from global markets[90].

Besides diversifying production practises and the need for generational renewal, farmers should be acknowledged, preferable financially, for the 'common goods' delivered by agriculture. Common goods are services provided by agriculture that society enjoys, such as clean water, fertile soils, landscapes and tourism. Additionally, financially compensating farmers for their societal roles, will give them incentive to expand these practises, which also aids the connection between farmers and society.

2.5.3 Vision; Inclusive prosperity

An increasingly globalised food system, controlled by powerful actors through continued consolidation, has led to a disproportionate disposition of prosperity under its actors. Farmers, in both western and emerging economies, struggle to cover their production costs and generate an income. The focus on cheap, uniform consumer goods has led to intensification and up-scaling of industrial farms in western economies, neglecting environmental impacts and driving a wedge between consumers and producers. Furthermore, the large upfront investment costs make it difficult for farmers to change. In emerging economies, smallholder farmers produce 70% of the world's food but also represent the poorest people in the world, lacking the resources for improvements.

There is, undoubtably, an urgent need for change. Triodos Bank envisions this change as the transition towards food and agriculture systems in which farmers are paid for the ecosystem services they deliver and all parties in the food value chain receive a proper proportion of the prosperity generated, based on transparency as well as fair power balances, thereby ensuring "Inclusive Prosperity".

Triodos Bank contributes to this transition by supporting:
Initiatives that engage in fair and transparent business practices that ensure fair disposition of prosperity throughout food value chains and rural to urban areas. Initiatives that build resilient communities and strengthen local markets, by providing access to assets, finance, education and technology. Initiatives that ensure sustainable livelihoods, where every individual may live a socially, culturally and economically stable life. Initiatives that improve equally between genders, ethnicities, etc, but also provide equal socio-economic rights for all those working in food and agriculture systems.

Fair disposition of prosperity and equal socio-economic rights within food value chains is essential to create inclusive food and agriculture systems that build resilient communities and provide sustainable livelihoods.

More information about Triodos' statements on each individual subject can be found in chapter 4.3.

Fair disposition of prosperity and equal socio-economic rights within food value chains is essential to create inclusive food and agriculture systems that build resilient communities and provide sustainable livelihoods.

3 Systemic change

Transitioning towards socially and ecologically resilient food and agriculture systems where prosperity is distributed fairly, requires a systemic change. In this process the paradigms and structures on which a system is build are changed, thereby changing the system's output in its entirety. Focusing only on certain outcomes of a system, and not respecting the simple truth that everything is connected, will not create large-scale improvement, but only lower the negative outcomes of a single element. For example, tackling soil degradation by lowering agrochemical inputs is an improvement, but does not address the root cause which is intensive monocultural production systems fuelled by a demand for cheap and abundant food. However, in realising systemic change, we first need to discuss the root causes behind the negative outcomes of the modern food and agriculture system.

3.1 Root causes

The vicious cycles that trap rural people in poverty and create environmental and health problems need to be broken and transformed into virtuous cycles where food and agriculture systems contribute to the health and prosperity of people and the planet. While acknowledging the severity and urgency of the negative outcomes (the symptoms and challenges of our malfunctioning food and agriculture systems as described in chapter 2), we believe that identifying and tackling root causes is necessary to achieve real impact. There are several lock-ins: the underlying structures, mechanisms, and mind-sets keeping unsustainable food and agriculture systems in place. Identifying the root causes and addressing these lock-ins can provide entry points for positive change.

In this chapter, we explore how the design of our food and agriculture systems, the connections between actors, and the attribution and distribution of value need to be addressed to leverage change.

3.1.1 Unbalanced design; concentration of power

Transnational corporations have been central actors in the development of an increasingly globalised food system, with heavily consolidated markets[91]. Concentration of power is therefore one often-recognised lock-in[2, 26, 30]. For example, over 70% of the global grain market is controlled by four of the largest commodity trading firms[92]. Similarly, a small number of companies control a substantial part of the market for agricultural inputs, such as fertilisers, pesticides and seeds. Retail is another node in the food chain dominated by a limited number of players[2]. In this globalised agrifood system, the focus has been more on the production of tradable commodities than on food, which has led to the promotion of intensive, uniform production systems and the marginalisation of local, more traditional food and agriculture systems[93]. Dominant actors have the ability to influence the rules that govern our food and agriculture systems and have the pricing power to improve their margins at the cost of their suppliers, for instance smallholder farmers[51]. Decision-making by farmers can be greatly constrained by large agribusinesses with monopolies on agricultural inputs and standards that demand unblemished uniformity of agricultural products.

If used responsibly, the concentration of power in a small number of organisations can significantly leverage positive change. However, power concentration often leads to other lock-ins.

Over 70% of the global grain market is controlled by four of the largest commodity trading firms.

Dominant institutions develop path-dependencies and technological lock-ins through processes of optimisation and incremental innovation[94]. The private sector, being the main financial contributor to research and development, decides which direction is taken; a direction often favouring personal gain. These are unavoidable results of sunk investments and benefits of scale. Over time, however, this creates tensions and problems in the regime that limit the ability to change beyond optimisation.

3.1.2 Disconnect; distance, both physical and social

The disconnect between food production, nature, and society is at the heart of many of the negative outcomes that our food and agriculture systems generate for the environment, our health, and livelihoods worldwide[30]. Distance, both physical and social, between food production and consumption is both an outcome as well as a driver of a corporate-dominated modern food system. Modern food and agriculture systems are characterised by far-reaching specialisation, and consequently, separation and alienation between links in the food chain. With far-reaching specialisation where nobody has an overview of the chain as a whole, a system of 'organised irresponsibility' has been created[30]. This limits the opportunity to make the chain sustainable beyond its separate parts. Moreover, it can create dependency between specialised partners in the chain and therefore limit manoeuvring space for change.

In 2016 over half of the world population lived in cities[95], while worldwide, the number of farmers is still in decline[96]. Urbanisation widens the gap between producers and consumers. In a globalised food system, this distance increases more and more. For many consumers the negative impacts of food production are far out of sight and therefore out of mind. Global trade makes it possible to outsource these impacts to other parts in the world. With more intermediaries between farmers and consumers, and a decreasing knowledge about the origin of food and the way it is produced, making responsible food choices has become more difficult for consumers. Moreover, there is a discrepancy between consumers' sustainable attitudes and actual behaviour in the marketplace[97]. Nevertheless, a dominant ideology of "individual responsibility" puts the choice for sustainability on the plates of consumers and individual entrepreneurs[30].

Certification schemes and labels on food products can create transparency and guide consumers towards healthier and more sustainable consumption. However, usually only those already committed to responsible consumption are effectively stimulated this way. This suggests that other social incentives are more likely to guide consumer behaviour towards healthier and more sustainable patterns on a larger scale.

Distance, both physical and social, between food production and consumption is both an outcome as well as a driver of a corporate-dominated modern food system.

"What is wasted by society is the direct and opposite expression of what is valued."

- Carolyn Steel

3.1.3 Devaluation; externalising hidden costs

A productivism paradigm has dominated the design of food and agriculture systems for decades. Agriculture is still largely focused on providing large quantities of cheap food[48]. This narrow focus on increasing production has a negative impact on the environmental, health and social outcomes of our food and agriculture systems. Moreover, the growing price gap between healthy and unhealthy products supports the association between poverty and obesity[98].

In emerging economies, many people with low incomes depend on low-priced imported foods from western economies. They spend a large proportion of their household income on food (e.g. 40.9% in Pakistan and 56.4% in Nigeria)[99]. In effect, volatility of food prices threatens food security and social stability. Moreover, increased dumping of cheap, often subsidised western foods on local markets of emerging economies undermines sustainable development of local agriculture, as farmers cannot compete with the low prices[53]. In turn, this makes these countries even more dependent on these imports. In addition, these imports introduce the western diet to these places, accompanied with its associated health problems.

Consumers in western economies have become accustomed to the abundance of cheap, convenient foods. The more developed a country is, the smaller the percentage of household income it spends on food (e.g. only 6.4% in the US and 8.2% in the UK[60]). The external costs of producing this food and dealing with environmental damage and the health costs associated with modern dietary patterns are barely, if at all, included in the price. The UK food system, for example, generates an estimated GDP1 hidden costs for every GDP1 spent on food in shops, adding up to a total of GDP120 billion passed on to society every year in the UK alone. Half of these costs accounts for environmental damage caused by intensive production methods, and over one-third accounts for healthcare costs linked to unhealthy diets[100]. Moreover, farmers report that the low prices paid for their products by retailers and consumers is keeping them locked-in in unsustainable and unviable business models[47].

Devaluation of food is furthermore seen as part of the explanation for food waste on consumer level[101]. Environmental and social damage inevitably result from a race to the bottom between large players and consumers' expectation of cheap food.

3.1.4 Neoliberal environment; the root cause of the root causes

The ideology of neo-liberalism, in which free trade and free markets dominate at the cost of public services and public good, has been prevalent in western economies for decades and has shaped our world of today. In food and agriculture systems, it has also been a driving force behind the design of the modern system. The pure economic rationale has resulted in power concentration and a lack of attention for common goods and topics such as a healthy society and fair distribution of prosperity.

The pure economic rationale has resulted in power concentration and a lack of attention for common goods and topics such as a healthy society and fair distribution of prosperity.

It has caused a shift from state to private food governance with the unintended outcome of a disbalance and vulnerability in all aspects of our food and agriculture systems.

3.2. Transition

The need for change is no longer questioned. However, the focus of policies and programmes has been too much on reducing unsustainability through improving current systems and addressing the symptoms, rather than tackling the underlying root causes[54]. This is not enough as it does not truly tackle the issues at hand. A systems approach is necessary to implement principles of health, ecology, fairness and care in food and agriculture systems.

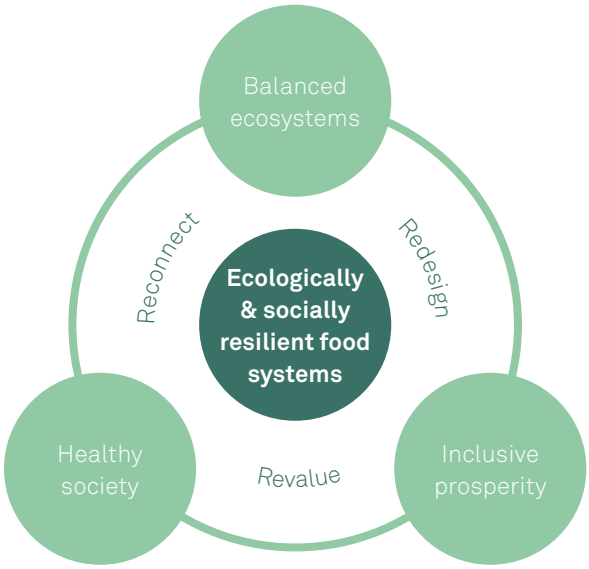
The momentum for systemic change is building. The challenges of food and agriculture systems are high on the agenda, on both global and local levels. It is increasingly recognised that systemic transformation requires economic, socio-cultural and institutional changes that reinforce each other. There are many bridges to be built from now towards a future with balanced natural systems, healthy societies and inclusive prosperity.

In order to build these bridges and translate these long-term goals into short-term practices several actions have to be taken which aim to tackle root causes and steer away from lock-ins. A redesign of food and agriculture systems is needed.

Furthermore, a reconnect between actors and goals in these systems has to be established. Finally, we should revalue food and agriculture systems and the natural resources they depend on and account for the environmental, health, and social impacts[102]. This will require participation by all actors involved in food and agriculture systems (e.g. farmers, businesses, government, science, civil society). Therefore, Triodos Bank calls for a societal agreement on how to achieve the transition to ecologically and socially resilient food and agriculture systems.

3.2.1 Redesign

Paradigms are the sources of systems and therefore high-level entry points for transformation[103]. The belief that the wellbeing of people and nature are inextricably connected, with food and agriculture systems as a key example, should be at the core of a fundamental redesign. Our current food and agriculture systems have essential design failures, as described in chapter 2. Hence, we need alternative models that challenge dominant paradigms, such as the belief that natural resources are infinite. We need alternative viable solutions to the dominant model.



Deviant approaches to food and agriculture that compete with the dominant regime typically develop in so-called niches. Niche activity has the ability to spur changes and shifts in power in the dominant regime[104]. The development from Organic 1.0 to Organic 2.0 was a good example of this. A growing dissatisfaction with powerful transnational corporations that continue business-as-usual practices and are unable to break out of lock-ins has led to the emergence of numerous grassroots movements and innovative businesses. These actors challenge the rules that govern our food and agriculture systems and foster innovations that dare to go beyond optimisation and incremental change. As change agents, they can play an important role in promoting farming based on ecological principles, providing healthy and sustainable diets, and distributing prosperity fairly. Many of these change agents and movements strive to reach the same goals as the organic movement but may fall outside the framework of the certification schemes of Organic 2.0. Inclusiveness through building alliances with a diverse range of actors with the same principles and complementary approaches is part of the updated framework of Organic 3.0[68].

Transitions can be defined as processes of innovation (i.e. technological, social, and institutional). Accelerating and anchoring innovation is typically most effective through a combination of bottom-up action and top-down activity[50]. This requires government and science policies that advocate collaboration between different stake-holders. This can include innovation platforms, farmer-driven experimentation and publicly funded research, farmer and consumer education, advisory services and food communities etc. Governments at all levels can actively subsidise promising activities and help to create a level playing field for these activities by setting rules or changing legislation.

However, promoting the development of disruptive innovations and creating learning environments is not enough. A thorough redesign of our food and farming systems requires strong leadership: clear governmental policy is required. Solving sustainability issues cannot be left to self-regulation of businesses and other actors alone. Regulation and effective monitoring of compliance are indispensable[105]. Policy instruments may involve so-called carrots, sticks and sermons (i.e. economic incentives, regulation, and information and inspiration). The uptake of organic practices in conventional systems such as enhancing soil fertility with crop diversity and rotation, green manure, organic fertilisers etc., should be promoted and rewarded. Governments not only have a role in enforcing compliance to minimum requirements but should also facilitate continuous improvement[68]. Innovation should be facilitated for example through guarantee schemes. This requires continuous dialogue and strategy development in cooperation with the sector.

The upcoming revision of the European Union's Common Agricultural Policy (CAP) is an important moment for a fundamental redesign of the agricultural and trade framework. In addition to the CAP, the EU trade policy, competition regulation and national policies can play an important role in redesigning food and agriculture systems.

Sectors and actors within food and agriculture systems need to reconnect and cooperate better to share responsibility and avoid blind spots in decisionmaking.

The transition to sustainable and inclusive food and agriculture systems should be at the heart of the CAP at EU level. The CAP should enhance the transition of agricultural land to organic and make conventional agriculture sustainable.

Today, the largest part of the CAP budget is spent on income support for farmers. In the new CAP these subsidies should be increasingly based on principles of organic farming, creating incentives for farmers to adopt sustainable agricultural practices. This can be done by raising legal requirements and industry norms to rule-out particularly unsustainable practices. Furthermore, income support should be maximised per farm, ensuring that a greater share will be available for small and medium size farmers. The position of these farmers can also be strengthened by redesign of the EU's competition regulation. As underlying party in the food chain, small and medium size farmers in particular feel the impact of pressure on prices.

Another important element of the redesign of the CAP is to rebalance ecological capacities and the impact of cattle breeding. In our opinion, it is unavoidable that the size of the herd in EU countries should be reduced. Land-based animal husbandry on the basis of organic principles should become the basis of EU and national regulation. This will also impact the EU's trade policy. Reform of the current free trade-regime can support closing of cycles in the food and agricultural markets. Application of true price principles could lead to reduction of large scale imports of animal feed like soy.

As ecological processes are not restricted by the borders of farms, area planning should be part of national policies and the CAP. The focus should not only be on making farms more sustainable, but on how to make the landscape as a whole more sustainable. In order to redesign food and agriculture systems, the CAP should not focus on agriculture only. To foster real change, the CAP should take a more systemic approach and broaden its reach to food systems as well. This will make it possible to address the bigger issue of power concentration within food and agriculture systems and enhance the need to transition to more local, plant-based, and diverse diets.

Businesses should naturally take their own responsibilities; they should produce food in a responsible and sustainable manner. Financial institutions must play a significant role by innovating their investment criteria, pricing models, investment horizons and their reporting. Their criteria and investment decisions should encourage long-term and holistic strategies as well as sustainable innovation both by mature businesses and early-stage companies.

The pathway towards a desired sustainable future with resilient food and farming systems is an uncertain one and will be a process that is complex, disruptive and non-linear by nature[54]. Processes of learning-by-doing and doing-by-learning are the only way to transform dominant regimes and steer away from lock-ins[106].

This means that decision-makers need to find a balance between pragmatism and ideology, short and long-term goals, certainty and risk, and control and creativity[107]. This will create a diversity of solutions and organisational models.

Moreover, experimentation is essential in the design of farming systems. Finding innovative solutions to global problems may therefore require the ability to transcend paradigms[95]. That means staying flexible and non-exclusive in the process of transition and being aware of other and possibly contradicting paradigms and what they have to offer. This acknowledges that the challenges in food and agriculture systems cannot be answered by universal solutions, but always need to be addressed in a place-based manner within the global context. Rather than sets of rules and practices, principles should guide local solutions towards global challenges. The basic organic principles of health, ecology, fairness and care can be a starting point.

3.2.2 Reconnect

To find synergies between environmental, health, and social goals we need to step beyond far-reaching specialisation in our food and farming systems. This has caused less transparency in value chains resulting in "organised irresponsibility". Sectors and actors within food and agriculture systems need to reconnect and cooperate better to share responsibility and avoid blind spots in decision-making. Integral systems-based solutions such as sustainable diets also require non-fragmented thinking. What helps is when all actors, from producers to consumers, are better connected to nature and the impacts their actions have on the environment. Proactively building alliances between actors, sectors, and movements is key. Joining forces between farmers and nature conservation organisations, nutritionists and agronomists, urban planners and healthcare workers, are just some examples. It is increasingly recognised that the boundary-spanning nature of governing food and agriculture systems calls for more holistic food governance with better integrated food-based strategies[108]. Governments should consider initiating, facilitating and bringing about social transition agreements with the participation of stakeholders in the food and agricultural sector.

Moreover, establishing more sustainable production in sync with increased sustainable consumption calls for a closer connection between producers and consumers, especially in western economies. The most straightforward way to achieve this is for consumers and producers to engage in more direct relationships with each other. Short and more local food supply chains can bring consumers closer to local farmers. In recent years, new forms of consumer-producer cooperation in local food networks have emerged in which consumers go beyond their role as food procurers[109]. Examples are farmers' markets and box schemes which can promote sustainable consumption by increasing awareness and knowledge about (local) food

The pathway towards a desired sustainable future with resilient food and farming systems is an uncertain one and will be a process that is complex, disruptive and non-linear by nature.

production and reskilling of consumers[101]. Other examples where consumers even become 'co-producers' include community-supported agriculture (CSA) and collective urban gardening initiatives. High levels of consumer trust and transparency are established through personal relationships, rather than through third-party certification. Although many forces are at work in food and agriculture systems, these examples of alternative, local, and civic food networks show that civil society's agency for driving change is growing. Moreover, they are starting points for innovation with urban consumers and cities as drivers, thereby reversing traditional rural-urban relations.

Citizens can vote daily with their wallets. (Re)gaining consumer trust requires businesses to take the responsibility of being transparent about their value chain footprints and provide clear nutritional information. Financial institutions should also be clear about their important balancing role of using savings money for investments in the real economy. They should be transparent about their investment policies and what they aim to achieve with their activities for society at large.

Increasing knowledge (e.g. about nutrition and food production) and improving food skills (e.g. meal planning and cooking) of consumers can strongly influence their food-related behaviours and attitudes[110]. Therefore, food education for children and adolescents is increasingly promoted as a pathway to improve healthy and sustainable consumption and to reconnect citizens with food and agriculture systems[111, 112].

Governments can contribute by adapting their public food procurement decisions. The Dutch government alone procures circa EUR 60 billion per annum from over 70,000 suppliers, some of which are food suppliers. If citizens were served healthy and sustainable meals at public places such as schools and hospitals, they would become familiar with the importance of sustainable diets.

Nevertheless, healthy and sustainable consumption cannot be based exclusively on individual choices and personal responsibility of farmers and consumers. We also need personal responsibility and willpower on part of policy makers[113]. Rules and controls need to be established aimed at those who fuelled a disconnect in the first place, such as the multinational corporations enabling the globalised food system. At the same time, initiatives that by-pass the conventional regime by creating new networks and business models deserve more governmental support.

3.2.3 Revalue

Finally, we all need to revalue natural systems, our food, and the people who produce it, culturally, as well as financially. In resilient food and agriculture systems, benefits and burdens of these systems are equitably distributed.

Personal and cultural values influence choices made by members of a society but are not easily changed. Increasing knowledge and awareness and reconnecting food system actors may be a first step to change the cultural values around food and nature, as described above.

Prices can, in a more tangible manner, reflect the value society attributes to food. Food prices should reflect the value that we attach to landscapes, natural resources, culture and fair business practices, at least by covering the societal costs inflicted by production and consumption. Currently, damage to the environment, health and society are paid through taxes imposed on citizens while actors in the value chain don't take responsibility for these costs. Sustainable practices are not rewarded. Externalities stemming from unsustainable production and consumption need to be corrected for a transition towards more sustainable food and agriculture systems. Hence, tools must be developed to internalize these costs[114]. True pricing is the monetary valuation of social and environmental externalities[115]. Firstly, internalisation helps to make these hidden costs for society visible and identifies

Externalities stemming from unsustainable production and consumption need to be corrected for a transition towards more sustainable food and agriculture systems.

where positive impact can be made. Moreover, this increased transparency can stimulate market forces and turn consumers towards more sustainable practices. Interest and research around true pricing is growing. One example is the hidden costs in the UK food system, with an estimated GBP1 hidden cost for every GBP1 spent on food in shops[99]. This emphasises not only the negative (and positive) consequences of the way we eat, but also the interconnectedness of balanced ecosystems, healthy society and inclusive prosperity.

Businesses should take responsibility and embrace the true pricing system of "internalising externalities". This will force them to value natural systems, a healthy society and fair market practice, because it will directly impact their competitive position. Financial institutions can thereby logically adjust their risk perspective and incorporate nature, health and inclusive wellbeing in their risk analysis and pricing models.

Successful implementation will require governments to recognise the societal roles that farmers play and to adopt true pricing policies in order to create a level playing field. Governments can recognise the societal roles of farmers by paying farmers for their ecosystem services that support sustainable and resilient food and agriculture systems. There is currently no market for these kind of ecosystem services by farmers. However, farmers should get paid for their services through payment schemes. For true pricing to be reflected in market prices, it will require governments to levy taxes accordingly. For example, taxes could be levied on meat to reflect the hidden costs of meat on natural capital degradation and diet-related diseases. A similar approach could be taken for the use of nonrecyclable or nondegradable packaging, heavily processed food, food with high levels of sugar, or on transport. On the other hand, in an EU context, reform of existing VAT (Value Added Tax) could facilitate a reduction of VAT rates for organic products supporting demand. In this way, markets will steer consumer choices in a more sustainable direction. A shift from taxes on human capital (labour) towards materials, resources and environmental aspects is a possible direction for governments to revalue the importance of economic action on our environment. True pricing can be a tool to revalue the natural systems our food provisioning depends on and the contribution it makes to a healthy society and fair trade relations.

4. What Triodos Bank can contribute

In this chapter, we will elaborate on the vision and role of Triodos Bank. The vision statements for each individual theme are described as well as our position regarding technology.

4.1 Current food and agriculture activities

From the start, sustainable food and agriculture have been important themes for Triodos Bank. So far, the focus of Triodos Bank's food and agriculture activities has been primarily on the organic sector. With the strategic decision for a renewed Triodos Bank-wide commitment to the transition theme of Food & Agriculture (next to the themes Energy & Climate and Social Inclusion), we aim to significantly increase the importance of Food & Agriculture within our wider organisation. This calls for a considerable growth in Triodos Bank lending to and investing in food and agriculture businesses worldwide.

Food and agriculture are already important themes both for Triodos Bank branches and subsidiaries in Belgium, France, Spain, the Netherlands and the UK, as well as for Triodos Investment Management (Triodos IM). Triodos Sustainable Trade Fund (TSTF), Triodos Organic Growth Fund (TOGF), Hivos-Triodos Fund (HTF), Triodos Groenfonds (TGF) and funds at Impact Equities and Bonds to various extents invest in sustainable Food and Agriculture. Moreover, Emerging Markets (EM) funds indirectly invest in agriculture, as 20% of financial institutions invested in have portfolios in the agricultural sector.

Loans and investments are currently dominantly focused on organic farming, distribution and food processing with less on the consumption end of the food value chain such as retail and restaurants. Clients highlighted by relationship and fund managers as food transition leaders, all transgress traditional boundaries. They take a holistic approach to food and agriculture, and make integral efforts to reach environmental, health and social goals, by stimulating a redesign, reconnection, and revaluation of food and agriculture.

4.2 The way forward

Triodos Bank's focus in relation to food and agriculture has mainly been on organic food and agriculture. Triodos Bank portfolios, especially at Triodos Bank branches and subsidiaries, are predominantly focused on certified organic clients. In a meeting with relationship managers, one of the outcomes was to provide support to stretch Triodos Bank's activities beyond certified organic towards broader transition leaders.

To address all the challenges in our food and farming systems, it is considered that promoting certified organic agriculture alone will not be sufficient. If Triodos Bank wants to stimulate a systemic transition, other themes such as the protein transition towards more plant-based food, food waste reduction and equitable distribution of prosperity deserve more attention, even if they fall outside of the organic box.

To address all the challenges in our food and farming systems, it is considered that promoting certified organic agriculture alone will not be sufficient.

Moreover, evaluating how businesses can contribute to a redesign, reconnect and revaluation of our food and agriculture systems may be as important as organic certification. Ideally, Triodos Bank's partners should commit to the same goals by promoting balanced ecosystems, a healthy society, and inclusive prosperity. Organic certification can be a way to reach those goals but should not be considered an end in itself. By transgressing paradigms and silos in the debate around food and agriculture, Triodos Bank should take a leading role.

To create a concrete role for Triodos Bank as leader in the transition of food and agriculture systems, the following directions for our activities should be considered. These directions should not be seen as a box-ticking exercise but rather as guidance and should be considered holistically including all elements of transition.

4.3. Vision implementation

In this document, the current negative outcomes of the modern food and agriculture systems were discussed as well as the root causes keeping this system in place, and possible solutions and transition opportunities. While this vision paper is written from a global perspective, actions are needed at local level.

The vision statements below serve as a tool to implement and communicate the position of Triodos Bank on each relevant theme that is part of the vision. They are the result of a two-month period gathering and collecting data through interviews and work sessions with co-workers from the different branches, subsidiaries and business lines. Each of the three pillars of the vision paper were further specified into separate themes. Every theme contains one or more statements that capture Triodos Bank's ambition on the subject. The statements are broad to ensure the framework is relevant and usable for every branch, subsidiary and business line involved in food & agriculture. They provide guidance on relevant topics for each branch, subsidiary and business line to develop its own context specific implementation strategy. As the situation in western economies is considerably different from emerging economies, vision statements are formulated which respect the context driven nature of food and agriculture. Therefore, each vision statement features a colour that shows the focus region for the specific statement. However, this does not mean that the statement is not relevant for the other focus region.

Regional focus

- Relevant for both western economies and emerging economies
- Relevant mainly for western economies
- Relevant mainly for emerging economies

Terms of use

There is no clear, quantifiable method to decide when a company 'fits Triodos Bank's criteria'. This decision is the responsibility of our co-workers who are experts in their field. However, discussions are encouraged in the decision-making process, as there will always be dilemmas. A helpful directive is the question:

Does a lending or investment opportunity contribute significantly to the systemic changes needed in food and agriculture?

Furthermore, a general rule applies to specified cases:

While we might accept an opportunity that focuses on one specific theme only, it should not negatively impact other themes.

4.3.1 Vision on technology

Technology plays an important part in modern food and agricultural systems and continuous advancements and innovation can improve sustainability. For example, improved irrigation techniques can greatly reduce the amount of water required for production.

Triodos Bank supports technological advancement and innovation in food and agriculture; however, we believe that technology should always support ecosystems and never alter or replace them.

Below, we discuss three technologies to clarify our current position. These examples were discussed extensively with co-workers active in the field of food and agriculture.

GMO

Triodos Bank does not support the use of genetically modified organisms (GMO) in agriculture or the production of genetically modified (GM) food products.

According to the WHO (2014) GMOs can be defined as organisms (i.e. plants, animals or microorganisms) in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination.

Triodos Bank supports natural breeding programmes and food fortification, as they are integrated in our modern food and agricultural systems. However, Triodos Bank draws the line at genetically modifying organisms, as we feel that the benefits do not outweigh the risks. There is no clear consensus and still little insight in the environmental consequences and long-term health effects of GM organisms. What is known however, is that GMO research has primarily been funded by the private sector for a select number of production crops and animals to benefit large industrial farming operations that promote monocultural production practices and decrease food diversity. Erosion of plant and animal DNA has lowered genetic diversity, which decreases resilience. Additionally, while benefits such as production growth or drought resistance are often voiced as an argument for GM crops, they have not helped smallholder farmers in vulnerable areas, as they do not represent interesting markets. Lastly, dependence on GM seeds and patents on DNA strands increases the power of agrochemical corporations and decreases farm sovereignty, increasing disbalance in value chains.

Vertical farming

Triodos Bank does not support food production in completely closed systems, generally defined as vertical farming. We argue that it is impossible to recreate the complexity of minerals and trace elements found in natural soils. Furthermore, there is still no clear consensus on the effects on human health of crops grown on artificial soils and without exposure to sunlight. Additionally, because vertical farms use LED-lighting for crop growth they require electricity, while crops benefit from sunlight which is freely available. Another disadvantage of vertical farming is that only a small percentage of our crops can be grown inside. Cereal crops, which make up the largest share of our diets, but also fruits and legumes, require large spaces and are therefore not viable for indoor growing.

Triodos Bank supports technological advancement and innovation in food and agriculture; however, we believe that technology should always support ecosystems and never alter or replace them.

Lastly, Triodos Bank feels that vertical farming does not reconnect consumers with food production as the system is completely closed and sterile, similar to a laboratory and not to farming.

In vitro meat

Triodos Bank does not support lab grown meat, generally defined as in vitro meat. The process of artificially growing meat is energy intensive and costly. More interesting would be to look at legumes for providing alternative proteins. As well as being high in protein, legumes are natural fertilisers, as they are able to fix nitrogen. Another aspect that makes in vitro meat unsustainable is the use of foetal bovine serum (FBS) as a basis for cell growth. If a cow is pregnant during slaughter, a needle is inserted into the heart of the cow foetus to drain its blood and FBS is produced from this blood.

Conclusion

Triodos Bank does not support GMO, vertical farming or in vitro meat as the environmental consequences and impact on human health are still not fully understood. Furthermore, these technologies facilitate corporate dominance, as only these players possess enough resources to finance the expensive research into these fields. While Triodos Bank follows developments with interest, we strongly believe that there are always better ecological alternatives that cost less and are available to all.

4.3.2 Vision statements

The vision statements for each theme are described below. The footnotes provide additional content for clarification of the statements. Each theme also features one sentence describing the importance of the subject.

Balanced ecosystems

Balanced and resilient ecosystems are vital for human well-being as they provide the food we eat, the water we drink and the environment we live in. We need to make the transition towards resilient food and agriculture systems that work with nature rather than against it and that maintain ecosystems. Therefore, Triodos Bank advocates for the transition towards food and agriculture that maintains and supports ´balanced ecosystems´.

Triodos Bank supports initiatives that work towards balanced and resilient ecosystems by developing healthy soils, safeguarding biodiversity, while simultaneously lowering carbon emissions, creating circular value chains and efficiently using the earth's natural resources.

Healthy soils

Healthy and living soils form the basis for food production and are therefore essential for providing food and nutrition for all.

- Triodos Bank supports agricultural initiatives that adhere to the organic principles[1] and actively develop healthy soils.
- Triodos Bank supports agricultural initiatives that value soil health as an integral part of their production system.

1 The **principles** of organic farming are health, ecology, fairness, and care. Organic certification can provide guidance in determining if an initiative adheres to the organic principles but should NOT be mandatory. It does however mean, **no use of agrochemicals**.
2 **Agricultural biodiversity:** a broad term regarding all forms of life relevant to agriculture, including **functional biodiversity** and **genetic biodiversity**. Maintaining and increasing agricultural biodiversity is essential to ensure resilient food production systems.
3 **Functional biodiversity**: organisms that support and enable agriculture such as insects (pollinators and natural pest control), fungi (nutrient recycling) and soil fauna, but also biodiversity in general such as birds and rodents.

Agricultural biodiversity

Agricultural biodiversity[2] provides essential ecosystem services, such as pollination, biological control and sustaining healthy soils, and is important to build resilient and genetically diverse food production systems.

- Triodos Bank supports agricultural initiatives that adhere to the organic principles and actively preserve (functional) biodiversity[3].
- Triodos Bank supports agricultural initiatives that value (functional) biodiversity as an integral part of local ecosystems.
- Triodos Bank supports agricultural initiatives that maintain the genetic diversity[4] of production crops and animals, thereby improving resilience to shocks[5].

Carbon emissions

Lowering carbon emissions is necessary to decrease the speed of global warming and reduce the impact of climate change.

- Triodos Bank supports initiatives that, on-farm and throughout the entire food value chain, decrease their dependence[6] on fossil fuel and incorporate renewable energy sources, improving resilience and decreasing carbon emissions.
- Triodos Bank supports initiatives that address deforestation and improve soil health to maintain and increase earth's ability for carbon sequestration.

Water

Water is an important life source for plants, animals and humans, and essential for the functioning of our food and agriculture systems.

- Triodos Bank supports initiatives that consider water a valuable and finite resource and strive to decrease their water use and pollution, especially in dry areas.

Conscious resource use

Feeding 10 billion people in 2050, while maintaining balanced ecosystems, requires conscious use of the earth's resources and the creation of circular chains that recycle nutrients and minimise losses.

- Triodos Bank supports agricultural initiatives that recycle nutrients back into the soil through locally closed[7] loops.
- Triodos Bank supports initiatives that develop interdisciplinary and innovative solutions to recycle or reuse waste streams throughout food and agriculture systems,

4 **Genetic biodiversity**: genetic diversity of production species used in agriculture, including rare and native seed varieties and animal breeds, and genetically different varieties of the same species.
5 Examples of shocks related to genetic diversity are **pathogens, pests or fungi**, but also **climate change**.
6 Industrialised farms and value chains in western economies are highly **dependent** on finite fossil fuels as a resource for e.g. fertiliser, machinery, irrigation, transport, etc.
7 The co-worker should carefully consider **'what is local?'** in the context of the initiative.
8 **Biodegradable waste streams**: e.g. food losses and waste. **Non-biodegradable** waste streams: e.g. packaging material
9 In this context **natural capital** are resources provided by nature that we use in food systems, such as land and water, but also wood and medicine. **Ecosystem services** are services rendered by nature that enable food production, but also the ability for humans to survive on earth, such pollination, plant growth, climate control, CO_2 uptake, soil formation, etc.

both degradable and non-degradable waste streams[8].

- Triodos Bank supports the conscious use of natural capital and ecosystem services[9] throughout our food and agriculture systems.

Animal welfare

In sustainable food and agriculture systems, animals fulfil their natural and essential role in preserving the balance in eco-systems.

- Triodos Bank supports agricultural initiatives that follow the organic principles and allow animals to express their natural behaviour and fulfil their natural function within ecosystems.
- Triodos Bank supports animal husbandry initiatives that reduce the risk of bacterial or viral contamination and raise healthy and robust animals with well-functioning natural resistance.

Healthy society

A transition towards sustainable diets that nourish the body is necessary to provide nutrition for the growing world population and support a healthy and resilient society.

We need to make the transition towards food and agriculture systems that provide healthy and nutritious food for all and shift towards sustainable diets. Therefore, Triodos Bank supports the transition towards food and agriculture systems that produce sustainable diets for a 'healthy society'.

Triodos Bank supports initiatives that work towards a healthy society by improving food security and safety, eradicating all forms of malnutrition, while simultaneously promoting sustainable and diverse diets that maintain food culture and traditions and create responsible and conscious consumers.

Food security

Ensuring a stable supply of affordable and nutritious food for all is essential for a healthy society.

- Triodos Bank supports initiatives that provide diverse, nutritious and affordable food to all worldwide, especially to vulnerable or low-income groups.

Food quality[10]

Providing healthy and nutritious food, through a responsible food environment is essential for transitioning to healthier diets.

- Triodos Bank supports initiatives that provide quality food products containing complex nutrients, while simultaneously decreasing energy dense, ultra-processed food products.
- Triodos Bank supports initiatives that create a healthy food environment for people, including children.

10 **Quality food** is defined as: safe, nutritious and healthy, and supplying the body with its daily nutritional needs.

11 The food environment defines how consumers interact with food and influences their food acquisition choices. E.g. the food environment for western consumers is dominated by supermarkets offering cheap and abundant food.

Food safety

Creating a healthy society requires a stable supply of safe food for all that eradicates food related illnesses[12].

- Triodos Bank supports initiatives that provide food products that comply with EU food safety standards.
- Triodos Bank supports initiatives that provide adequate food preparation facilities and resources[13].

Sustainable diets

A transition towards sustainable diets is necessary to ensure well-being for 10 billion people in 2050.

- Triodos Bank supports the transition towards diverse, local and seasonal diets (where possible), that follow the 80 – 20 percentage distribution between plant-based and animal protein.

Consumer awareness

A healthy society requires well-informed consumers who base their food choices on relevant information, nutritional value, and product background, thereby making conscious decisions that have a positive impact on both health, the environment and a fair value chain.

- Triodos Bank supports initiatives that educate consumers and reconnect them with producers, thereby contributing to well-informed and conscious consumers and farmers.

Culture and traditions

Food is key in preserving culture and traditions, and many traditional food production systems possess important knowledge resulting from an intimate understanding of the local ecosystem.

- Triodos Bank supports initiatives that preserve traditional farming systems[14], local food culture and traditional food types.

Inclusive prosperity

Fair distribution of prosperity within food value chains is essential to create inclusive food systems that build resilient communities and provide sustainable livelihoods.

We need to make the transition towards food systems in which all parties in the food value chain receive a fair portion of the prosperity generated, based on transparency as well as fair power balances. Therefore, Triodos Bank supports a transition towards food and agricultural systems that ensure 'inclusive prosperity'.

12 **Pathogenic food related illnesses**: resulting from contaminated food through bacteria. **Chronic food related illnesses**: non-communicable diseases such as cardiovascular disease and diabetes type 2, resulting from unhealthy lifestyles partly caused by high consumption of processed food products. **Harmful farming or food processing residues**, such as chemicals or antibiotics.

13 Access to clean water, cooking facilities, fuel and food preparation knowledge.

14 The co-worker should carefully consider what farming systems are considered 'traditional'.

Triodos Bank supports initiatives that engage in fair and transparent business practices that ensure fair disposition of prosperity throughout food value chains and rural to urban areas. Furthermore, Triodos Bank supports building resilient communities that can withstand the impacts of climate change and ensure sustainable livelihoods for all, guaranteeing socio-economic rights.

Transparent and fair business practices

Transparent and fair business practices ensure a level playing field and fair distribution of prosperity throughout food value chains.

- Triodos Bank supports initiatives that apply transparent business practices and create fair food value chains based on equal power relations[15].
- Triodos Bank supports value addition in the country of origin, thereby strengthening local economies.

Rural development

Resilient (rural) communities, that are able to endure external disruptions (environmental, political, economic), are essential to provide a stable food supply.

- Triodos Bank supports initiatives that improve and reinstate often underdeveloped rural areas.
- Triodos Bank supports initiatives that empower communities and build resilient[16] local food systems by providing access to assets (i.e. land), finance, markets, education, and further developing local infrastructure.

Sustainable livelihoods

Every person working within food and agriculture systems, should be able to make a decent living in a socially, economically and ecologically sustainable manner.

- Triodos Bank supports initiatives that value and reward farmers for their broader role within society, such as landscape management and water retention.
- Triodos Bank supports initiatives that improve the social and economic position of individuals working in food and agriculture systems.

Equal rights

Sustainable and inclusive food and agriculture systems guarantee that every actor has equal socio-economic[17] rights, receives fair financial compensation and works in safe conditions.

- Triodos Bank supports initiatives that ensure fair and equal socio-economic rights, provide fair financial compensation (including access to assets), and guarantee safe working conditions, regardless of gender, ethnicity or culture.
- Triodos Bank supports initiatives that improve gender equality in agriculture.

15 Special focus on fair use of **intellectual property rights**, especially with regards to **plant seeds**, that enable smallholder farmers to benefit from research and development.

16 Resilient agricultural communities are able to **withstand external shocks and disruptions** and maintain productivity.

17 Socio-economic rights are **economic, social** and **cultural rights**, including right to education, right to housing, right to adequate standard of living, right to health, victim's rights and the right to science and culture.

Climate change mitigation and adaptation

The impact of climate change will be felt worldwide, especially in emerging economies by low-income groups. This burden should be shouldered equally by countries and people.

- Triodos Bank supports climate mitigation projects that help build resilient food and agriculture systems that can produce quality food and sustain communities and livelihoods, even in time of distress.

Systems thinking approach

The subject of future food and agriculture systems is, as already stated, incredibly complex. The three main themes of healthy society, inclusive prosperity and balanced ecosystems, and the 17 subthemes are introduced to provide structure. The statements displayed above were developed to provide a method of conveying the position of Triodos Bank on each sub-theme, thereby giving a sense of direction for co-workers who work in the field of food and agriculture.

However, with every investment related to one or more subthemes, it is important to maintain the systems thinking approach and consider the impact in the context of the larger system. The subjects of ecosystems, health and prosperity are not elements that function in isolation, but constantly influence each other and are crucial for the transition towards sustainable food and agriculture systems. The ability to recognise this interconnectivity is an important and necessary element in implementing the food and agriculture vision of Triodos Bank.

Therefore, co-workers active in food and agriculture should ensure they adopt a holistic view of the vision implementation that recognises the interconnected-ness of the three main themes and 17 subthemes.

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