SOLUTIONS FOR THE FOOD SYSTEM
In Flanders we enjoy an abundant and affordable food supply. Our food system is nevertheless reaching its economic, social and ecological limits. In spite of the many initiatives already taken, important steps remain necessary to further reduce its environmental impact. In this chapter, we will discuss the potential solution paths and levers for the transition to an (ecologically) more sustainable food system.

4.1 What is it about?

Abundance at the expense of sustainability

Our food system provides us with a broad, varied and affordable supply of products. There are, however, various other areas where the system is reaching its limits.

As a result of globalisation and liberalisation, the actors in the European and Flemish agri-food chain have become players on a global market. Cost leadership – producing highly standardised products as cheaply as possible – has become the dominant competition strategy. This strategy leads to a progressive process of specialisation, upscaling and intensification based on technology and intensive use of resources such as water, fossil fuels and other, often imported, raw materials. The environmental impact of the Flemish food system has thus become too great. The intensive use of resources and the emissions generated in the process are harmful to the soil, water and air. These resources are not only necessary for the proper functioning of the food system itself, but also for other systems. Thus, intensive agriculture in some regions leads to erosion or a decline in carbon content in soils, which is detrimental to food production. Air pollution, climate change, water pollution and loss of biodiversity are, however, also detrimental to other societal systems.

In addition, Flemish agriculture is also economically and socially vulnerable. This is mainly due to low profit margins, unequal distribution of the added value throughout the agri-food chain and the high land prices in Flanders. The way in which we feed ourselves also has an impact on public health. The over-consumption of certain food products has resulted in a significant increase in diseases such as obesity and cardiovascular disorders in Flanders. The food system as we know it today is therefore reaching not only its ecological but also its societal limits.
THE CHANGING FOOD SYSTEM IN FLANDERS: A DIAGNOSIS

The western food system is characterised by self-evident abundance and convenience. Economic performance remains the greatest driving force. To this end, the food system is split up into chains that lack transparency and have highly specialised links. These are aimed at maximising profit through growth and cost efficiency. Only a small share of the total added value goes to primary producers in the agricultural sector.

Drastic changes in the past

The industrial revolution has drastically altered our food system already from the second half of the nineteenth century. Modernisation allowed agriculture to achieve giant leaps in productivity. This was the result of the use of machinery, pesticides, fertilisers and hybrid seeds, among others. A new wave of change took place after the two world wars. Intensification, specialisation, economies of scale and industrialisation were aimed at developing a production system that was to provide sufficient food at low prices, and that would also make Europe self-sufficient. This led to a high level of food security. Belgium and Flanders are global front-runners in the supply of a broad and varied range of high-quality food products.

Pressure on the dominant regime: the transition impulse

Growing production volumes used to be the prevailing means to achieve the goal of a guaranteed food supply. However, once that goal had been achieved, the growth paradigm remained intact. Thus, the means became an end in itself, which has implications for sustainability. The broad, varied and affordable range of food currently available in Flanders – and that the consumer expects to find on the market – requires a large and resource-intensive production and processing apparatus. This has implications for the environment, just think of eutrophication and acidification, the impact of pesticides on the environment and the greenhouse gas emissions during production and processing. These effects often adversely affect the basis and the resources of the food system itself. They can lead, for example, to reduced soil quality, declining water reserves and diminished biodiversity. There are also adverse social effects that become apparent, such as high work pressure and income uncertainty due to market volatility and low margins in agriculture. Any further economic benefits seem to be virtually impossible.

There are also health implications. Whereas the system initially developed in a period where sufficient food was a legitimate goal, it has evolved towards a system of excess (lots of meat, energy-rich foods). This leads to an increased risk of health problems. The abundant food system also causes quite a few losses throughout the chains and with the consumer.

In the food system, a number of niches have emerged over the past decades, such as short chain, urban agriculture, multifunctional agriculture, organic farming, and more recently, agroforestry. These offer alternatives that respond to specific problems in the dominant regime.
Resistance of the regime to drastic changes

However, the entire food system, which is made up of knowledge, technology, institutions, infrastructure, practices and habits, rules, norms, values and thinking patterns, is geared to an intensive, specialised and export-oriented agri-food chain. This ‘path dependency’ makes the system stable and inhibits the breakthrough of production and processing methods and eating patterns that deviate from the common model. The regulations, for example, remain tailored to the needs of those who apply the norms and values of the dominant regime. Alternatives are required to operate within outlines that are often inadequately aligned to the goals being pursued.

The same applies for subsidy systems. Where large-scale subsidies used to be an effective lever to achieve a sufficiently efficient food system, they also remained in place afterwards. Public support has thus become part of the economic calculation model, the income and therefore also of many investment-related decisions.

The high investment costs in infrastructure and technology and the low margins, mainly in the agricultural sector, also result in long payback times. This has led to a lock-in which impedes the switch to alternative production and processing methods. This takes place not only at the level of individual farmers; the entire food system is characterised by numerous, and often major, interests tied up with investments in very specific directions. In addition, the outspoken growth and export strategy of the food industry represents a clear lock-in that drives production towards increasingly larger volumes. But also the consumer plays an important role in all this. The consumer takes it for granted that high-quality food is permanently, abundantly and easily available at low prices.

Where does the change process stand today?

In spite of the pressure exerted on the system by sustainability issues, societal developments and emerging niches, there appears to be no real sense of urgency for structural changes. The regime of conventional agriculture, food industry and retail focuses primarily on the preservation of existing organisations, structures and institutions, and on transformation based on technologically supported ecological modernisation.

Various alternatives are appearing on the market or are under development. However, they remain relatively small and are mostly still in the experimentation phase. In many cases, the growth rate and scale are not yet sufficient to generate an (effective) acceleration. Demand for organic products is on the rise, for example, but the organic farming area in Flanders remains limited to around 1 per cent of the total agricultural area. Also the market share of short-chain farm selling and farmers’ markets is less than 1 per cent of total fresh product purchases.

The niches mainly exert pressure on the existing regime through powerful narratives that inspire and legitimise. They are tolerated by the dominant regime because they are not perceived as a serious threat to the status quo. Some niches are also (partially) incorporated into the prevailing food system. For example, a number of farms are
focusing on broadening their traditional business operations with short-chain selling. There is also a relative increase in the distribution of organic products via supermarkets. This can help in upscaling niches, but also holds the risk of eroding the original principles of the alternative.

It is probably neither desirable nor effective to think in terms of a sustainable new regime that is emerging and a non-sustainable regime that is being broken down. More is expected from a co-evolution where a thoroughly transformed regime, built mainly around updated world views and values, exists alongside co-regimes, which have managed to scale-up from niches to full-fledged alternatives. It is therefore essential to actively and strongly connect both paths into a coherent discourse that promotes a meaningful acceleration dynamic. Systems with a sufficient number of good connections are after all the most effective and resilient ones.

**Steering the food system of tomorrow**

Addressing the various environmental problems calls for structural innovations throughout the food system. Not only the production links play a crucial role in this regard. It is essential to suitably involve all the other actors such as trade, consumers, authorities, knowledge institutions, lenders, education, interest groups and social organisations.

The *Environmental Outlook 2018* outlines three categories of solution paths that together can contribute to an (ecologically) more sustainable food system:

- **Eating differently**
  The focus here is on achieving more sustainable dietary patterns. More specifically, we look at dietary patterns with fewer animal products, dietary patterns with more local and seasonal products, and dietary patterns with less food waste.

- **System improvements**
  System improvements indicate how the customary production and distribution system can be made more sustainable. This solution path zooms in on further increasing eco-efficiency, reducing food losses in production and distribution, and closing loops as locally as possible.

- **System changes**
  We investigate how differently organised food systems can contribute to a sustainability transition. We look at the application of agro-ecological principles, the provision of multifunctional services, and the introduction of new food systems with minimal use of land.
4.2 Eating differently

The sustainability of our food system is highly dependent on our eating habits. Changes in the average eating pattern – what, how, where and how much we eat – can therefore have a great impact. Options that are often put forward for eating more sustainably include consuming fewer animal products and preferably choosing local and seasonal products. Reducing food losses is also considered to be an important part of the solution.

Dietary patterns with fewer animal products

At present, slightly less than two-thirds of our protein intake comes from animal products, over half of which consists of meat. There is, however, a visible shift in the eating pattern. Meat consumption in Belgium declined by 22 per cent between 2005 and 2016. Consumption of high-quality vegetable protein sources such as legumes, seitan and soy-based products grew by 60 per cent between 2008 and 2014, but remains very small when compared to meat consumption. Dairy consumption in Flanders is also much higher (more than fifteen times) than that of plant based substitutes.

Animal products generally have a greater ecological footprint than vegetable protein sources. Per kilogram of protein and per kilocalorie, they require more land and water and generate more greenhouse gas emissions and nitrogen losses. Poultry, eggs, dairy and pork all score better than beef on these indicators. The results do vary according to the production method used. For some parameters, the environmental impact of the best scoring animal products may differ relatively little from that of the lowest scoring vegetable protein sources.

Despite the large differences between products and production methods, the environmental gain of eating patterns with fewer animal products can be significant. Meta-studies show that a vegan eating pattern in high-income countries can reduce greenhouse gas emissions by 25 to 55 per cent and land use by 50 to 60 per cent. A vegetarian eating pattern can result in 20 to 35 per cent lower greenhouse gas emissions and 25 to 50 percent lower land use.

In a scenario where the EU’s consumption of meat, dairy and eggs is halved and there is no increase in exports, nitrogen losses in European agriculture are expected to drop by 40 per cent and greenhouse gas emissions by 20 to 40 per cent, depending on the use of the freed up land. Furthermore, soybean meal imports would drop by three-quarters and energy-rich feed imports would almost be halved.

A smaller livestock also offers opportunities to broaden the focus on more extensive livestock production, which offers animals more space and better living conditions. In addition, it enables a better integration of vegetable and animal production, which could enhance the closing of loops. Livestock has always played a role in closing food loops through the conversion of grass and food waste into meat, dairy and eggs and the production of manure for crops. Even today, quite a number of food waste streams from Flemish agriculture and food industry find useful application as feed. However, the size of the current livestock is such that large quantities of raw materials have to be imported, so that sustainable closing of cycles is ruled out for the time being.
In addition, numerous studies show that eating patterns with fewer animal products can also provide health benefits. The Flemish Institute for Healthy Living (Vlaams Instituut Gezond Leven) argues that a diet with lots of different kinds of vegetable foods and low quantities of animal foods – red and processed meat in particular – is often not only healthier, but has also a lower impact on the environment.

In Flanders, however, the meat and dairy sectors play an important economic and social role. Diets with fewer animal products would therefore also have significant implications for the agri-food chain. Compensating strongly reduced domestic demand by exports seems difficult because demand for meat products within the EU is stagnating. A strong increase in exports to countries outside the EU seems unlikely. Production costs in the EU are generally higher than in countries like Brazil, Australia or the United States. The food industry is, however, strongly focused on growth and exports. Although meat consumption in Flanders is declining, meat exports are currently still growing, so that production remains at the same level. Dairy production is even on the rise, again fuelled by growing exports.

However, diets with fewer animal products also offer opportunities for the agri-food chain. Growing and processing of vegetable protein sources such as soy, and in the longer term possibly also insect farming, algae cultivation, novel protein foods and cultured meat offer alternatives. Livestock farming can also focus on products with higher added value, such as meat and dairy from production systems that guarantee more animal welfare or apply extra environmental criteria. Another option is the switch from beef to dairy production.

**Dietary patterns featuring more local and seasonal products**

Food is often transported over large distances. The choice for locally produced food is therefore often seen as a way of reducing the carbon footprint of our food consumption. However, local food does not always translate into lower greenhouse gas emissions. The difference in emissions between a locally produced and an imported food product depends not only on the transport distance but also on the mode of transport and the way in which the food products are produced. There is great diversity in transport and production systems and a high level of interwovenness between local and global production, one example being local meat production based on imported feed raw materials. This makes it difficult to make general statements about the impact on greenhouse gas emissions of an eating pattern with more local products.

It is clear, however, that a consistent consumer choice for seasonal fruit and vegetables grown locally and in open air, does provide a significant climate benefit. The effect could be further intensified if producers were to systematically opt for crops for which the climate benefit of local production is maximal. Season-lengthening measures such as more scattered sowing and harvesting, use of different varieties and cultivation techniques such as cold greenhouse, heat from composting or milder microclimates – such as crinkle-crankle walls – could expand supply. In urban agriculture, use can be made of the heat island effect.

Local products can be distributed via conventional distribution channels such as shops and (super)markets or via the short chain. There is considerable scope of improvement in the area of short-chain logistics and distribution. The smaller volumes and the lack of efficiency and professionalisation play a role in this.
For deliveries to the hospitality and catering sectors, fine-mesh city distribution (see 3.4 “An (ecologically) more sustainable fleet”) could produce environmental gains. The bundling of perishable products allows smaller, more environmentally friendly means of transport to be used. Various (trial) projects in Europe are showing positive results.

In short chain distribution models, food products are sold to consumers either directly or through a limited number of intermediaries. This can be done via farm outlets, food dispensers and farmers’ markets, or via collective systems such as food teams or food subscriptions. In addition, consumers could be involved more closely in the production, as is the case in community supported agriculture (CSA) and self-picking farms. In 2015, turnover generated by farm selling and farmers’ markets amounted to 92 million euros or 1 per cent of spending for fresh foods.

Short chain also includes non-commercial urban agriculture, a collaboration between socio-cultural associations and active citizens who develop vegetable garden projects. Here, food production also serves as an instrument of social cohesion.

Food production for the local market could offer an interesting economic perspective to producers. This is certainly the case for products with a higher added value, such as regional and/or organic products or food products that are produced with special attention to animal welfare. The renewed link between consumer and producer could prompt consumers to attach greater importance to food (production) and therefore be prepared to pay a correct price. However, the balance between financial benefits and costs is not always evident for producers.

When taking into account a broad range of sustainability considerations – environmental, economic, social, health and ethical aspects, etc. – it appears that neither global nor local chains perform better for all considerations. That is why it is important to look for a new balance between local and global, and to make all chains more sustainable.

**Fewer food losses on consumption side**

Over 900,000 tonnes of food was wasted in Flanders in 2015. Consumers account for 23 per cent of this figure. Factors at the basis of this waste include poorly planned or impulsive purchases, campaigns and discounts, too large packaging, and improper storage. In addition to the losses of edible food, there are non-edible by-products that cannot be avoided, such as bones, fruit and vegetable peels and pips.

Three-quarters of these food losses and by-products are valorised: 40 per cent is composted via home composting and organic waste, 28 per cent goes into animal feed, and 6 per cent is digested. Around one quarter ends up with residual waste and is incinerated with energy recovery.

Eating out also generates a substantial amount of food loss. In the hospitality and catering sectors, this loss is estimated at 19,000 tonnes (2 per cent of total food loss in Flanders) and 57,000 tonnes (6 per cent) respectively. These losses are caused mainly during the prepara-
tion of meals (hospitality) and due to wrong portion sizes (catering). A good deal of the food losses and by-products in hospitality (69 per cent) and catering (76 per cent) ends up with the residual waste, the rest is digested.

Prevention of food losses reduces the environmental pressure. Food that does not need to be produced does not require farmland, water, nutrients and energy, and does not generate emissions. The impact on greenhouse gas emissions nevertheless appears to be limited: the food loss by Flemish consumers represents only a few percentage points of the carbon footprint of the food consumption by Flemish households. However, the food that is wasted every year by Flemish consumers could be used to feed nearly half a million people.

**Levers**

**Develop a long-term strategy on food production and consumption**

For the transition towards diets with fewer animal products, more local and seasonal production and less food waste, a broadly shared long-term strategy on food production and consumption is essential. Such a strategy must be supported by coherent policy.

Growth remains the dominant paradigm within the agri-food chain. Therefore, a strategy that focuses on lower production and consumption of animal food products will stress the importance of innovation and reconversion within livestock farming and the food industry. Moreover, the major investments made in specialised infrastructure do not always make reconversion evident. Financial aid and reorientation of existing resources will have to back up the transformation. Also investments in research and the necessary re- or up-skilling are necessary.

Another focal area in a long-term strategy is seeking a new balance between local and global chains. Further research is needed to gain an insight into how they can complement each other, taking into account the different dimensions of sustainability. At the same time, the focus must be on making each of the different chains more sustainable.

A consistent food policy requires alignment and coordination between the different policy areas involved, possibly via a food policy area. Such policy must be supported by consistent awareness-raising about healthy and sustainable food. The food triangle of the Flemish Institute for Healthy Living (Vlaams Instituut Gezond Leven) is a good basis to this end.

Cities can also play an important role in this respect. Ghent, Brussels and Leuven have already taken the initiative to elaborate a strategy that focuses on local and sustainable food. By setting up learning networks, such initiatives can serve as inspiration for other actors.
**Change the entire food environment**

Nudging – or gently prompting people to move in the ‘right’ direction – can be helpful in adjusting habitual behaviour. For example, public restaurants, schools and businesses could reduce meat portions and include vegetarian alternatives in their standard offer. Supermarkets could reduce the packaging size of animal products and give a more prominent place to local products.

However, nudging will not suffice to ensure wider and permanent acceptance of more sustainable eating patterns. In fact, eating habits are shaped by a combination of factors, including norms and expectations, knowledge and skills, available supply, and integratability into work, school and free time routines (convenience). The whole food environment needs to be changed by consistently addressing all these factors.

**Influence food norms and values**

Norms, values and expectations play an important role in our eating habits. For example, for many consumers, eating meat every day is part of the culture in which they grew up. Due to the low prices, consumers in prosperous countries often also attach less importance to food. Food is not always treated with proper care. Influencers such as famous cooks, athletes and media figures and a larger supply of sustainable food in the public environment, for example at festivals or in stations, may help in making sustainable food the new normal. More attention could be given to sustainable food in education, youth work and the voluntary sector. The perception of food can also change by shortening the distance between consumer and producer. This can, for example, be done via short-chain selling or by bringing the farmer’s story to the supermarket.

Many consumers place great value on convenience. They have neither the time nor the desire to gather and compare information, to locate specific points of sale, or to apply lesser-known or longer preparation methods. For seasonal products there is also the expectation that everything is available virtually the whole year through. The demand for convenience is a major challenge for producers active in short-chain selling. This explains the need for further knowledge development on new economic and logistic models. One example is to set up short-chain hubs and distribution platforms at strategic locations. Local policy can support these via subsidies, interest-free loans or the provision of unused or underused premises. Businesses specialising in home delivery can bundle various short-chain concepts such as vegetable subscriptions, meal boxes and fresh produce. It is also possible to focus on ready meals.

**Promote sustainable products in retail**

A greater supply and better marketing in supermarkets and local shops is crucial in bringing about a shift to more sustainable eating patterns. Although a growing number of supermarkets profile themselves around local and sustainable food, the share in the total supply remains relatively small. One of the reasons is the price pressure from the average consumer, who sees cost as a very important criterion in their food purchases. That is why it is important to develop a vision and strategy on correct pricing.

The government could also provide a number of guidelines on sustainable food for retail by means of a ‘distribution policy’. This should obviously be based on scientifically substantiated information and developed in collaboration with the actors involved.
Activate hospitality and catering as customers
Hospitality and catering are also important for the broader adoption of sustainable eating patterns. One barrier is that small, individual hospitality and catering businesses have little market power. As a result, the supply of, for example, local products and alternatives to meat and dairy with their suppliers is often rather limited. The catering departments of the Flemish and local governments are major customers and could join forces to create a larger market for sustainable food products. In this way, the government could set an example and generate leverage.

Smaller hospitality and catering businesses do not always have the necessary time, knowledge and skills to ensure the sustainability of their supplies. Concrete guidelines from sector organisations and public authorities can help in this respect. Such guidelines are also important to reduce food loss. In addition, concepts where consumers scoop the food themselves or are offered a choice of portion sizes, can be rolled out further. Finally, certain aspects of the legislation on food safety could be refined, thereby facilitating the donation of surpluses that do not pose any health hazards.

Stimulate local production
Producers aiming at the local market often do not come from farming families and therefore rarely have (sufficient) land. The high prices of farmland represent a major barrier for them. Furthermore, existing financing and support systems are still often focused on conventional, large-scale farms. Producers aiming at the local market could be supported in a more consistent manner.

Farmers could themselves promote demand for local products through a more effective embedding in the local community (village, municipality, region). The farm could be made more open and fulfil other – social – functions. This requires a modification in business operations, but could benefit their economic viability.
4.3 Improving food production and distribution

Major efforts have already been made throughout the agri-food chain to reduce the environmental pressure of the various links. Technological advances and increasing knowledge have played a major role in this process. There is, however, still ample scope for improving the sustainability of the dominant system. In this part we will discuss the improvement of eco-efficiency, the reduction of food losses in production and distribution, and closing loops as locally as possible.

Improving eco-efficiency

Our current food system has a high productivity due to the large use of external resources to produce food. In agriculture, intensive use is made of resources such as fertilisers, imported livestock feed, water, fossil fuels, pesticides and animal healthcare products. Also the other links in the chain, such as the food industry and retail, are greatly dependent on the use of energy and water, among other resources. The intensive production throughout the chain places great pressure on the environment. To reduce this pressure, all kinds of efficiency measures were taken over the last decades in order to reduce the use of resources and the emissions per unit of output produced. This approach has resulted in a significant reduction in environmental pressure from the Flemish food system, especially during the 1990s. Over the past decade, however, the reduction in environmental pressure by agriculture has stagnated for a number of major parameters. Emissions of, among other pollutants, methane (greenhouse gas) and ammonia, and nitrate and phosphate concentrations in surface water are no longer declining.

There is still ample scope for further improvement of eco-efficiency. For example, LED lighting could reduce energy use in supermarkets, and solar panels, solar boilers and wind turbines could increase the share of renewable energy in the food industry and in retail. Innovations such as new, soft processing and separation technologies, and refrigeration, stabilisation and conservation technologies could help further reduce the environmental impact of the food industry.

A new concept in horticulture is the exergy-efficient greenhouse (EXE greenhouse) whereby insulation by means of Energy Balancing shields is combined with a vapour heat pump. This concept could reduce primary energy consumption in horticulture by three-quarters. The smart siting and judicious combination of horticulture enterprises could create opportunities for use of residual heat, residual CO₂ or other residual streams from other farms or sectors. In intensive dairy cattle systems, optimisation of digestion processes could reduce enteric methane emissions by 15 to 40 per cent.

Another promising innovation is precision agriculture or smart farming, whereby information is collected based on new technologies such as GPS, sensors and drones. This massive amount of data allows very accurate monitoring of crops and animals, so that they can get the precise treatment that they need. Whereas in traditional farming the work to be done is determined per field, smart farming does this on a smaller scale – per square metre or per animal. As a result of this strong focus on a smaller level of detail, smart farming can lead to reductions in greenhouse gas emissions, improved nitrogen efficiency, lower fuel consumption and less soil compaction through more selective use of machinery, and to a reduced use
of pesticides. At present, it is difficult to assess the applicability in Flanders and the potential environmental gain.

While such strategies certainly have potential, the stagnation of eco-efficiency in agriculture shows that the low-hanging fruit has been picked. The question therefore is whether the environmental impact of production can be brought within the limits of the environmental space quickly enough without changing the production volumes.

Another focal area is that eco-efficiency improvements are often focused on individual environmental parameters, such as greenhouse gas emissions or nitrogen losses. This could lead to a shifting to other environmental aspects. For example, some techniques to reduce ammonia emissions require a lot of energy, and some measures to reduce greenhouse gas emissions could cause other emissions to increase. By adding more protein to animal feed, for instance, methane emissions per litre milk may decrease, but nitrous oxide emissions from manure may increase and there is also a negative impact on ammonia emissions.

Furthermore, it is important that strategies for eco-efficiency improvement pay attention to the preservation of soil fertility. A fertile soil is not only important for the actual production. It also helps to prevent nutrient leaching, buffer climate change through carbon storage, store water and protect soils against erosion. The principal indicator for preservation of soil fertility is the organic carbon content in the soil. On farmlands and meadows, it is significantly lower than with other land use in Flanders. Options to increase the organic carbon content of the soil in arable farming include the regular administration of organic matter in the form of crop residues, such as straw or organic fertilisation (compost or farmyard manure) or the use of cover crops.

**Fewer food losses on production and distribution side**

Agriculture and the food industry have the greatest share in total food loss in Flanders, with 36 and 25 per cent respectively. The share of retail is 5 per cent. In relation to the total production of the different sectors, food loss is comparatively low, only a few percentage points. These food losses are, for the greater part, valorised.

In addition, a portion of the food surpluses from the chain is donated to social organisations. In 2015, 16,400 tonnes were donated, more than three-quarters of which by the food industry. This number is an underestimation, because both suppliers and social organisations do not have any structural monitoring and reporting in place. Not all unsold products in the food industry and retail are suitable for subsequent social redistribution. Possible reasons are quality issues and expiry of the use-by date. There is, however, still untapped potential.

Food loss has various causes. There is the loss that is caused by natural production conditions in agriculture, such as the weather. Examples are glassy potatoes due to drought, or apples and pears with hail damage. Losses can also be the result of technical inefficiencies such as harvest, sorting and storage losses in agriculture, start-up and shutdown of production lines in the food industry, and wrong opening of packages in retail.
There are also structural causes of food loss, such as oversupply, aesthetic quality requirements and consumer requirements relating to product freshness and availability. These causes are deeply rooted in our food system. Oversupply is promoted by the growth-oriented food system which induces farmers to always produce more at the lowest possible cost. This can lead to significant food losses, especially in horticulture, for example when export markets are lost. Consumer expectations and preferences play an important role in food losses in retail. The sector strongly focuses on optimising supply via IT systems that take into account external factors such as the weather. The objective is to have optimal stocks in the shops: not too much, but certainly not too little. Because consumers expect everything to be available at all times.

Food losses caused by inefficiencies can be further reduced with technical measures. Examples are the optimisation of harvesting, sorting and preservation techniques and air-conditioned accumulation tables and towers. These allow for optimal preservation of intermediate products if the production line shuts down. To address the structural causes of food loss, however, more radical adjustments are necessary. This is a shared responsibility of all chain actors, the policy and consumers.

Closing loops as locally as possible

Closing loops fits in with the drive towards a circular economy, where materials and products are kept in circulation for as long as possible at the highest quality standard. In this way, the use of new materials is minimised. There are various options to close loops in the dominant system. These include the valorisation of food waste at the highest possible standards according to the food waste cascade, the local cultivation of raw materials for animal feed, and the recovery of nutrients from wastewater.

The food waste cascade serves as guide in dealing with food waste. Food loss is preferably prevented or food is processed into other food products. Lower on the cascade is valorisation, initially as animal feed and in second instance as material application (fertiliser, soil improver or raw material for the industry). This is followed by the possibility of converting food into forms of energy such as biofuel. The last recourse is to dispose of the food by incinerating it with energy recovery or, finally, to dump or discharge it.

In Flanders, 92 per cent of all food waste is reused within the food system: 43 per cent is used as animal feed, 44 per cent as material – generally as soil improver or fertiliser, with or without prior composting or fermentation – and 5 per cent is used for energy applications. Only 6 per cent is incinerated (with energy recovery) and about 1 per cent is landfilled or discharged.

Valorisation of food waste as animal feed ensures greater value retention than other material applications because it contributes indirectly to the human food supply. In 2015, half of the raw materials used for compound feed consisted of by-products from the food industry.
However, only a portion comes from the Flemish food industry. Around half are by-products from oilseeds such as soybean meal, mainly from Brazil and Argentina, and rapeseed meal from Germany. Research into further valorisation options for food waste from the Flemish agri-food chain is ongoing. Also the local cultivation of feed raw materials such as indigenous legumes (for example lupines and clover) and eventually also soya, algae and duckweed can offer opportunities for the better closing of nutrient and carbon loops. This also applies for a reduction of the livestock, which would reduce the need for importing feed raw materials.

Food waste is converted into soil improver or fertiliser through composting and digestion, the latter with or without composting of the digestate. In case of digestion, also energy is generated simultaneously. Of the food waste in Flanders, 21 per cent is fermented and 6 per cent composted. In agriculture, there are still large quantities of residual streams that could be composted or digested, including food waste from fruit and vegetable production.

Compost and certain types of digestate products can be used to improve the quality of farmland. They ensure a more balanced supply of nutrients as compared to raw animal manure. The higher supply of stable carbon also reduces the risk of erosion. Treated soils can also retain more water in drier periods and drain better in wetter periods.

There is also great potential for the valorisation of food waste through biorefinery. Biorefinery uses techniques to separate biomass into semi-finished and finished products. Certain components from food waste can thus be reintroduced in the food. Another possibility is the extraction of building blocks for chemical or pharmaceutical applications. The majority of these techniques are still in the research phase. There is as yet little quantitative data available on their environmental impact. A prerequisite for a positive environmental impact is that the streams do not travel over too large distances and that the extraction and processing methods cause only a limited environmental impact.

**Levers**

**Cooperate from a chain perspective and continue to focus on a common strategy**

Cooperation from a chain perspective can create opportunities to achieve a higher environmental gain with the same investment. This implies a better distribution of the costs throughout the chain, including the consumer. New business models can be instrumental in this process. For example, agricultural providers could offer services (such as crop protection) instead of products (pesticides). This could be an extra incentive for suppliers to provide the service as efficiently as possible, and therefore as a rule also with less environmental impact.

Closing loops, too, calls for cooperation, not only within the food chain but also with other sectors such as the chemical industry. Major challenges are factors such as seasonality, limited shelf-life, and geographical spread.
Cooperation – both within the chain and with sectors outside the food system – requires a common long-term strategy and concrete roadmaps. The vision developed by The New Food Frontier, which was reaffirmed within the project ‘Transformation to sustainable agriculture and food’, can be used as basis. Also investing more in ‘matchmakers’ and highlighting front-runners could promote cooperation.

The New Food Frontier was made up of a network of fifty thinkers and doers who explored new ways to facilitate the transition to a more sustainable agricultural and food system. Based on analysis and creative thinking, they developed visions of the future agricultural and food system.

According to The New Food Frontier, a sustainable agricultural and food system:

- is resilient, dynamic and focused on the long term;
- excels in diversity;
- offers room for innovation and entrepreneurship;
- is made of visible links, the relations between which are transparent and respectful (‘partnerships’);
- secures access to sufficient food so as to enable a healthy life;
- is internationally fair;
- is efficient, not harmful to people and the environment, respects animal welfare, and uses resources economically;
- offers ecological, economic, cultural and social (ethical) added value, and is economically viable for all actors within the system, also through the application of a correct price;
- assigns meaning to food;
- consists of consumers who opt for a healthy lifestyle.

Make existing knowledge accessible and stimulate new knowledge development

A great deal of research is being done on eco-efficiency improvement. One area for improvement is providing independent information about new technologies and training to producers. They will then be less dependent on the free information provided by their suppliers.

In order to close loops as locally as possible, much more knowledge needs to be developed. Valorisation options vary greatly depending on the composition, size and geographical spread of the streams. This requires intensive cooperation with practice partners, for example in the form of living labs. Sufficient accessibility of results, for instance through a central knowledge database, could promote the translation into practice.
Integrate and simplify available financing and subsidy systems
The government provides numerous resources to invest in new technologies. However, the financing and subsidy systems appear to be rather unwieldy and not transparent enough. It is important to centralise (information about) available financing and subsidy systems and to further simplify and speed up the administrative application procedures. Furthermore, existing and new financing and subsidy systems must be aligned with the vision on the sustainable Flemish food system of the future.

Group purchases or agricultural cooperatives could also help make the investment cost more manageable. Moreover, banks could take into account sustainability criteria when granting loans.

Create room for change through policy and legislation
Policy has many options to promote eco-efficiency improvements and the closing of loops. Thus, more efforts could be made to facilitate cooperation between companies at the spatial planning level. Multifunctional zoning, whereby agriculture and certain complementary economic activities are merged, could be instrumental in this.

To close loops, coherent policy is of paramount importance. The feasibility of high-quality valorisation is influenced by laws and regulations, in particular regarding waste, energy, agriculture and food. Depending on the type of valorisation, regulations on, for example, food safety or waste could be refined or amended. Another important lever is the creation of shielded places for experimentation, where departures from regulations can be authorised under controlled conditions, for the purpose of innovation research.

Promote valorisation of food surpluses for human consumption
Certain food surpluses can be reprocessed to food products with a longer shelf life. However, current production processes in the food sector require more or less uniform input streams. As a result, it is often difficult to valorise food surpluses via conventional production lines. New experiments can be set up for the processing of non-uniform streams. Quality assurance of finished products is essential to convince consumers.

Improve the organisation of food donations
To facilitate the donation of food surpluses, an initiative called the Schenkingsbeurs was set up. This online platform links organisations with unsold food products to food aid and social organisations. There is also a growing number of distribution platforms that collect and redistribute surpluses. Optimisation of the logistics is important to expand their role.

Social organisations often have insufficient cooling and freezing capacity to collect large quantities of fresh products. This may lead to food losses. It would be possible to provide resources for food hubs that collect and, where appropriate, process larger quantities of food. Such hubs could be linked to distribution platforms.
4.4 Changing food production and distribution

Food production systems that are organised differently can play an important role in the transition to a more sustainable food system. In what follows, we will zoom in on the application of agro-ecological principles, the provision of multifunctional services, and the introduction of new food systems with minimal use of land.

Apply agro-ecological principles

A fundamental principle of agro-ecology is that nature is the most important production factor in the food system. Whereas conventional agriculture uses numerous external inputs to increase productivity and control natural risks, agro-ecological models use natural processes and services (ecosystem services) wherever possible. Examples include the preservation of soil fertility, regulation of erosion risk, and natural pest control and pollination. Reinforcing and maintaining these processes and services is therefore central to business operations.

Agro-ecology implies a high level of autonomy on the part of the farmer and requires correct pricing with internalisation of environmental and societal costs. It involves the active search for links with society and the creation of social involvement. This is accomplished in various ways, including short-chain selling and cooperation with citizens, scientists and other actors in the food system.

In what follows, we will discuss three systems that apply agro-ecological principles to a greater or lesser extent: integration of vegetable and animal production, organic farming, and agroforestry.

An important agro-ecological principle is closing loops. This can be done, among others, through the integration of vegetable and animal production, which involves the implementation of rotations or the exchange of products across sub-sectors. All of this serves to reduce the use of external inputs, optimise the nutrients loop, and improve the soil structure. Integration can take place at business or cooperative level, but also on a regional scale in the form of partnerships between specialised farms. Such systems can lead to more efficient land use, an increase in the amount of organic matter in the soil, less erosion and a better balance between input and output of nitrogen. All this requires the necessary expertise and planning.

A number of studies show that the operating results of mixed farming systems vary widely, but that farm income is often below average. By contrast, profit margins are not very sensitive to fluctuations in market prices. Further research should provide a better insight into this matter.

Organic farming is based on four basic principles: health, ecology, care and fairness. It is internationally governed by the basic standards of the International Federation of Organic Agriculture Movements (IFOAM), which have also been transposed into national and regional law. Some organic farmers keep to the legal minimum requirements as laid down in European organic farming legislation. Others go further and apply additional agro-ecological principles.
Organic farming strongly focuses on preserving and improving soil fertility and on closed loops. This involves intensive crop rotation, suitable tillage practices and use of green manures and organic fertilisers. Chemical-synthetic pesticides, chemical fertilisers, feed with growth stimulants or antibiotics and genetically modified organisms are prohibited. The balance between animal and vegetable production is preserved by limiting stocking densities.

The organic sector is experiencing strong growth in Flanders. The area under organic farming has doubled since 2005. However, in 2017, only 1.2 per cent of the total Flemish agricultural area was used for organic farming, which is well below the European average of 6.7 per cent. In 2017, organic fresh food in Flanders had a market share of 2.4 per cent.

Organic farming is put into practice in different ways, meaning that the environmental impact also varies greatly. However, organic farming soils appear on the whole to contain more organic material, which is the most important indicator for the preservation of soil fertility. Agro-biodiversity is also greater in organic farming. Nutrient losses to water and air and greenhouse gas emissions are lower per hectare, but not always per kilogram of product. It should be noted that the environmental impact per kilogram of product does not show whether the environmental capacity is exceeded. In fact, the environmental impact also depends on the production volume, the production density and the vulnerability of the local environment.

Land use per kilogram of product is generally higher in organic farming, because crop yield is lower and animals are allowed more space. The difference in yield with conventional farming does, however, strongly depend on the crop type, the local growth conditions, and the management methods. Polycultures and modified rotations can reduce the difference in yield between organic and conventional farming to less than 10 per cent. Further research into the optimisation of cultivation and management techniques and into the selection of varieties that are optimally geared to organic farming can further reduce this difference in the future.

Research suggests that organic farming can make the European food system more resilient, allowing it to better deal with challenges and shocks such as climate change, pests and diseases, declining subsidies or more expensive external inputs. An important observation here is that an organic food system that restricts itself to the certification of production would likely suffer from the same vulnerabilities as the dominant system.

Agroforestry combines woody plants and agriculture. As with organic farming, some practices can rather easily be integrated into conventional agriculture, whereas other practices require a major transformation of business operations. In 2013, 0.3 per cent of the agricultural area in Flanders fell under the label of agroforestry. The model could be applied to a large portion of the total agricultural land area. Interest, however, remains rather limited, even though in recent years it has grown among young starters in agriculture.
Agroforestry in general leads to a positive impact on biodiversity, higher nutrient concentrations through decomposition of leaf litter, reduction in the amount of leaching nitrogen, more efficient water use and reduced soil and wind erosion. In addition, the production of ligneous biomass (both above ground and underground) allows a substantial amount of carbon to be captured. Agroforestry even allows a higher total biomass production to be achieved than is possible with separate cultivation of crops and trees.

The system involves additional costs at start-up. However, the combination of agricultural, timber and fruit production enables the farmer to diversify the farm’s income.

**Provision of multifunctional services**

Apart from food production, the food system can provide other societal services, ranging from biodiversity to education and care functions.

One example is agricultural nature management. This covers activities that farmers undertake as part of their business operations for the purpose of nature development. It ranges from small, low-threshold measures, such as the installation of nesting boxes, to the individual or group-based provision of green services in nature or other areas, such as grazing management, reed mowing, or ecological verge management. A more holistic concept is nature-inclusive farming which is focused on agro-biodiversity, efficient use of raw materials, and care for the landscape.

Provision of multifunctional services may also include multifunctional management of the landscape, whereby agriculture, in collaboration with other actors, carries out various landscape management functions. Examples are water storage, erosion protection, landscape care or preservation of old regional varieties or forgotten vegetables.

**New food systems with minimal land use**

Since recently, experiments are being carried out with new food production systems that use (virtually) no conventional farmland. A first group of systems includes food production on buildings (open cultivation on roofs or cultivation in greenhouses on roofs) and in buildings (vegetable production, fish farming in combination with vegetable production, mushroom cultivation, insect farming). These new forms of landless food production often use urban residual and waste streams as inputs. They include fully controlled systems such as LED light cabinets, but also open systems such as roof gardens.

These systems are so diverse that no general statements can be made about the environmental gain. Food production generally takes place close to the end consumer, so that the environmental impact of transport is low. In particular high-tech production systems in buildings are still in the research phase. They require more start-up capital due to the technology necessary for lighting, water/nutrients/climate control systems and the monitoring and coordination of these systems. Roof gardens have been in existence for some time and their environmental effects appear to be generally positive. They consume little energy and produce relatively high yields. Roof gardens can also relatively easily make use of (composted) organic waste from the city.
A second group of landless systems for food production includes technologies such as cultured meat and 3D-printing, a technique used to print food. The latter technique offers numerous opportunities such as the supply of personalised food in terms of taste, shape, texture and nutritional value. Cultured meat does not come from slaughtered animals, but is produced artificially.

Both production methods are still in the research phase. For cultured meat, the high production cost, technological issues and uncertainty about consumer acceptance are still main barriers to its commercial deployment. Potential benefits of cultured meat are reduction in the use of vegetable raw materials, space saving, less water consumption, improved animal welfare and the absence of problems with animal diseases. It is still too early for an effective assessment of the environmental impacts.

**Levers**

**Break the path dependency of the food system**

In recent years, many initiatives and networks with a different perspective on the food system have been set up. Alternative food systems also attract attention from policy makers, as demonstrated by the Flemish strategic plan ‘Organic Farming’ and the work on mixed farming systems and agroforestry within the European Innovation Partnership Agriculture (EIP-AGRI).

However, alternative production models still remain relatively small niches. The food system remains strongly focused on an intensive, specialised, export-oriented agri-food chain. This ‘path dependency’ makes the food system stable and prevents the breakthrough of production and processing methods and eating patterns that deviate from the common model. New models can only find wider acceptance if the various factors making up the food system are addressed consistently.

**Develop a long-term strategy and transition paths**

A guiding long-term strategy for a sustainable food system, developed with, and supported by, the various actors, is of paramount importance to facilitate the acceptance of models such as agroecology, multifunctional agriculture and food production systems with minimal land use. Such a strategy must make the transition paths transparent for the diverse group of actors within and outside the conventional food system. Only then can full-fledged opportunities be created for innovation and reconversion.

The clear growth and export ambitions of the conventional agri-food chain and of policy constitute a major barrier to the development of transition paths that bring the system within the environmental carrying capacity. That is why attention to reconversion and innovation opportunities for actors at risk of dropping out due to changes, is of crucial importance. The long-term vision must be consistently translated at the various policy levels (EU, national, regional and municipal) and policy areas (agriculture, nature and environment, spatial planning, economy, etc.).
Use sustainability and resilience as criterion for success

The success of the food system is often assessed on the basis of efficiency indicators such as labour productivity, yield per hectare or per kilogram of feed, and emissions and resource use per kilogram of product. These indicators provide only a limited picture. They do not indicate, for example, whether the carrying capacity of the environment is exceeded. Nor do they provide an insight into the resilience of the production system, such as sensitivity to diseases, extreme weather conditions, or the economic and geopolitical context.

To give more opportunities to new production models, it is crucial to assess the success of the food system against sustainability and resilience, instead of evaluating it only in terms of efficiency. This also requires the further development of sustainability monitoring instruments.

Stimulate knowledge development and innovation

There is still a great need for knowledge development on agro-ecology, multifunctional services, and food production systems with minimal land use. In addition to additional technical-scientific knowledge, there is also a need for further socio-economic research into business models and logistics systems for the distribution of products. Apart from science-driven fundamental research, resources are needed for research in collaboration with farmers and the other actors involved. This should preferably be based on their specific needs and demands. More public financing is necessary because private partners often see little value in providing funding for research into models such as agro-ecology.

The large-scale dissemination of research results to (future) food producers is of great importance. Apart from (agricultural) education itself, low-threshold initiatives such as company visits and social media can be used to enable the parties involved to become acquainted with alternative approaches. Also independent advisers to support farmers can play an important role in this process.

Provide space and financial resources

The lack of affordable agricultural land is a major barrier to agro-ecology. Possible ideas to remedy this are a tax on farmland that is used for other purposes, local authorities that provide land, and a tax cut when undeveloped land is (temporarily) made available for food production.

Alongside space, the lack of financial resources constitutes a barrier to agro-ecology. Support mechanisms for what often are smaller agro-ecological projects can make a big difference. By incorporating a more holistic sustainability assessment into existing subsidy systems, common farming systems could also be eligible for support when they apply agro-ecological principles.

The lack of open space in Flanders is not only a barrier to agro-ecology, but also to the provision of multifunctional services. There is still a trend towards economies of scale and specialisation, whereby farmers seek to maximise their total land area for agriculture. There is concern that nature-related efforts may eventually result in the land being designated as nature reserve. A multifunctional zoning policy could alleviate this concern. The government could also provide land or include the provision of multifunctional services as a criterion for the allocation of available land.
For food production systems involving minimal land use, cities or other actors could provide roofs or vacant buildings. The construction industry could be stimulated to integrate the possible installation of roof gardens in building projects.

**Identify new business models and ways of marketing**

For many consumers, convenience is a decisive factor. In addition to short-chain marketing, food produced according to agro-ecological principles could therefore also be made available more often in conventional retail. At the same time, the reach and efficiency of short-chain selling could be increased, for example, through short-chain hubs and combined home deliveries. Farmers are not always familiar with new business models and product marketing strategies. More attention to this aspect in agricultural education, knowledge sharing and cooperation could provide solutions.

Another major market barrier for agro-ecological products and new food systems is the often higher cost. Retail can help increase the consumer’s readiness to pay by improving the marketing of sustainable products. There is also potential in the hospitality sector, where the higher cost can be recouped through storytelling. The price difference with less sustainably produced food should moreover be reduced by reflecting the environmental and societal costs of food production in food prices.

The provision of multifunctional services must also give rise to appropriate compensation, which can be included in the price of the food product, but can also come from, for example, so-called ‘landscape funds’. These funds consist of contributions paid by actors who use the landscape, such as tourists, local residents and companies, for care of the landscape. Direct agricultural support can also be linked to a number of conditions to be met by multifunctional services. Furthermore, support measures on, for example, agri-environmental measures and management agreements could be revised, whereby the level of support increases as the system becomes more multifunctional or is implemented area-specifically.

**Create consumer support and acceptance**

Networks such as ‘Voedsel Anders’ (Food Otherwise) already help to familiarise citizens with agro-ecological principles and to create public support. Collaboration with civil society organisations with a wider range could augment and accelerate the effect of these networks. The government could give more attention to products from new food systems in its communication and promotion, e.g. via VLAM (Flanders Agricultural Marketing Board). Education can also play an important role in this respect. For the acceptance of high-tech food production such as cultured meat, it is essential to provide clear and substantiated communication on the production method, as well as the advantages and drawbacks.

**Support collaboration**

Much is happening in the area of agro-ecology and new systems with minimal land use, but there is too little interaction between the many, and often small-scale, initiatives. Cooperation can help to share costs, expand the customer base and increase entrepreneurship. Knowledge and experience can be shared via networks. Policy support is necessary in order to further develop existing networks and optimise their interaction. For new production forms with minimal land use, consultation with actors from other sectors, including energy, architecture and urbanism, is also necessary.
Cooperation and consultation are also crucial for multifunctional agriculture, which requires effective forms of governance where the various stakeholders attempt to find a balance between the different, and sometimes conflicting, objectives. This should preferably be done with facilitation by a third party. Regional actors could, for example, be given room to freely determine how to achieve an objective that is put forward by the government. Process guidance and any other appropriate public support could be provided for this purpose.

**Aligning laws and policy with new food systems**

More clarity is desired on the necessary licence(s) for food production with minimal land use. At present, it is not clear whether such production is allowed on agricultural land, in an industrial area or city centre. A relaxation of the existing food safety laws could be a lever. Low-regulation zones could create experimentation space to further develop new technologies and applications until they are ready for the market.

### 4.5 Conclusions

**Towards a sustainable food system**

In spite of the numerous initiatives already taken, major steps remain to be taken towards further reducing the environmental impact of the food system. Many solutions are either already available or in the research phase. The potential impact of the different solutions is quite diverse and not always easy to assess correctly. This is due, among other reasons, to the fact that solutions can be implemented in different ways or have thus far found only limited application.

It can, however, be assumed with sufficient certainty that optimisation of the conventional system will not suffice to bring the environmental impact of the food system fast enough within the limits of the environmental capacity. Over the past decades, the agri-food chain has strongly focused on gradual improvement. In the 1990s, this led to a significant decrease in environmental pressure. Over the past decade, however, key parameters showed a stagnation. There also remain economic, social and health problems. New production and distribution systems and alternative diets that respond to specific problems in the conventional system have difficulties establishing themselves. This is due, among other reasons, to the path dependency of the food system.

Action is therefore needed now. In addition to the sustained focus on system improvements, we must actively create room for system innovations by consistently acting on the various factors that shape the food system. Bringing about a sustainable and resilient food system that is capable of meeting challenges and shocks, is a systemic ‘and-and story’ where the various solution paths complement each other.
Levers for the transition

Throughout the analysis of the barriers and levers for the different solution paths, the following five key focal areas emerged.

There is need for a long-term strategy linked to a coherent long- and short-term policy for the food system. In Flanders, several vision development processes were organised in recent years. The most recent ones are The New Food Frontier and ‘Transformation to sustainable agriculture and food’. In the second project, the actors translated their shared vision into both a strategic plan and an action plan. However, implementation is stalling due to the path dependency of the system, among other things. For example, there are the clear growth and export ambitions of the food industry and the lock-ins due to the major investments in infrastructure and technology in the various sectors. Furthermore, there are also not enough economically viable reconversion options. The Flemish government and the actors in the food system can, however, use the shared basis from the vision development processes to work out a policy strategy. In this strategy it is determined how we, in our region, wish to approach food production and consumption and how we can meet the accompanying ecological, economic and social challenges. Flanders is not an island, so a long-term strategy should ideally be linked to a policy vision and dialogue at European level. It should preferably also be consistently implemented at the different levels of government. The strategy should be as broadly supported as possible, but the government must also have the courage to make guiding choices and put forward binding targets. This may require certain sectors to reorient themselves. Support of reconversion and innovation is therefore an absolute prerequisite.

Cooperation and dialogue among the actors involved are critical success factors. They enable shared discourses, shared knowledge building and investments, valorisation of food waste and the closing of loops. Dialogue is also crucial to create sufficient support for the food policy in the long term. The sustained focus on cooperation and dialogue can lead to a food system made up of ecologically and economically resilient chains. This also includes a fairer distribution of both the costs of sustainability efforts and the generated proceeds. It also implies a correct food price that reflects environmental, health and social costs, and a correct compensation for the ecosystem and social services provided by agriculture.

In addition, there must be sustained focus on innovation and knowledge building, both in the technical-scientific and the socio-economic area. Also the set of instruments for monitoring the sustainability and resilience of the food system must be further developed and refined. Practice-oriented research with a transdisciplinary approach can play an important role in scaling up sustainable solutions and ensuring their broader acceptance. Research funding should preferably be spent on practices and technologies that support the long-term strategy. Research into system innovations can help to break path dependence and provide insight into feasibility and sustainability. Cooperation and knowledge sharing between researchers and practice are important in this respect.
The current **legislative and policy framework** needs to be adjusted to reflect the long-term vision on the food system. Coordination and alignment between the respective policy areas, possibly through a food policy area, are necessary for this purpose. Barriers within legislation and subsidy systems, among others, must be removed to enhance opportunities for solutions that have environmental potential. Low-regulation zones could serve as experimental space.

To support the broader introduction of more sustainable eating patterns – and therefore also more sustainable production – the whole **food environment** needs to be reoriented towards the long-term vision on sustainable food. This involves the broad spatial, economic and sociocultural context that shapes our eating habits. It is driven by the practices of numerous actors, including the agri-food chain itself as well as retail, hospitality and catering, but also education, influencers such as famous cooks, athletes and media figures, non-profit organisations, and above all the government.