



# Agriculture in 2030 – stories of the future

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Working group:

Lars Andersson, Jan Bengtsson, Lena Ekelund Axelsson, Camilla Eriksson, Katja Fedrowitz, Klara Fischer, Hanna Friberg, Sara Hallin, Erik Hunter, Torbjörn Jansson, Pernilla Johnsson, Mikaela Patel, Lotta Rydhmer, Elin Rööf, Elin Slätmo, Cecilia Sundberg, Catarina Svensson, and Erik Westholm from SLU, and Malin Mobjörk, Per Wikman Svahn, Riitta Rätty, Liselotte Dahlén, Daniel Oskarsson and Maria Stenström from FOI.

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# Swedish agriculture: stories of the future

**This publication consists of seven stories that focus on different perspectives of the future of Swedish agriculture. The stories describe both possibilities and threats and raise many questions. What will agriculture and society be like in 2030? And above all, how do we want things to be? What possibilities do we have of influencing the way things develop?**

The purpose of these stories of the future is that they shall play a role in democratic processes by offering a more far-reaching perspective and stimulating discussions about how the choices we make today will affect our future. The future of agriculture is a matter of concern for everyone. We hope these stories will give rise to creative discussions within the agricultural sector, at universities, among politicians and in society as a whole. Hopefully, the discussions will eventually lead to the drawing up of new proposals on political governance, influence on consumers and industry agreements - proposals that will

result in a more sustainable development of agriculture. We also hope that the discussions will identify knowledge gaps so that new research that is of significance for the future of agriculture can be initiated.

The seven stories of the future are the result of a project that was carried out under the interdisciplinary research platform Future Agriculture at the Swedish University of Agricultural Sciences, SLU. The people who participated in this project are researchers who are linked to Future Agriculture and analysts at the Swedish Defence Research Agency, FOI.

The material for the project was compiled at a number of workshops and seminars in which the Future Agriculture reference group, researchers and students at SLU participated. The material consisted of visions, desires and demands on Swedish agriculture. The participants made a list of anything they could think of, irrespective of their own personal desires for the future. The project also included a literature study of the visions, desires and demands that have been

described in the specialised press and political party programmes, and in policy documents and documents on the future produced by trade organisations and public authorities.

The stories of the future are set in 2030 but they look ahead to 2050. The setting in which the stories take place has been taken from an earlier Future Agriculture project (Öborn et al, 2011) where the following future scenarios were constructed: An over-exploited world, A world in balance, Altered balance of power in the world and A fragmented world. The first step of the work was to review these scenarios since a number of years have passed since they were constructed. After that, all the visions, desires and demands that had been compiled (almost 600) were analysed and categorised under 21 different headings, for example: Efficient land use with preserved soil fertility in farmland, Specialisation and rationalisation with regard to size, and More even power structure in the foodstuffs chain. The next step was to investigate how these visions, desires and demands could be fulfilled in the different future scenarios. The purpose was to find combinations of future scenarios and visions, desires and demands that would give rise to interesting questions and ideas. These then formed the basis of the stories of the future presented in this publication.

The seven stories of the future are:

- **Technology is the solution to agriculture's problems** – the driving forces, possibilities and consequences of technological developments
- **What will we eat for dinner?** – how we value our food
- **Controlled by large companies** – large companies control Swedish agriculture in a future where there is basically no political control over environmental issues
- **The new rural population** – integration policy and the development of rural areas in a future with huge migratory movement
- **Eco-labelled food or eco-smart food for everyone?** – sustainable food production and the role of eco-labelling
- **Swedish agriculture 2.0** – agriculture in Sweden is expanding and is profitable in a hard-pressed future
- **Self-sufficiency?** – different reasons for and different degrees of self-sufficiency

The stories of the future are not to be read as traditional descriptions of scenarios; instead they aspire to be thought-provoking and perhaps provocative depictions of the future. Some of the stories depict more than one type of future. You will probably think that some parts are more feasible than others. We believe all the events/circumstances in the stories are possible but we have not included any probability calculations. Our aim has not been to predict what the future will actually be like - no one knows that! Instead we have described different developments in the future which are more or less feasible and more or less desirable. We have not attempted to include all important perspectives and issues – it would be easy to think up more stories.

## References

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- **Join us in the year 2030 and see how Swedish agriculture has changed.** What threats and possibilities do you see in the different stories? Some of them perhaps describe developments that you yourself would like to see happen. What can you do to help to bring about those changes? Some of the stories describe a future that you probably do not want to experience. What can you do to prevent such developments? Read, reflect and discuss.
- **You are very welcome to contact us at** [framtidenslantbruk@slu.se](mailto:framtidenslantbruk@slu.se) if you want to comment on what you have read.



# Technology is the solution to agriculture's problems

In the future, new technological solutions and increased use of technology will make it easier for agriculture to develop production that is economically, ecologically and socially sustainable. Perhaps it will be possible to process and make use of residual products instead of them being the problem they are today? At the same time, it may be difficult to overview the long-term consequences of a major technological breakthrough. There is a risk that certain types of production will be knocked out and people will be forced to abandon the land that their family has farmed for generations. There is also a risk that the agricultural landscape will be changed which will have consequences on both biological diversity and aesthetic aspects of the

countryside. The development of technology is in itself dependent on either the state or companies investing resources and the way developments will move forward depends to a large extent on the development of society. The central issues are: what direction will the development of technology take, what control will society have over that, and what will the consequences be for agriculture and the rest of society?

This story describes three different future scenarios for the development of technology in the 2030s: new technology for a sustainable future, Swedish food for export to Asia, and Swedish bio-fuel as a driving force for technological developments.



# Scenario 1: New technology for a sustainable future

The first scenario describes a future with few conflicts in the world around. Much of the power in Europe is at supranational level, beyond national borders, and there has been a clear shift towards a more sustainable society. Ambitious goals for global justice, equality and the environment are well on their way to being realised and new technology has been developed which is suitable for both small-scale and large-scale agriculture. The focus is on reducing environmental impact and making it easier to do ecological recycling agriculture, both on land and in water, in the form of aquaculture with the cultivation of fish, shellfish or aquatic plants. Precision cultivation is used and cultivation measures and production inputs are carefully adjusted to suit local conditions and variations. With the help of biotechnology, plants are developed that are resistant to pests and disease and small robots are used in the cultivation beds to combat weeds. Animals are fed according to their individual needs which minimises environmental impact and optimises the use of resources. Thanks to breeding efforts and new technology to detect and prevent disease in animals, the effectiveness of animal production and animal welfare have increased. Animal welfare is considered by society to be an important ethical matter.

Within the EU, there is free trade and Swedish agriculture is subject to strong competition from nearby countries. Because of that, agricultural production in Sweden has become niched, competing with products that can be produced in Swedish conditions. Because Sweden holds a leading position when it comes to developing and using new agricultural technology, several niche areas have been very successful.

For environmental and climate policy reasons, incentives are used to promote the development of an economy with a higher degree of re-use and recycling. This trend has been beneficial for research and industry which has led to Swedish businesses also being successful when it comes to developing environmental and ecological recycling technology for agriculture. Swedish technology is exported to other countries, for example, technology for cooling manure and purify outgoing air in animal houses so as to minimise emissions of greenhouse gases and ammonia.

The development of new technology is steered to a high degree by agreements made in international organisations, which for Sweden's part means primarily within the EU. The market's demand for new environment-friendly technology is also driving developments forward. The changes have been achieved by using

both stick and carrot. In some cases, the use of technology and substances that are harmful to the environment or health has been forbidden which has either led to the emergence of new techniques that replace the old ones, or to production being shut down because there has been no breakthrough of effective alternatives. In other cases, subsidies and research have encouraged the development of and a transition to new techniques, for example, biological control of pests and diseases. Because there is a large demand for eco-smart technology, it has become economically worthwhile for trade and industry to invest in research and development within this field.

The general public have great confidence that developments in technology are regulated in a responsible way. This has brought about a rapid growth of Swedish biotechnology companies in the agricultural sector which has led to a market for products that have been adapted for different types of production. One important reason for increased confidence is that global and interstate agreements about how companies must make their risk analyses public have changed. There is greater scope for adapting risk evaluation processes and taking regional and national differences into consideration regarding how risks linked to cultural and ethical aspects are viewed. For example, it is considered very important that the consequences of new technology on health, animal welfare, the environment, cultural landscape and biological diversity are evaluated.

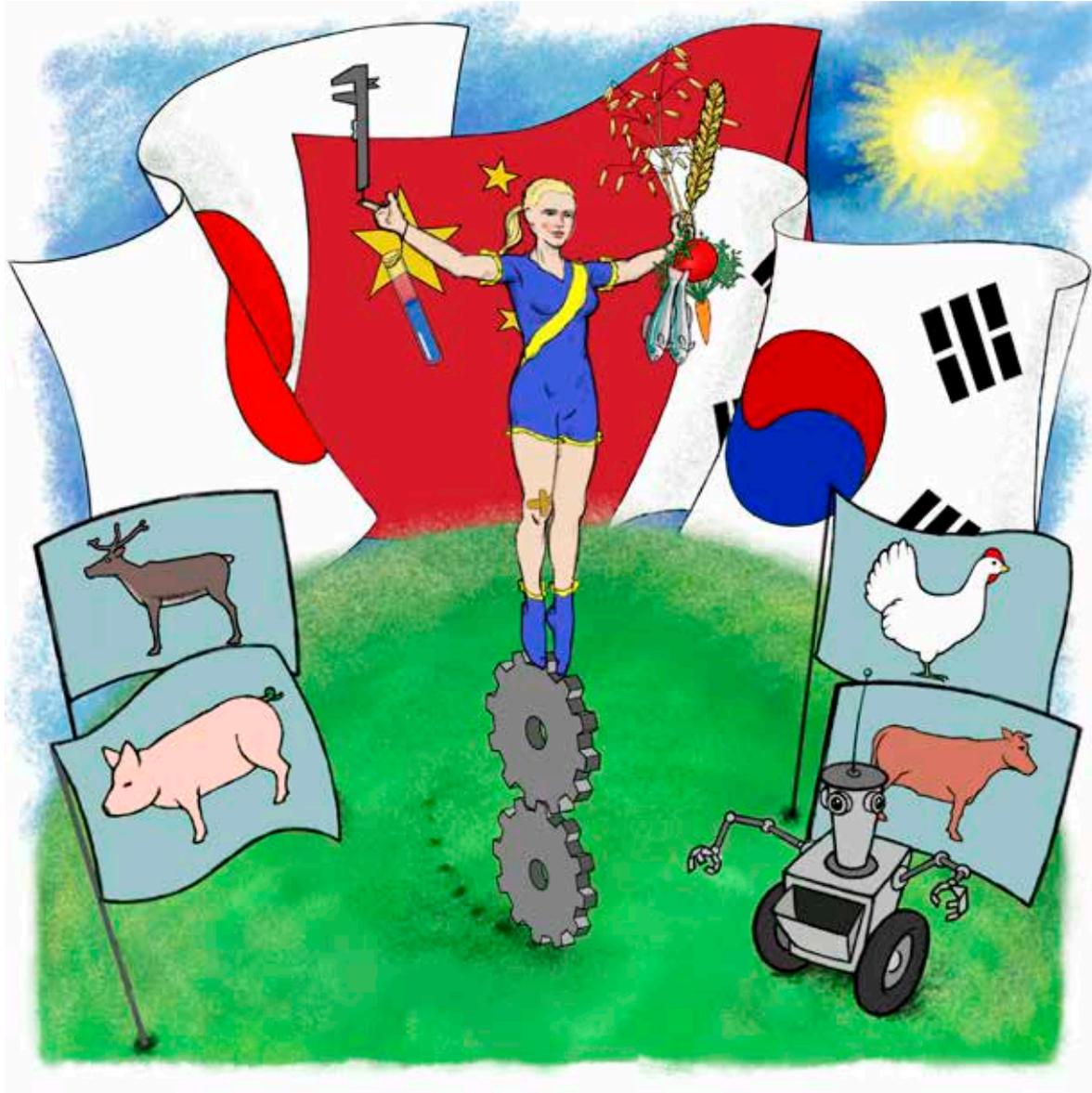
### **Many small biotechnology companies**

There is global agreement on the setting up of control instruments and trade rules which means more companies succeed in establishing themselves in the seed sector. One of the effects of the new regulations concerning biotechnology and refining processes is that they have secured the rights of farmers to take their own seed and refine it at farm level. Moreover, many small biotechnology companies have entered the market by developing and selling niche products that are specially adapted for small markets, for example, farmland in Norrland.

### **New technology has resulted in sustainable agriculture**

Both animal and human manure are processed to make fertilisers that are free from metals, pharmaceuticals and infective agents. The content of nutrients is analysed carefully so they are adapted for precision fertilisation. Greenhouse cultivation has become more significant through the use of waste heat from industries and buildings. Most of the energy that farmers use is renewable, coming from farm-based production of solar and wind power, and bio-energy from by-products from forestry and agriculture. Fossil fuels are being phased out since new machinery is run on electricity and bio-fuels in different combinations. New technology has raised the level of technology of agricultural companies which

has in turn made them more eco-friendly and profitable. Lighter, self-driving and precision-guided machines perform many work tasks and reduce labour and fuel costs. At the same time, dependency on IT technology has increased and thereby made agriculture and society more sensitive to disruptions. New, advanced technology entails high costs when introduced but the costs decrease rapidly once the technology has become established and made an impact. Then small companies can also benefit from the new technology.



## Scenario 2: The export of Swedish added values to Asia

In the second future scenario, the power balance has shifted from the Western world to countries in East Asia whose economies have developed strongly. At global level, political ambitions as regards climate and the environment are low. Severe global warming has meant plant production for food and animal feed has moved towards the northerly regions of the world. The global economy is characterised by deregulation and free trade. In Europe, economic developments are relatively weak and there is practically no common agricultural policy. Many Swedish farmers are employed by, or subcontracted by, Asian companies that have set up business in Sweden. Labour immigration to Europe has led to an increased supply of labour for the agricultural sector. Global competition is higher than it was in the 2010s. In order to handle that and at the same time try to benefit from Asia's interest in Nordic food products, many Swedish agricultural companies have readjusted and started to produce products for the Asian market. Interest in Nordic added values such as purity and naturalness has meant that Sweden is exporting certain foodstuffs to Asia, for example, meat, dairy products and berries.

The large demand for animal products in, for example, Asia and the good supply of labour for the agricultural sector has contributed to the

development of rational management systems for large animal stocks with access to the outdoors. New biotechnology has been extensively used for breeding programmes and has focused on robust animals with good production and high resistance to disease. The reindeer industry has benefited from this and become more important thanks to good export opportunities.

There is berry production in Sweden's countryside, both in forests and farmland. The berries are refined locally or exported fresh for use in different food products that are marketed on the basis of their health-promoting properties. The growing and picking of berries is extensively automated, using small and cheap machines that are made in Asia and owned by the Asian companies.

### **Large biotechnology companies**

The companies promote new technology through their development departments and the market is dominated by large international companies with a long-term perspective who are prepared to make investments. For example, plant breeding has resulted in cultivars that are more resistant to fungi and pests and they have developed technology that can register nutritional status, disease and insect infestation on crops so that both nutrients and disease control can

be set in at the right time. Genetically modified crops that have been developed in China and are adapted for the Asian market are cultivated by Asian agricultural companies in Sweden and then exported. These include vitamin-enriched crops and other modified products that focus primarily on an optimal nutritional content and are aimed at the health-conscious and growing middle and upper classes in Asia. The development of new technology focuses on the crops and animals that are the most profitable or that have an obvious added value for the consumer, for example, that the animal has been reared in a clean environment. A prerequisite for this development is that agriculture is profitable so it is possible to invest in new technology. This means that the development of technology is rather unevenly distributed among different types of production and there is little interest in developing technology for unusual crops and animal species. Because no new technology that is adapted for small-scale production is developed, many small farms are knocked out of business.

### **Insufficient control of technology has a negative effect on third parties**

The large companies are driving new technology forward. Technology is being developed to suit Swedish conditions but Sweden has little control over what new technologies are introduced. Most responsibility and risk assessment has been handed over to the companies. New technology is launched onto the market when the companies deem the market is ready for

it. The companies are very willing to test new technology. Even though the larger enterprises do take some form of long-term responsibility via, for example, industry standards, in this future scenario, insufficient control of new technology leads to a relatively large risk of surprises that can afflict third parties. For example, insufficient safety awareness means the number of work-related injuries is unnecessarily high. There is also a risk of monopolistic situations where individual companies that come up with a revolutionary new discovery can rapidly gain a dominating position where farmers and the general public end up in a clear relationship of dependence.

## Technology and ethics in animal husbandry

New technology in the field of agriculture, especially when animals are involved, is viewed in a special way since this is about the food we are to eat and how that technology will affect other living creatures.

Some technology can cause increased suffering for animals, for example, if the animal must undergo a procedure or be held in a restricting way. Likewise, certain genetic changes to the animals' properties, irrespective of technique, reduce animal well-being if the conse-

quences of a certain type of breeding selection have not been investigated in advance. However, breeding management can also improve animal health and well-being and technology can improve the animals' environment. Automated feeding and milking stations have made it possible to have free-range dairy cows indoors. Irrespective of whether breeding is done with genetic engineering or in the traditional way, it may result in species that are better adapted to the environment and production system.



## Scenario 3: Swedish bio-fuel – driving force for technology development

The third future scenario depicts a world where there is a global shortage of goods, land and water. There is still free trade in many fields but protectionism is increasing, especially in the food industry. There is a low-intensity trade war going on between the EU and certain countries outside the EU. This unsettled situation has meant that the import of agricultural products to Sweden has been replaced by self-sufficiency as regards important staple foods such as cereals, root vegetables and legumes, and Sweden has also become more self-sufficient when it comes to meat. The main problem has been a shortage of fuel since the import of oil and other petroleum products has become uncertain. However, a combination of bottom-up innovation where individual farmers and small enterprises find solutions, investments made by the vehicle industry, and some state aid for innovation has meant that the technological and economic obstacles that have obstructed the use of bio-fuel have been overcome and there is now a sufficient supply of fuel in Sweden. The vehicle industry has made major investments in adapting vehicles to new blends of fuel and most Swedish vehicles and agricultural machinery are

run on bio-fuel. Primarily, fuel from the forest industry is used but bio-diesel is also produced from rape, biogas and ethanol from cereals and agricultural residual products. Developments in this part of the technology sector are a result of joint efforts by the state and private companies.

In other sectors, technology development in agriculture is slow because of the difficult economic situation. The government only makes limited investments in stimulating new technology and instead prioritises cheap measures such as simplifying regulations.

### **Increased production of Swedish vegetables**

After some resistance, the need for domestic vegetables production has led to such production becoming part of agricultural policy. After a period of adaptation, less meat and more vegetable products are being produced. Since less animal feed is needed, there is enough farmland for both food and bioenergy crops.

The production of bio-fuel provides extra income for agriculture which compensates for increased fuel costs. There are bio-refineries of varying sizes which combine in different ways

the production of fuel, electricity, heat, food, animal feed and fibre for the manufacture of textiles. New technology has been developed to produce pure phosphorus fertiliser from sewage sludge and mineral fertiliser nitrogen using renewable energy. This technology is exported to other countries.

### **Small-scale plant breeding**

Because of limited global cooperation and trade, in this future scenario, global and interstate agreements on intellectual property rights and plant breeding protection are no longer followed. At the same time, Sweden's poor economy means there is minimal state investment in plant breeding and development. The shortage of domestically produced seed from new varieties and the fact that it is more difficult to rely on the import of seed means that many farmers have taken the matter into their own hands. Several farmer-run cooperatives for small-scale plant breeding and a system

for swapping seed has been started up in the Nordic countries. The cooperatives have access to genetic material in the Nordic gene bank which increases the diversity of varieties and the genetic variation of the crops that are grown. This means it is easier to adapt varieties to suit different regions than it was in the 2010s. In this future scenario, developments are pushed forward by necessity and many people are prepared to take greater risks. At the same time, uncertainty in the world around may lead to concern about the consequences of a major adjustment and people may instead choose to refrain from major changes in technology.

## Discussion questions

- To what extent are policy instruments needed so that the development of new technology will promote a sustainable development of agriculture?
- Is it possible for large international companies to steer the development of new technology towards a sustainable development of the agricultural sector?
- Can the private sector develop new technology that will be suitable for forms of production that are small-scale or marginal in some other way?
- What are the driving forces that make a farmer an innovator and entrepreneur?
- Does it make any difference to animals or humans if animals are cared for by robots or by people?
- Can technological solutions be regarded as being more or less "natural"?

# What will we eat for dinner?

What sort of eating habits will we have in the future and what food will we put on our plates? This story presents two different future scenarios where our eating habits have changed as a result of new values. In the first scenario, Sweden's economy is strong, there is a major breakthrough for environmental and sustainability issues, there is sufficient food and thanks to an ecocycle approach, the earth's vital resources are being preserved. In the other scenario, Sweden's economy is weak, population growth is rapid, people are more focused on simply getting food on their plates, and food safety is a major problem.

In both scenarios, a large share of the food is produced in Sweden and people spend about 20 percent of their disposable income on food. Food waste has decreased at every stage. The consumption of meat has gone down radically while the consumption of legumes, fruit and vegetables is much higher than it was in the mid-2010s. In both scenarios, new varieties of crops are being grown in Sweden.

In the first scenario, consumption is affected by values linked to the environment and justice; in the second, food supplies and safety are central issues. In both cases, the farmers are key players since they are the ones who produce food and there is close contact between farmer and consumer.

In 2030, the year in which these two future scenarios are set, the total agricultural area and food production have increased in Sweden, compared with the mid-2010s. Hunger and starvation in the world are largely the result of the uneven distribution of global resources. With a growing middle class, more food needs to be produced, food waste must decrease and resources must be more evenly distributed. Sweden's responsibility for the global supply of food is increasing as climate change continues since we have good access to water and fertile land. At the same time, the area of cultivable land in southern Europe is decreasing because of climate change.

## Food was not valued highly at the start of the century

In the 1950s, Swedes spent half of their disposable income on food. Around 1975, that proportion had dropped to a quarter and around 2015, the proportion was down to one eighth.

At the start of the 21st century, about 15 percent of edible food in Sweden ended up as waste. This was in part because food was relatively cheap.

Most waste was generated by the end consumers.

In the 2010s, many Swedes ate one or more meals a day at a public institution. Because the cost of food at such institutions had to be kept down, the economic value of publicly procured food was only a few percent of the total value of food.



# Scenario 1: It feels good to eat good food

In the first scenario, people are interested in the environment and justice, and from a global perspective, the standard of living is more equal than it was in 2015. Thanks to forceful global environmental policy, carbon dioxide emissions are decreasing and the pressure on land resources is moderate, despite climate change and population growth. Sweden has good pre-conditions for food production compared with countries in southern Europe where drought is a major problem. A conscious ecocycle approach means agriculture has a limited need for external inputs such as phosphorus. The inputs needed for agriculture are available on the market. The EU imposes forceful governance over matters linked to the environment, climate and energy use. Fossil fuels are expensive and the price of electricity is also high.

In the 2030s, food is highly valued by a majority of the population, at the same time as people understand the importance of economising with the earth's resources. This development has been driven forward by the drawing up of a Swedish food strategy that was started in 2015. According to consumers, good food is food that is sustainably produced with regard to the environment, animal ethics and social aspects, while at the same time being tasty and nutritious. Global justice is an important social aspect but many

consumers want to protect and promote Swedish agriculture and a small-scale food industry. In their opinion, good food is food that is produced in Sweden.

The restaurant sector has reached a voluntary agreement that the country of origin is to be stated in menus in restaurants and cafés. There is still a difference in price between Swedish and European raw food materials but the difference is less than it was in 2015. This is because EU regulations have become more stringent and are now approaching the level of Sweden's rules, wage levels within the EU have evened out as the union's most recent new member states have developed, and the cost of producing food has increased in countries around the Mediterranean sea because of climate change.

## **Winter apples are at a premium**

In 2030, Swedes spend on average almost twice as much of their disposable income on food compared with the 2010s. This increase is primarily because of increased interest in good quality food. Food is important and people want to enjoy eating tasty food. However extravagance is viewed as being immoral and no one wants to be called a gourmand. Chefs compete in cooking good, seasonal food and like to use leftovers and raw food materials that may otherwise go

to waste. Food magazines and television programmes also highlight food that is made from leftovers and recipes that use an entire fish or a whole vegetable. Restaurants serve small portions, allowing people to take a second portion if necessary. At home, many people have disposed of the huge dinner plates that were popular at the beginning of the century.

In this future scenario, the quality of food does of course vary but many consumers choose to spend a lot of time and money on food. They search for information, make demands and buy food that is of good quality. For reasons of public health, the VAT on items with a high content of “empty calories”, for example, fizzy drinks, is higher than on other foodstuffs. Of course some people still buy cheap food during certain periods when they prioritise other things in life than food but the change in values that has taken place in society means that the demand for cheap food of poor quality is going down year by year.

### **No red stickers**

There is a wide range of good quality, ready-to-eat products that are made of Swedish ingredients. Supermarket chains do not want to be associated with the cheapest foodstuffs so low-price items are not advertised, and not displayed in shops. Animal rights organisations have managed to get the large supermarket chains to stop using animal foodstuffs to attract shoppers. A common attitude is “better to have expensive meat of good quality at the weekend instead of cheap meat several times a week”.

### **Locally produced food in schools**

Schools play an important role in creating values. Primary production, the manufacturing of food, education in nutrition and cooking are given a lot of space in the curriculum and sustainable consumption is integrated with a number of other subjects. There is a political will that food at public institutions must be of good quality and public procurement is used as a control instrument. Many municipalities are proud that they serve locally produced food of good quality which has meant that food comprises a relatively large share of the budget. As a result, municipal food policies are discussed during election campaigns and the cost of food is compared with, for example, costs for recreational facilities and public decoration. In line with Sweden’s food strategy, EU funding is used to strengthen an infrastructure that makes it easier for local producers to compete in public procurements, for example, common preparation facilities for root vegetables.

Because of extensive public interest in food and good profitability, the status of farmers in society is high. Farmers are heroes! Upper secondary schools with Natural Resource Management programmes have many young pupils and also older people who want to change career and study so they can work in agriculture. There is a demand for new vegetables from people who have migrated to Sweden and because of the strong market, farmers dare to try to cultivate new varieties. Fruit and vegetable growing contributes to high employment and

fish cultivation, which is an important branch of agriculture, also generates jobs. Food tourism is well-developed in rural areas and there are many farm shops, village taverns and farms with accommodation for tourists.



## Scenario 2: Food for the day is the most important thing

In the other scenario, Swedes have little interest in matters linked to the environment or justice. The social welfare system, for example, compensation in the event of illness or unemployment, is not as good as it was at the beginning of the century. Nevertheless, living conditions are still better in Sweden than in most other countries.

There is free trade but it is hampered by the lack of common sets of regulations. The EU is weak and in many member states, agricultural policy is focused on national self-sufficiency. All over the world, there is great competition for farmland and in large parts of the world, crops are grown wherever it is possible to do so. This means that even contaminated ground is used for cultivation and grazing. The national control systems are often deficient and residues of pharmaceuticals and pesticides are often found in imported raw food materials. Food safety is therefore an urgent matter for consumers. Food scandals, health risks and cheating are given a lot of coverage in the media and many scandals are linked to imported foodstuffs.

Consumers say that good food is food that is affordable, safe to eat and nutritious. All the people who neither trust producers nor the

control systems in other countries say that good food is food that is produced in Sweden. People's diet consists primarily of domestic products such as potatoes, oats, bread, apples, carrots, cabbage, beans, milk, egg and rapeseed oil. In 2030, Swedes spend on average almost twice as much of their income on food, compared with 2015. The increase is because of a combination of reduced income and more expensive food.

### **Ready-to-eat food makes everyday life easier**

In Swedish towns, the standard of living is lower than it was at the beginning of the century. Cramped housing accommodation is common and there is often nowhere to store food. Society has made huge cut-backs in welfare, both in Sweden and in other countries. Many people have two jobs so as to be able to afford private schooling for their children and someone to take care of their elderly family members. At the same time, it is difficult to find a job and many people choose to start up their own company on a small scale. It is easy to get hold of cheap labour. All in all, the lack of space, time and permanent jobs leads to a greater demand for and

a large supply of ready-to-eat everyday food. Entrepreneurs buy up food that is approaching its sell-by date and vegetables that are discarded by the shops. Using these ingredients for cooking takes time (cleaning, peeling, chopping) but there is plentiful cheap labour. The food is sold ready-made at places many people pass by on their way home from work. Some of these companies have direct contact with farmers and buy up “second choice” raw food materials, for example, crooked carrots. There are also many markets where consumers can buy raw food materials direct from the producers or from market stalls. Producers often collaborate as regards distribution and marketing.

### **People are frightened by food scandals**

A fear of cheating with food and food poisoning drives consumers to make contact with farmers. Cow-share programs and pick-your-own farms are common and some farmers let their customers take part in farm work, for example, pick the potatoes left in the ground after the harvester. High levels of immigration have led to changed demands for vegetables, fruit and cereals. Some farmers have started to grow new crops so as to meet such demands. Many immigrants start up gardening companies and food companies on a small scale, some of which grow over time. Farmers rent out allotments in places that can be reached by bus from the towns. The government buys up land for allotments which are rented out at a low cost and the Swedish church offers free allotments on their land as

part of their charity work. In towns, fruit trees and berry bushes are more common than ornamental plants in parks and there are also bee hives. Schools and care facilities are expected to have their own vegetable gardens.

In rural areas, it is common for people to have a few household rabbits or hens and these domestic animals are also common on housing estates and in schoolyards. They provide meat and egg which improves people’s diet and this is also a way of making use of leftovers. Any surplus is used in informal barter trade or sold which provides a little extra income. This small-scale production is difficult to control and every now and again it causes outbreaks of disease. The regulations for food production and food control are adapted for small-scale production which means that food safety is not quite as good as it was at the beginning of the century but it is still better than it is for imported food.

Hunting, recreational fishing and berry-picking provide food and extra income. This is encouraged by the state and tax rules have been adapted to promote such use of natural resources. The great interest in “wild” food leads to many conflicts with landowners and the right of public access rule is put to the test.

# Food, power and values

Both these future scenarios show that there may be different reasons why people's attitude to food changes. Shifts in values may be linked to a striving for justice in society, a shortage of food and money, health risks, a desire for a healthy lifestyle or a positive

interest in food. In the long run, political objectives influence people's values and therefore a national food strategy will play an important role in shaping developments.

## What influences our consumption?

Political control can be executed through, for example, public procurement, education, tax regulation, distribution of EU aid and national, strategic investments. Decision-makers in the food industry also affect consumption, depending on how they view their role when it comes to the supply of food and food safety. Altered values can influence both what consumers choose to buy and how much waste there is at all stages of the food chain. Historical changes that show it is possible to

change values linked to consumption are attitudes towards cigarettes and furs - no one thinks it is glamorous to smoke or wear a leopard fur anymore. A shift in values is noticeable both in food stores and on election day. Individual persons can only have a small influence on the food industry and agriculture but as a collective, they can be of great significance.

## Discussion questions

- How much of one's disposable income is it reasonable to spend on food?
- In what way can school affect people's eating habits and is this a task that schools should take on?
- Domestic rabbit-keeping and hens in gardens - how would that affect animal welfare and who would care?

*In both future scenarios, food is valued more highly than it is today but there are different driving forces behind this change.*

- Does it make any difference to agriculture why food is valued more highly?

*Consumers want to know where food comes from and they want to be involved. Owning a share of a cow, planting one's own rows in a potato field, pick-your-own farms...*

- What demands does close contact with consumers place on farmers?

*The gap between rich and poor in Sweden is increasing.*

- How will the poorest people be affected in these two future scenarios? What do they consume?

## Further reading

- Jordbruksverket, Livsmedelsverket och Naturvårdsverket. 2013. Hur liten kan livsmedelskonsumtionens klimatpåverkan vara år 2050? Ett diskussionsunderlag om vad vi äter i framtiden.  
<http://webbutiken.jordbruksverket.se/sv/artiklar/ovr296.html>
- Röös, E., Patel, M., Spångberg, J., Carlsson, G., Rydhmer, L. 2015. Kött och mjölk från djur uppfödda på bete och restprodukter – ger det en hållbar kost? Uppsala, Sveriges lantbruksuniversitet, Future Agriculture. ISBN: 978-91-576-9370-9 (electronic), 978-91-576-9371-6 (printed)

# Controlled by large companies

What will happen if property rights for natural resources are no longer *restricted* by legislation and other state governance, and instead market forces have more freedom of action? How would the market handle environmental issues? What would the consequences be for rural areas? How would consumers be affected?

This story describes a future where the position of democratic institutions has become weaker, at the same time as global climate change has changed preconditions

## Property rights

Property rights are usually defined as:

- 1) The right to use an asset
- 2) The right to make an income from an asset
- 3) The right to permanently transfer a property right to someone else

Source: Alchian, A. A. 2008. Property Rights. In David R. Henderson. Concise Encyclopedia of Economics (2nd ed.). Indianapolis, Library of Economics and Liberty. ISBN 978-0865976658.

for agriculture. Productive land has become a scarce resource and the purpose of legislation is primarily to strengthen property rights and open up for international trade with agricultural land.

With the right framework conditions, companies will voluntarily choose to address certain effects on the environment, in situations where poor management leads to costs for the companies. For example, it may be profitable to preserve the fertility of the land, to protect the company's own water sources from contamination, and to protect one's own supply of pollinators. Other natural resources, for example. seas and global climate, are difficult to manage effectively without policy control instruments and their environmental status is deteriorating drastically in this story of the future.

Small and medium-sized agricultural companies have problems coping with an increased need for capital which is a consequence of increased international competition. Farmers become middle managers and the working conditions of farm labourers are similar to industrial workers. This story is also based on the assumption that

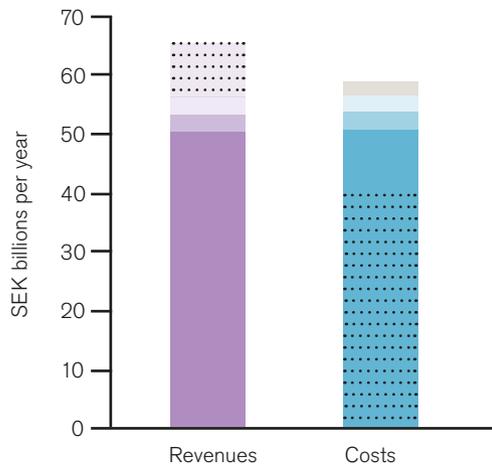
consumers are relatively uninterested in the environment or food. When large companies take over, power in the food supply chains is shifted to the production side and the position of consumers is weakened.

### Number of agricultural companies in Sweden

The number of agricultural companies in Sweden has steadily declined during the last thirty years. Despite this drop in number, there are still many small companies. In 2014, there were about 30,000 full-time farms.

Source: Jordbruksverkets statistikdatabas

### Income from agriculture



Income from agriculture does not cover its costs unless aid is included.

Source: Jordbrukets inkomster: Statistiska meddelanden, Statistiska centralbyrån, JO 45 SM 1601.

4 February 2016. <http://bit.ly/2dQWcjH>

- Aid
- Secondary activities
- Production of services
- Production of goods
- Net interest
- Leases and rent
- Salaries and fees
- Capital consumption
- Inputs



## Scenario: A world dominated by large companies

It is 2030. Global climate has deteriorated so that temperate areas that used to be productive are now affected by drought and poor harvests. The most fertile land is now located closer to the poles. The political climate has also changed. The European Union collapsed as early as in 2020 as a result of growing conflicts between its member states.

When climate change and international unrest pushed up food prices, the Swedish government saw opportunities to exploit Sweden's relatively good supply of fertile land and to expand food exports. As part of this rationalisation process, legislation on land use was simplified in a number of areas. The government made it possible for landowners to make long-term plans by simply doing away with most of the old patchwork quilt of rules and laws and replacing it with a liberal system whose purpose was to protect private property rights. The Land Acquisition Act was abolished, as was the right of public access and most animal protection legislation.

Agricultural and forestry companies no longer have any special legal or tax status. They have been incorporated into the general system together with limited companies, trading companies, limited partnerships and sole traders.

Land as a resource is handled in the same way as any other capital good. The result has been that

strong national and international investors have been able to enter Sweden's agricultural industry and have replaced many of the traditional family farms. The structure of production has also been changed by this large input of venture capital, not least by animal husbandry now being concentrated to fewer and larger units.

### The Land Acquisition Act

Trading with agricultural land is regulated in the Swedish Code of Statutes 1979:230.

*"The Land Acquisition Act is an old law which the competitiveness inquiry has clearly identified as an obstacle for agricultural companies that are run as limited companies."*

Minister of Agriculture, Bucht, in the paper Jordbruksaktuellt, 5 May 2015

Many of these changes became possible after the collapse of the European Union. After being liberated from the EU, the government saw opportunities to deregulate Sweden's agriculture to make it more efficient and rational. As a result, Sweden's relatively good supply of fertile land can now be utilised in an economically effective way and contribute to the global supply of food.

After the Land Acquisition Act was abolished, more and more Swedish farms have been bought up by limited companies and in 2030, most of the large farms are owned by multinational giants. Some of the companies are specialised agricultural groups while others belong to company chains that have interests in several areas of products.

The demand for forest has also increased after the right of public access was abolished which means that berry production with professional pickers has become profitable for forestry companies. Several food retailing groups have therefore become forest owners.

### The world' supply of calories

In 2010, 49 percent of the calorie consumption of the world's population came from four products: wheat, rice, sugar and corn. These products, primarily corn and wheat, are also used to a large extent in animal feed and thereby indirectly further contribute to humans' calorie consumption.

Source: FAOSTAT Food Balance Sheets.  
[http://faostat3.fao.org/browse/FB/\\*/E](http://faostat3.fao.org/browse/FB/*/E)

All countries in Europe have controlled borders and they make use of opportunities to fill up their coffers and protect their domestic sectors by having import customs wherever possible. Increased protectionism runs counter to the uneven distribution of fertile land: as a result of climate change, yields increase in Sweden

and cereals can be grown relatively far north, while large parts of the world are suffering from drought and erosion. It is profitable to export food from Sweden to many parts of the world, despite trade barriers. Consumers in the importing countries spend a large share of their income on basic foodstuffs and problems with food supply has led to open trade war.

There are no longer any large international, interstate funded research programmes of the kind that primarily the EU used to run. Because of a lack of resources, the government's funding of research within the fields of agriculture and food has been reduced to a minimum. National research is therefore limited or of poor quality. Instead multinational agricultural groups do some applied research and development. These companies are sufficiently large to be able to fund extensive research but there are no international agreements about how patents and other intellectual property rights are to be handled. It is difficult therefore for companies to make money out of research when results can be copied by competitors - it is hard to assert property rights.

Plant breeding and animal breeding, which are often done using biotechnology and genetic engineering, are focused on properties that are desirable at the processing stage. Companies strive to create a production system that extends all the way to marketing to the customer, where their own varieties and production methods are part of the concept. Within animal breeding, multinational companies produce new lines for different markets, for example, for different climate zones

## Number of livestock breeds

In Sweden, milk production is dominated by the breed SLB. In 2014, 53 percent of cattle were SLB, 39 percent were SRB and only 8 percent were other breeds. The trend is that SLB is increasing.

According to FAO, 35 percent of the world's domestic animal breeds are unthreatened while the status of 36 percent is unknown and the others are either threaten (20 percent) or extinct (9 percent). The situation is worse for poultry than for mammals.

Sources:

Växa Sverige, Husdjursstatistik 2015.

FAO. 2007. The state of the world's animal genetic resources for food and agriculture. ISBN 978-92-5-105763-6

or different kinds of feed, and above all, for raw food materials for their own highly refined end products.

Another reason for conducting a certain type of breeding and refining is to reduce the economic risk that is associated with poor harvests and epidemics. By ensuring that each production region produces at least a handful of different lines and varieties, the damage that could be caused by an outbreak of disease can be limited. This insurance aspect is particularly important since the high levels of border protection lead to stronger

price fluctuations. Customs duties isolate markets from one other and prevent trade from adapting to variations in supply and smoothing out fluctuations. The companies protect themselves from price variations in other ways too: because of their size, they can supplement their product portfolio with substitutes. A group that produces beef, pork and poultry, and is large enough to influence prices, can make a profit in almost any market situation. For example, the price of pork will increase if pig production is disrupted, which stabilises the profit of that sector at the same time as consumers will instead demand more beef and poultry, which will increase profitability there.

## The large companies' interest in the environment

Agricultural land is a scarce commodity all over the world in 2030. Producing food for a growing global population is profitable and Sweden is one of a diminishing number of countries and areas in the world where there is still fertile land that has not been ruined by environmental toxins. Swedish land is therefore a valuable and

## Quote from Nestlé

*"Nestlé Waters recognizes that the long term success of the company is built on effective water stewardship in the watersheds where our factories are located and where suppliers and consumers live."*

Source: [www.nestle-waters.com](http://www.nestle-waters.com), March 2016.

attractive resource for international investors. In this story of the future, much of the companies' capital is tied up in land ownership and the shareholders demand that the land resources are managed well. This means that the companies are prepared to make long-term investments in order to preserve the properties of the land that influence productivity. For example, fertility is highly valued. For brands that are directed at the higher price segment, it is also important to limit the amount of toxins and injurious substances since any scandals will have a negative effect on the status of the brand and the value of the shares.

Good protection against disease and pest mana-

### Water Framework Directive

The EU's Water Framework Directive regulates activities that affect surface water and groundwater in a run-off area. It regulates, for example, the handling of plant nutrients and wastewater.

Source: The European Parliament's and the Council's Directive 2000/60/EG of 23 October 2000 on the setting up of a framework for the community's water policy measures.

gement are important elements in the companies' strategies for quality assurance.

Because one and the same company owns large, connected areas of land, some of things

that were previously categorised as ecosystem services or external effects are now internal economic effects for the companies. For example, the companies are forced to tend to pollinating insects by integrating beekeeping with their activities, adapting chemical pest control to pollinators and ensuring there are suitable habitats for the insects by integrating suitable crop rotation and landscape elements. One side effect of this is that a certain amount of biological diversity is maintained. In addition, groundwater - which is used for food processing and the production of bottled water - must be protected from plant nutrient leaching and pesticides.

However, the companies' responsibility for the environment ends where collective benefits start. They are not interested in preserving cultural landscape, nor in reducing their climate impact unless doing so would be advantageous for the share owners' private economies. In this story of the future, society has little interest in environmental preservation and state resources for handling problems - especially border-crossing problems - are even smaller. Natural resources that are not owned privately have collapsed. Leaching to watercourses is only prevented if the watercourses are owned by a company and used, for example, for aquaculture. The companies do not care about any leaching into the Baltic Sea. Lack of collaboration around the Baltic Sea has resulted in there no longer being any fish stocks of economic interest in Swedish waters. The Baltic Sea is therefore character-

rised by over-fertilisation, contamination and overfishing. Instead, fish are produced mainly through aquaculture on land where the producer has full control of the entire process.

### **Altered rural areas**

In 2030, the the prices of bulk commodities, that is, non-processed agricultural raw food materials such as cereals, oil crops, sugar and starchy root vegetables, are too high for them to be used for animal fodder to any great extent. The large companies' production of bulk goods is specialised on a few plant species that are grown on large areas in the most fertile lands in Sweden. Profit is created through the scarcity of land. It is more profitable for companies to choose varieties with a high yield than to produce diversified niche products that few people are interested in and even fewer can afford to buy.

No grazing cattle are seen in these regions since the large companies do all their meat and milk production on a large scale indoors. Fodder often consists of by-products from the food industry. If there are effective drugs, antibiotics are permitted in Sweden's animal production. Because of growing problems with resistance to antibiotics, many companies have introduced strict quality assurance programmes to prevent the spreading of infectious diseases. The large production units are not open to visitors and extensive measures are taken to protect the animals from infection.

Less fertile land is also valuable and global warming has made it possible for new perennial

### Resistance to antibiotics

In 2007, an estimated 25,000 people in the EU died as a result of an infection that was caused by one of just five antibiotic-resistant strains of bacteria. The cost for society was estimated at 1.5 billion Euros.

Source: European Centre for Disease Prevention and Control. 2009. ECDC/EMEA joint technical report. The bacterial challenge: Time to react. ISBN 978-92-9193-193-4

crops such as vines and several varieties of fruit and berries to be grown there. On land that is rich in lime, such as on the islands of Öland or Gotland and around the big lakes, new successful wine regions have been created. These areas are also attractive tourist destinations.

Agricultural work is done by employed farm workers. Agricultural work is like any other type of salaried work and the wage and status of farm workers are similar to those of industrial workers. The work consists mainly of supervising semi-automated processes and the number of employees is smaller than it was in the early 2000s. Robots and precision machinery that is controlled via GPS are used a lot but they must be supervised and maintained.

Small agricultural companies are no longer of any major economic significance. They lack the capital that is needed to farm the most fertile lands. On the other hand, there are more

“moonlight farmers” now than there were at the beginning of the century. This is partly the result of a reactionary romantic trend, and partly because of new poverty where people without any social network are forced to be self-sufficient in a black market economy. These small business owners farm marginal lands that are small, poorly located and with a low yield per hectare. They cannot afford to use the large groups’ protected varieties and breeds; instead they are forced to use older native breeds and varieties with low productivity which in turn cements their poverty through continued poor yield. They contribute, albeit involuntarily, to the preservation of fragments of cultural landscape and to the survival of the native breeds. These small farms provide opportunities for self-sufficiency and a certain financial security at a time when social welfare networks have become weaker. The excess is sold and some companies have succeeded in creating niche markets in which the large companies are not interested, for example, tourism for nostalgic town-dwellers, the cultivation of tobacco and cannabis, the selling of exotic, organic products, and farm-produced dairy products for upper class gourmets.

### **Weak consumers**

In 2030, the structure of the foodstuffs chain is completely different from the way it was in the 2010s. Many large companies own everything from production and processing to distribution and retail. Consumers have little power because they are numerous, small and not organised. At

the same time, food is relatively expensive and consumer-targeted marketing is essential. It is profitable for the companies to refine foodstuffs as far as possible. It is difficult to get hold of good raw food materials in the shops. People who are living in a world where the news is full of reports on conflicts and who are struggling to make ends meet are not very interested in health and the environment. Animal welfare, the environment and similar values are played down by the producers while convenience, taste and health arguments are used in marketing.

In a situation where only a few companies dominate the market, the companies that administer the brands that are most highly valued are very keen to get good publicity. They actively strive to avoid scandalous headlines caused, for example, by residues of pesticides or cases of poisoning.

In the low-price segment, the health effects of food are less important. Raw food materials for that type of foodstuffs are purchased from areas that are already downgraded from an environmental point of view.

## Food desert

The term “food desert” is used to denote “areas where people experience physical and economic obstacles that prevent access to healthy foodstuffs”. In food deserts, there is only fast-food and semi-manufactured food. Food deserts have been linked to health problems and the Department of Agriculture in the USA publishes maps showing how food deserts are spreading.

Sources:  
Reissig och Hobbiss, Health education journal. 2009:59, 137-159

[www.ers.usda.gov/data/fooddesert](http://www.ers.usda.gov/data/fooddesert)

# What can the market handle?

This story of the future describes a situation where the climate and environment have deteriorated. Thanks to strong property rights, primarily for land ownership, companies do take at least a limited amount of responsibility for the environment and health. This is achieved in part by changes in legislation (like for the land), and in part because the companies are so large that goods that used to be collective - fertility, pollination and water quality - have now become private goods. Companies preserve their valuable land resources out of self-interest - bees would not have the energy to fly over to a competitor anyway and the company's own drinking water sources are located on its own land. Because more goods have become private, the value of the companies' investments is guaranteed and the companies choose voluntarily to take responsibility for the environment when it serves their own economic interests.

If property rights were weaker, the ecological system could completely collapse. In many areas, companies do not take any responsibility at all. This applies to values from which it is difficult to exclude consumers and other companies (and thereby difficult to charge for) such as a varied agricultural landscape,

clean bathing water and strong fish-stocks. Because there is no reasonable definition of property rights, it is not possible to stop certain consumers from enjoying the benefits of limiting climate change, in the same way as it is impossible to create our own private climate gas bubble. Other environmental effects that cannot be handled in this scenario are resistance to antibiotics, air quality and border-crossing assets such as fish.

If the bureaucratic control of public environmental goods stops, there is a risk of an ecological collapse. In some circumstances, voluntary cooperation as regards the use of a common resource may reduce or solve the problem. In this story, many problems could have been avoided through even stronger property rights for, for instance, the sea, lakes and other watercourses. Transboundary problems require transboundary solutions. In this future scenario, one way of making it easier for companies to do research could be international agreements about property rights related to research findings. It is harder to construct effective market solutions for climate impact since it is technically impossible to exclude any one person from the global climate.

The problem with public goods is a real problem. Identifying what the market can handle and what things must be handled in other ways is an important matter for economists.

### Discussion questions

- What conflicts are there between promoting freedom of trade and taking ecological responsibility?
- What environmental problems could reasonably be handled by private property rights in this future scenario? What natural resources would probably collapse?
- What distinguishes land from other production factors such as work, buildings and machinery? Is special legislation needed for business deals involving land?
- Is there any fundamental difference between agricultural companies and other companies that can justify special treatment in the form of, for example, special agricultural policies?

*Some economists, with Elinor Ostrom at the forefront, claim that voluntary cooperation among users of a common resource can, in certain circumstances, solve what is often called "the tragedy of the commons" (Governing the Commons, Cambridge 1990).*

- What natural resources could be managed in that way in this future scenario?

# The new rural population

This story of the future is set in 2030 in a future characterised by unrest. Global population is growing and a steady stream of refugees and migrants is coming to Europe. The EU and the Swedish state have regulated asylum immigration so it is kept at an even level with about 120,000 immigrants per year. This to be compared with 2015 when 160,000 migrants came to Sweden. As a result of migration, Sweden's population has increased by 2 million since 2015.

The future scenario depicted in this story describes dramatic changes. The new immigration has implied an upswing for rural areas and agriculture and has made a significant impact on Sweden's economy. But in what ways have immigrants affected how agriculture is conducted, long-term sustainability, the agricultural landscape and biological diversity? This story of the future describes an economy with a surplus of labour. Fossil fuels are expensive because of mandatory climate policy objectives. Much of the work that used to be done by machinery is now done manually. For some crops, this

means the need for pesticides has decreased since they can be replaced by manual weeding.

In this scenario, economies of scale is still a driver and there are many huge farms which are concentrated in the most fertile farmlands on the plains. In other places, there is a wide variation of forms of farming and different specialisations. The relative number of small farms has increased and "community work" means that even small family farms can afford to hire extra labour. More people live in the country and many have vegetable gardens, bee hives and animals such as hens and rabbits. All in all, a larger share of Sweden's land area is used for farming and there are no longer any abandoned fields. Natural pasture has increased and it is now also possible for animals to graze in areas where there are many predators. In many regions, these developments have been positive for the landscape and biological diversity.

## Rural areas in 2016

This story is about events that took place during the 15-year period leading up to 2030. In 2016, urbanisation had characterised Sweden's rural areas for more than 150 years. Uneven regional development had effected the age structure for decades since young people had moved to cities and university towns. Because of that, there were few women of fertile age in rural areas and fewer and fewer children were born there. In the long run, this led to schools and shops closing down. In parts of the inland, both in the forestland in the north and further south, forecasts showed that the population that was of working age would not be sufficient to even cover the labour needs of the eldercare sector. Urbanisation had been replaced in part by depopulation that was almost self-propelled.

Like any other Western countries, economic developments in Sweden generally were weak during the early 2000s. The age structure of the population made it difficult to maintain a sufficiently high level of production and there were deep holes in Sweden's welfare. Since many years back, cities were divided into wealthy inner-city areas and poor suburbs. In rural areas, many jobs had disappeared and benefits for the unemployed had decreased.



## Scenario: From depopulation to growth

In 2030, the global challenges of population growth, economic growth, energy use and climate change have moved into most people's everyday lives. The demand for land is increasing in the world. The yield from forest and land is becoming increasingly important and all agricultural land must be taken into use.

Food production has high status and is given political priority: all land must be used and cared for. Climate change has meant the preconditions for agriculture in northern Europe are favourable and the economic significance of agriculture has increased. In Sweden, the desire to farm land concurs with a rapid increase of the rural population after decades of depopulation. The large growth in population in rural areas is mostly an effect of immigration but also a consequence of the high cost of homes in the cities.

Immigrants are immediately sent on after their arrival in Sweden. It is essential they start to work as soon as possible and get a chance to become integrated in Swedish society and they do a number of months of obligatory "community work" in the public or private sector.

At this time, for years rural areas in Sweden have been receiving about 50,000-60,000 new residents each year. Half of them work in the gardening, farming and forestry sectors and with natural resource management, for example, for an

agricultural company or with taking care of protected natural areas, culture reserves or landscape care in towns.

The people who do community work receive an allowance from the state and the companies only pay a small part of the salary (a symbolic amount). However, the entrepreneur is expected to function as a supervisor and mentor for the people doing community work. Many municipalities and communities in Sweden's rural areas welcome the immigrants because they help to vitalise the area and create a new rural economy. Rural areas that previously were characterised by depopulation and an increasingly ageing population are now characterised by growth and a significantly larger share of young people in the population.

Many newcomers are well-educated officials from urban environments who lack experience of and interest in agricultural work. This can lead to social problems but on the whole, community work works as a form of integration. Because it is combined with Swedish lessons, most immigrants accept community work as an initial, obligatory phase of their new life in Sweden, even if they do not intend to continue to work in agriculture. For those who want to continue to work in the agricultural sector, community work serves as a kind of entrance ticket.

Swedish agriculture has become dependent on the immigrants. The profitability of the larger farms is adapted to this “free labour”, since interventions are funded by the state. The supply of workers provides increased revenue in agriculture. Some examples are round-the-clock supervision of farrowing stalls which means more piglets survive, the pruning of young forest which improves the quality of the timber, weeding and thinning which gives better quality vegetables and fruit. The large farms have a rolling schedule where newcomers are brought into the workplace as those who have completed their months of community work leave. For the more advanced work tasks, people with training and experience are required. For many immigrants, community work serves as an apprenticeship period and they are later given a job at the company or they find employment at another company in the rural area. The large farms also need foremen and many are recruited from the people who had previously done community work there. Their language skills are an important asset for the entrepreneurs. Providing further training to people in transit between community work and a “proper” job in agriculture has become an important activity for agricultural upper secondary schools and advisory organisations.

Farm amalgamation has continued and about five percent of the farms now use almost half of the area. All agricultural companies have diversified their production so as to be prepared for fluctuations in global market prices. The increased value of arable land means that old

natural pastures have become profitable again. The Swedish government’s standpoint is that all land that can be used for agricultural production must be used and it gives financial aid to people who want to establish new agricultural companies, cultivate new land or resume the use of old, overgrown fields.

The crops consist mostly of vegetables, legumes and cereals for consumption by humans, and to a lesser extent animal feed. Meat consumption has gone down as a result of successful state regulation of the price. The production of eggs, meat and milk is to a large extent dependent on grazing lands and on residual products being used as feed.

### **Seasonal work and cheap labour**

As the population grows, the demand for food increases. At the same time, the supply of cheap labour is increasing. Fossil fuels are expensive because of climate policy measures, which makes it easier for farming methods that are based on manual labour to compete with methods that need diesel. Alongside the development of high-tech technology intended for large farms, new technology is also being developed for tools and methods that make manual jobs easier. Much of this development work is done by entrepreneurs with small companies who work in rural areas.

A large number of people who live in rural areas make a living by combining different occupations and they also produce their own food to varying degrees. These country residents, most of them newcomers, consist of a mixture of people

who have moved out from the cities and immigrants who have stayed on in the rural area where they did their community work. Together with the people who lived in the rural areas before, they form a sort of farm worker proletariat that provides the farmers with cheap labour. They are only in demand in the peak season since the farms have a good supply of immigrants through community work. There are almost no seasonal workers from other EU countries.

The working conditions of farm labour are poor and wages are generally low. Wage levels vary according to season and the availability of immigrants doing community work. At the same time, terms of employment are uncertain.

Rural areas are also characterised by a steady flow-through of people with some moving out and others moving in. The local communities are exposed to more and more global knowledge, different ways of making a living and types of everyday life. The number of people living in rural areas has a regular pattern of variation because of seasonal workers.

In 2030, agriculture is a growing sector. Thanks to the state aid which is provided as an integration policy measure, a relatively large number of new agricultural companies are being established and some smaller farms are owned by immigrants. They are often niche producers focused on products that are in demand by immigrants. Some have experience of trade and commercial activities and new networks develop within distribution and retail which challenge the old structure with its small number of large players.

Contacts in the immigrants' home countries mean the networks can expand internationally with a fair degree of export of Swedish foodstuffs and other agricultural products.

### **New resources develop**

The new rural population has contributed to a large variation in the development of rural areas. The tens of thousands of people who come to Sweden's rural areas every year have a wide range of experience, knowledge, education, awareness, values, norms, etcetera. They encounter many different situations and feelings when it comes to, for example, accommodation, the expectations of the local residents, resistance, hopes, fears, and explicit and implicit values. The immigrants come to places where everyday life has been shaped over many centuries in circumstances that are unknown to the newcomers.

This situation can sometimes give rise to conflicts concerning rights, ownership and the use of different resources. However, on the whole, the new population has found its place in Sweden's rural areas. Out of the emptiness that urbanisation and depopulation created, new resources are developing with people who have come here to work and make a new life for themselves. However, the way they are received varies. In some places, immigrants are seen as a much needed input of new residents, not just cheap labour, and they are well received. People are interested in their culture, food traditions and handicrafts and are pleased to have new, young families in the area. Many people realise that

without immigrants, the school, shop and health-care clinic would have closed down long ago. The increase in population has also made it easier to make a living in the country, for example, in the construction trade, in the service sector and in childcare and eldercare.

In other places, the immigrants are met with resistance but those who start up their own business become better integrated with Swedish society. Hard work is a key to legitimacy and being accepted in rural areas. New business activities that become successful fill the gap that was created during the years when young people moved to the towns.

The system with community work has given rise to new forms of enterprise and ownership and new forms of operation. The immigrants that marry into Swedish farming families are also part of the integration process. This often means that the next generation continues to run the family farm.

### **Increased competitiveness but poorer work conditions**

The new small farmers have brought a somewhat different view of animal husbandry and animal welfare with them, at the same time as demands for competitiveness and maximum production have increased. Swedish animal protection has loosened up and is now more or less the same as in the rest of Europe. New trade networks challenge the traditional food distributors and retailers, and small stakeholders who have interests in the entire production chain have appeared. There

are niche grocery stores where food that has been produced in Sweden is sold and which meets a huge variety of demands linked to food traditions from different parts of the world. Immigrants make use of their international networks and export goods to the parts of the world that they come from and to migrants in other countries.

Community work is a kind of subsidy that increases the competitiveness of Swedish agriculture. As the system was developing, there was concern that it would lead to economic problems: a greater supply of products but without a corresponding increase in demand. However, the effects of increased production are compensated to a large extent by reduced food imports since the competitiveness of Swedish food has improved. Swedish agriculture competes to a high degree with food production in other countries that is “subsidised” in various ways, for example, through poor animal welfare, extensive use of antibiotics or poor working conditions. The input of labour that community work implies is generally seen as being compensation for this – a different but reasonable type of subsidy. On the one hand, community work has helped Sweden not to be sucked down into a negative spiral, a “race to the bottom” when it comes to food production that is ethically and socially acceptable. On the other hand, community work has led to poorer work conditions in Sweden. This two-sided development means it is difficult to evaluate the state’s investment in community work.

# Finally...

This story depicts the year 2030 when there has been extensive flows of migrants to Europe for many years. There is war and unrest in many countries and people flee to, for example, Sweden. The world's population is increasing and thereby also the need for food. Changes in climate have become very noticeable.

The future scenario that is described here is to be seen from the perspective of Swedish agriculture.

Developments in the world challenge several of our core values, for example, the distribution of resources in society. Will there be political strength and will to slow down or change the distribution of resources so there will be tax revenue for interventions to give immigrants work and education so that in the long term they will be able to contribute to the creation of resources for society?

## Discussion questions

- What will the consequences be for our view on immigrants in the future depicted in this story?
- In this story, what are people's views regarding welfare, how animals are treated and the feeling of "us and them"?
- Which part of the scenario would connect to your preferred future?
- In what ways can we bring about that world?

## Further reading

Westholm, E. 2016. Framtidstro och framtidsoro i flyktingfrågan. Article published in the MittMedia group's newspapers on 18 April 2016.  
Example: [www.dt.se/kultur/debatt-ar-invandringen-ljuset-for-landsbygden-och-en-aterkomst-av-det-medborgerliga-ansvaret](http://www.dt.se/kultur/debatt-ar-invandringen-ljuset-for-landsbygden-och-en-aterkomst-av-det-medborgerliga-ansvaret)

# Eco-labelled food or eco-smart food for everyone?

Will there be a need for organic foodstuffs to be eco-labelled in the future or will that labelling system no longer be of any relevance? The need for labelling is very different in the two future scenarios depicted in this story. In the first scenario, the difference between organic and conventionally produced food has become so small that labelling has lost its significance. Consumers are very interested in environmental issues, climate threat, animal ethics and food quality and they have confidence that all food production lives up to such requirements. New technology and a good supply of plant fertiliser give sufficient harvests even though chemical pesticides are not used.

In the other scenario, developments have gone in the opposite direction and organic food has become an expensive alternative that only a few people can afford. The need to be able to feed a growing global population has created huge differences, with high-intensive bulk production for the large majority of the populace and environmentally-adapted production for a wealthy middle class. Eco-labelled food serves as an excuse for not

taking measures to adapt conventional production to environmental objectives. The need to be able to justify the difference in price between organic and conventional food means the set of rules for organic production is not adapted to new technology and the knowledge that is needed to improve harvests.

As the world's population grows, the question about the productive capacity of agriculture becomes increasingly important. At the same time, there are growing demands that food production must be more sustainable and be adapted to international conventions and environmental and social obligations.

In order to push developments in the desired direction, both state regulations and economic control instruments are needed, and consumers must be able to have an influence through carefully considered choices. It is not self-evident which measures have the greatest impact; it depends on the political, economic and social preconditions in society. In order for measures to be effective, a common view is probably needed with regard to objectives, clearly stated criteria for decisions and choices,

and confidence that laws and agreements will be followed.

In the 2030s, the period in which both scenarios are set, it is possible to look back on rapid developments within the food sector. The last decades of the 20th century and the first of the 21st century were characterised by segregated food consumption where environmentally-aware and well-off consumers bought eco-labelled and fair trade labelled food, to a greater or lesser extent. Labelling was seen as one of many ways of minimising the negative and increasing the positive effects of food production. Many municipalities and county councils adopted goals for procurements which implied increasing the share of organic food,

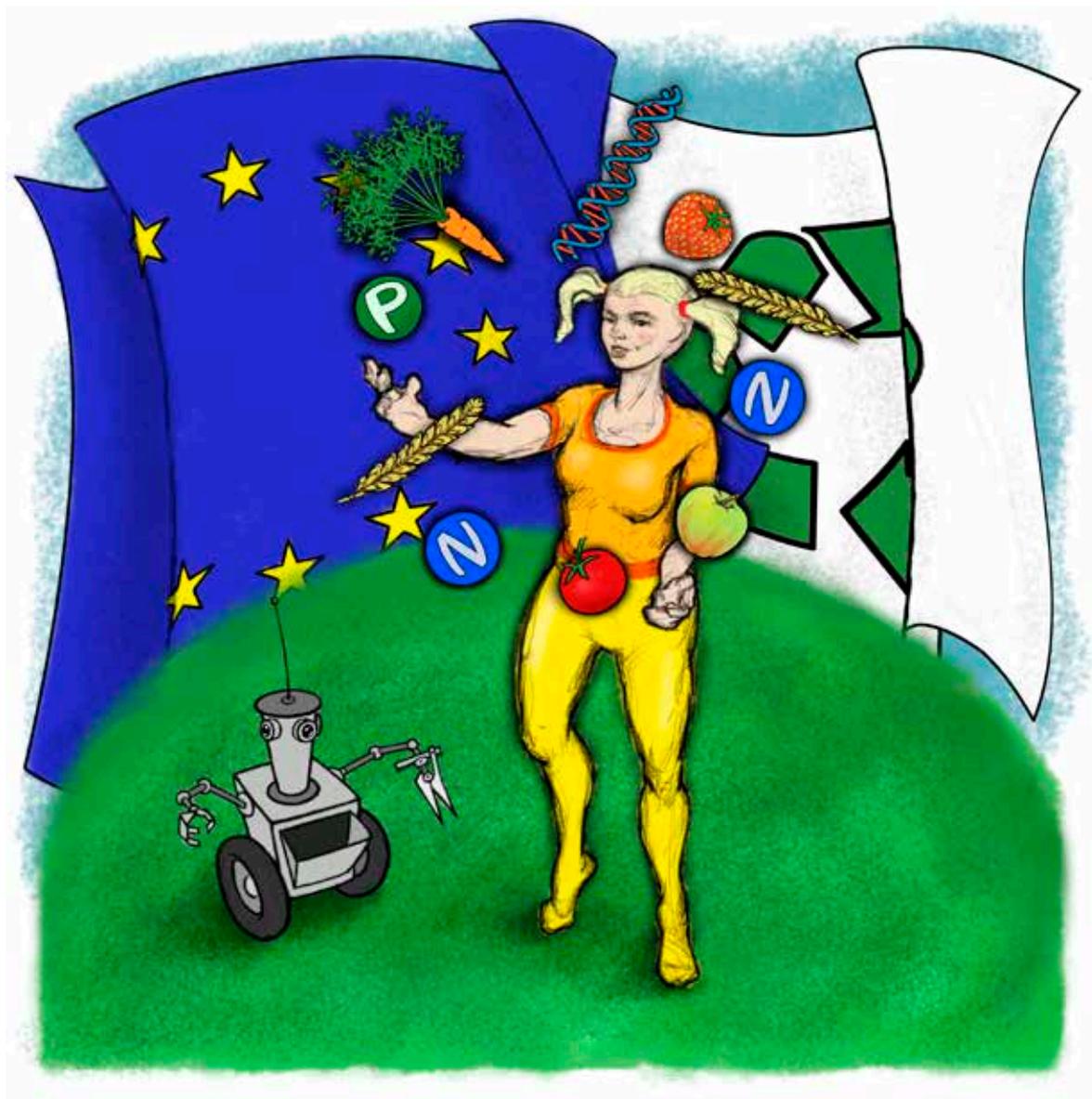
and organic labelled food became a positive marketing factor for a growing number of restaurants. However, economic control instruments in the form of taxes and subsidies, and regulation via Swedish legislation and international agreements, were often of much greater significance for agriculture than the choices made by consumers on the basis of labelling.

The following section presents two different future scenarios. In the first, environment and climate issues are important and there is a lot of interest in sustainable consumption. In the other, developments have gone in a different direction. The economy is weak and most people are more interested in cheap food than in how it is produced.

### Organic 3.0

Today's food market is severely polarised and prevailing regulations draw up a clear dividing line between organically and conventionally produced food. The differences in price and supply also exclude many consumers. Even if demand is increasing, still only a minority of the population buy organic food. The question is whether developments towards sustainable food production can be based on well-informed and well-off consumers paying more for food, especially considering there are different views about which criteria are the best from a sustainability point of view.

IFOAM – Organics International has initiated a discussion about the future development of organic agriculture (Organic 3.0) so as to reach more consumers and play a more significant role in efforts to meet global challenges. This is justified by, for example, the relatively modest amount of organic production, slow adjustment to modern technology and new methods, and the flaws of certification systems. The long-term goal is to loosen up the rigid set of regulations that the best solutions are used to achieve sustainable food production.



# Scenario 1: Eco-smart food for everyone

In 2030, at all levels of society, people are interested in sustainability. Thanks to forceful global environmental policies, emissions of carbon dioxide have been dramatically reduced and there is sufficient farmland to feed the world's population. Awareness of the importance of ecocycling has meant there is enough of the inputs needed for agriculture, primarily nitrogen and phosphorus. The EU has strict control over environmental, climate and energy policies. Moreover, many people are involved in issues linked to the sustainable use of resources, biological diversity and global justice.

## **Sustainable cultivation systems**

Food production is characterised by cultivation systems that produce sufficient food and which are well adapted to society's environmental objectives. The development and adaptation of organic and conventional farming that took place during the 2020s has meant that the differences between the cultivation systems are too small to justify special eco-labelling. Because of that, eco-labelling has almost disappeared. In the 2010s, both consumers and many decision-makers viewed eco-labelling as a way of confirming that the item in question was the best alternative from the perspective of sustainability. An opinion poll showed that people's

expectations regarding organic labelled food were primarily that it was produced without the use of pesticides but also that it was good for the animals and the environment. However, the regulations were sometimes criticised for being too rigid and organic production struggled with the same major sustainability challenges as conventional farming: a broken cycle of nutrients, the leaching of nutrients into lakes and the sea, dependency on fossil fuels, and the displacement of natural ecosystems.

The low market share of eco-labelled goods and difficulties tackling environmental and climate problems led to widespread discussion within the international organic movement and to fundamental changes in the regulations. In 2030, mineral fertiliser is accepted as a complement to organic fertiliser which has resulted in bigger harvests.

The re-circulation of plant nutrients is not yet working satisfactorily but new technology has enabled the return of phosphorus to arable land to begin. Farmyard manure, nitrogen-fixing crops and digestate are important for the supply of nitrogen but mineral fertiliser is also used to balance the crops' need for plant nutrients. This has in turn led to a positive effect on the climate by more carbon being stored in the ground. There have been many changes in the field of

plant protection since the 2010s. Together with the EU's set of regulations, the rapid development of resistance to chemical pesticides has forced new solutions to be found for controlling weeds and plant pests. A global phasing-out of chemical pesticides has taken place alongside the development of new technology and new methods and the use of chemical pesticides is strictly limited to acute attacks by pests. Acceptance for different plant breeding methods such as GMO and CRISPR/Cas9 technology has made it easier to develop crops that are less sensitive to plant disease and pests, and which can compete better with weeds. Biological pest control is common and advanced robot technology is used for weed control.

At the same time, the significance of using leys for bio-energy crops has increased which means that more farmers can make use of leys and thereby reduce weed infestation and crop rotation diseases. By supplementing the supply of plant nutrients with mineral fertiliser, crops grow more and can compete better with weeds.

### **Eco-labelled - what does that mean?**

At the same time as the regulations for organic cultivation were changed, a more eco-friendly regulation of food production at both EU level and national level was introduced. Because the new guidelines were accepted by both farmers and consumers, few consumers were willing to pay more for food that is produced according to a strict set of regulations associated with the certification of organic cultivation. Now, it is seen as being self-evident that all food is produced in a sustainable way and the system of eco-labelled food has disappeared. However, in some cases, negative eco-labelling can be used as information to consumers, for example, to inform them that the cultivation of a certain crop requires intensive watering or that chemical pesticides have been used as an emergency measure.

## Resistance to chemical pesticides

Extensive use of chemical pesticides to control pests, growth pathogens and weeds has in many cases led to increased tolerance or resistance. The first cases of resistance to insecticides were detected in the pollen beetle *Meligethes aeneus* in Sweden in 2000. Globally speaking, the development of resistance in weeds has increased dramatically since the 1960s ([www.weedscience.org](http://www.weedscience.org)), and in Sweden,

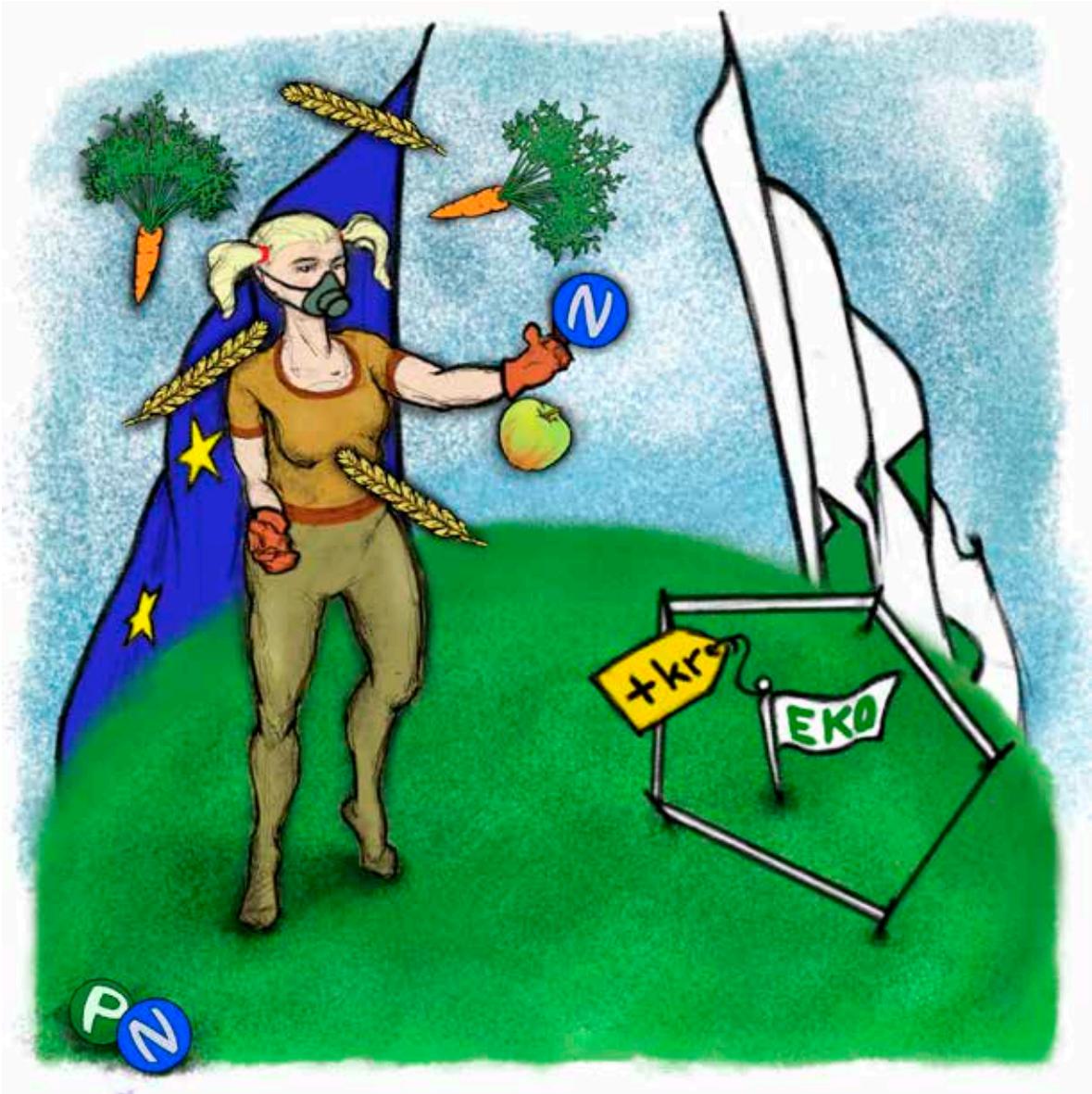
many cases have been identified in black grass, chickweed and loose silky bent which are problematic weeds in autumn sown crops.

Since the 1980s, no chemical weed-killers with new modes of action have been developed which has been a contributing factor to the lack of effective pesticides.

## Plant breeding with GMO and CRISPR/Cas9

One important way of reducing dependency on chemical pesticides is to develop crops that are resistant to different plant pests (such as fungi, insects or virus). The use of genetically modified plants is one effective way of developing resilient varieties but in Europe there is still widespread resistance to such crops. In Sweden, there has been experimental cultivation of a variety of potato that is tolerant to potato late blight, a disease that farmers control by chemical means many times during a season.

CRISPR/Cas9 is a new method that makes it possible to give a plant a new property without putting in new DNA in its germ plasm. In November 2015, the Swedish Board of Agriculture announced that organisms that have been given new properties through CRISPR/Cas9 are not to be regarded as being genetically modified. This means permission is not needed to cultivate a plant that has been refined using this technology.



## Scenario 2: Eco-labelled food for only a few people

In the other future scenario, the situation in Sweden is more difficult. In 2030, global population growth is high and many people are poor. Some people are still well-off in this over-exploited world but there is a shortage of productive arable land and water. The political ambitions as regards climate and the environment are low and the effects of climate change are clearly noticeable.

### **Hard-pressed cultivation systems**

The EU's rules for food production have become weaker but the population's need for food, and competitive bio-fuel crops and fossil-free materials are bringing about intensive and one-sided cultivation that is based on extensive use of pesticides and commercial fertilisers. In this story, people's confidence in new technology and new methods is very low, especially in the fields of plant breeding and animal breeding and the industry does not want to invest in an uncertain market. It is possible to buy organic food but the range of products is limited and prices are considerably higher than for conventionally produced food.

Conventional agriculture has major problems with pests and weeds which have become resistant to chemical pesticides. It is common to grow crops that have been genetically mo-

dified to withstand weed-killers but there are constantly new reports about weeds that are no longer sensitive to the broad-spectrum pesticides that are used. In some cases, farmers have been forced to change to a more varied crop rotation but usually, the solution has been to ease off restrictions concerning pesticides. Several substances that were forbidden in the early 2000s are now permitted again and a notoriously harmful agent like paraquat is used with special permission for several crops.

### **Eco-labelling for only a few people**

Politicians and most of the general public show little interest in environmental issues and many consumers feel unsure of the quality of food. The most well-informed people are also concerned about the effects of production on the environment and biological diversity. Concern about the quality of food means that those who have knowledge and can afford the extra expense want to be able to choose food that is free from pesticides. To satisfy this category's wishes, there is a small, exclusive range of organic food that is primarily based on consumers' concern for their own health (personal benefit). However, there is little interest in paying for collective benefits (climate and the environment). People have little confidence in public authori-

ties' and companies' monitoring of the environment and therefore the eco-labels that do exist are certified through a strictly controlled system of regulations. The stringent requirements of consumer organisations and the producers' need for a high added value price are the basis of the cooperation behind the eco-labels. Organic food can be sold at a high price to those who can afford to pay for it. However, conventionally produced food is considerably cheaper since there are few regulations and inputs are still relatively cheap.

The high price of organic food means it is primarily people with a high income who can afford to buy organic food regularly. High prices

and a limited demand means that the supply of organic food is limited, especially in small towns, but consumers who live in the big cities and who care about the environment and have financial resources can always find what they are looking for. So in this scenario, consumer power works at individual level but it has very little effect on the environment as a whole and it does not contribute to push developments towards sustainable food production.

## Finally...

These two future scenarios portray two different pictures of reality in which the eco-labelling of food represents completely different things. In the first scenario, eco-labelling is viewed as an odd phenomenon since it is taken for granted that all food is produced with the greatest respect for the environment, animals, the climate and the farmers' life situation.

There is a lot of interest in sustainability at all levels of society which has created the necessary prerequisites for a powerful environmental policy which is supported by the general public. There is also acceptance among both consumers and farmers for new technological solutions which has facilitated the phasing out of chemical pesticides. The terms organic cultivation and conventional cultivation no longer exist.

In the other scenario, for most people the most important thing is to get food on the table. There is eco-labelled food but this is

only for people who care about their health and who can afford to pay extra for it. Conventional cultivation has major problems with resistance to pesticides and the industry is not interested in investing in new technology. The organic movement has not succeeded in reforming its set of regulations nor broadening its customer base.

Eco-smart food for everyone or eco-labelled food as a luxury item for a few people. In which direction do we want to go? What is possible and what can be realistically achieved? What is needed to change the way things are developing? Hopefully, the questions below can be used as a starting point for important discussions on the future production and consumption of food.

## Power over food

Knowledgeable and well-informed consumers can influence how food is to be produced. A person who knows how something is produced can take that into account when making purchases, together with other factors such as price and taste. An eco-label or fair trade label can show, for example, that the food has been produced in a way that has minimum negative impact on the environment and which is also of collective benefit, not just good for the individual. The labels provide informa-

tion to consumers and enable producers to set a higher price on food that has cost more to produce. However, the effectiveness of eco-labelling depends on how consumers perceive the added value. In order for consumers to want to buy eco-labelled food, not only must they have great faith in the label certification rules, there must also be an obvious positive effect of the choices that are made in the shops.

## Discussion questions

- What role does the eco-labelling of food have for the development of sustainable agriculture from an environmental, climate and profitability perspective?
- Would it be a positive development if organic and conventional agriculture moved closer together in the way described in scenario 1?
- What are the main prerequisites and barriers for removing the differences between organic and conventional farming?

## Further reading

### Ekologisk produktion och konsumtion

<https://www.jordbruksverket.se/amnesomraden/stod/jordbrukarstod/ersattningarforekologiskproduktion/ersattningarforekologiskproduktion.4.6c64aa881525004b53beef8a.html>

[www.slu.se/globalassets/ew/org/centrb/epok/dokument/eko3.0\\_broschyr\\_webb.pdf](http://www.slu.se/globalassets/ew/org/centrb/epok/dokument/eko3.0_broschyr_webb.pdf)

<http://arkiv.krav.se/mr2015/marknadsrapport-2015-webb.pdf>

### Genetiskt modifierade organismer

<http://genteknik.nu/nya-tekniker>

[www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i-Sverige/Uppdelat-efter-omrade/Naturvard/Genetiskt-modifierade-organismer](http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i-Sverige/Uppdelat-efter-omrade/Naturvard/Genetiskt-modifierade-organismer)

<http://supermiljobloggen.se/nyheter/2014/05/mikael-karlsson-naturskyddsforeningen-en-del-gmo-produkter-kan-fa-gront-ljus-och-andra-rott>

### Återvinning av fosfor

<http://miljonytta.se/arbetsplatser/ny-teknik-for-atervinning-av-fosfor>

[www.ja.se/artikel/49776/manga-vill-atervinna-fosfor.html](http://www.ja.se/artikel/49776/manga-vill-atervinna-fosfor.html)

### Mekanisk ogräsbekämpning

[www.ucdavis.edu/news/uc-davis-developing-faster-more-accurate-robotic-cultivator](http://www.ucdavis.edu/news/uc-davis-developing-faster-more-accurate-robotic-cultivator)

[www.deepfield-robotics.com/en/Weeding.html](http://www.deepfield-robotics.com/en/Weeding.html)

### Kemisk bekämpning

<http://www2.jordbruksverket.se/download/18.724b0a8b148f52338a35a5d/1414588038252/ovr292v3.pdf>

<https://sv.wikipedia.org/wiki/Parakvat#H.C3.A4lorisker>

## Swedish agriculture 2.0

In this story, 2030 is characterised by rapid climate change and dramatic population growth which has led to unrest in the world. All over the world, natural resources are under strong pressure and food prices are high. In this future scenario, Swedish consumers are not particularly interested in how food is produced, nor in environmental values or cultural heritage. Instead, Swedish food production is run primarily by multinational

agribusinesses which achieve profitability by buying up land and smaller companies and investing capital in technological solutions. This future scenario is based on a shift in how food production is done which perhaps challenges both traditions and societal values.

### Strategy for a competitive agricultural and gardening industry

In a government inquiry on a competitive agricultural and gardening industry that was done in 2015, it was suggested (p. 64) "that the Land Acquisition Act should be changed so as to make it easier for limited companies to purchase farmland. The act covers both farmland and forest."

In the same inquiry, there is also a proposal to both sharpen and harmoni-

se legislation at EU level (p. 75): "that the government pushes to sharpen EU legislation on animal protection. Furthermore, the government shall promote an equal application of legislation at EU level".

Source: SOU 2015:5. Konkurrenskrafts-utredningen. Attraktiv, innovativ och hållbar - strategi för en konkurrenskraftig jordbruks- och trädgårdsnäring. Stockholm, Elanders Sverige AB.

## Size rationalisation in Swedish agriculture

From the 1950s up to the present (2016), Sweden's agricultural sector has been characterised by size rationalisation. That means that over time businesses have become fewer and larger.

The Swedish (and global) trend towards fewer and larger agricultural companies is expected to continue. Calculations in the USA using a method that measures the total percentage of the market that is controlled by the four largest players (known as the four-firm concentration ratio - CR4) show that increased vertical integration and concentration

is happening in almost all industries and companies linked to agriculture and food production all over the world. Globalisation and financialisation seem to be driving this trend forward and research predicts that this will mean the end of all profitable family farms over the coming decades.

Sources:

Clapp, J. 2014. Financialization, distance and global food politics. *The Journal of Peasant Studies*, 41(5), p. 797-814.

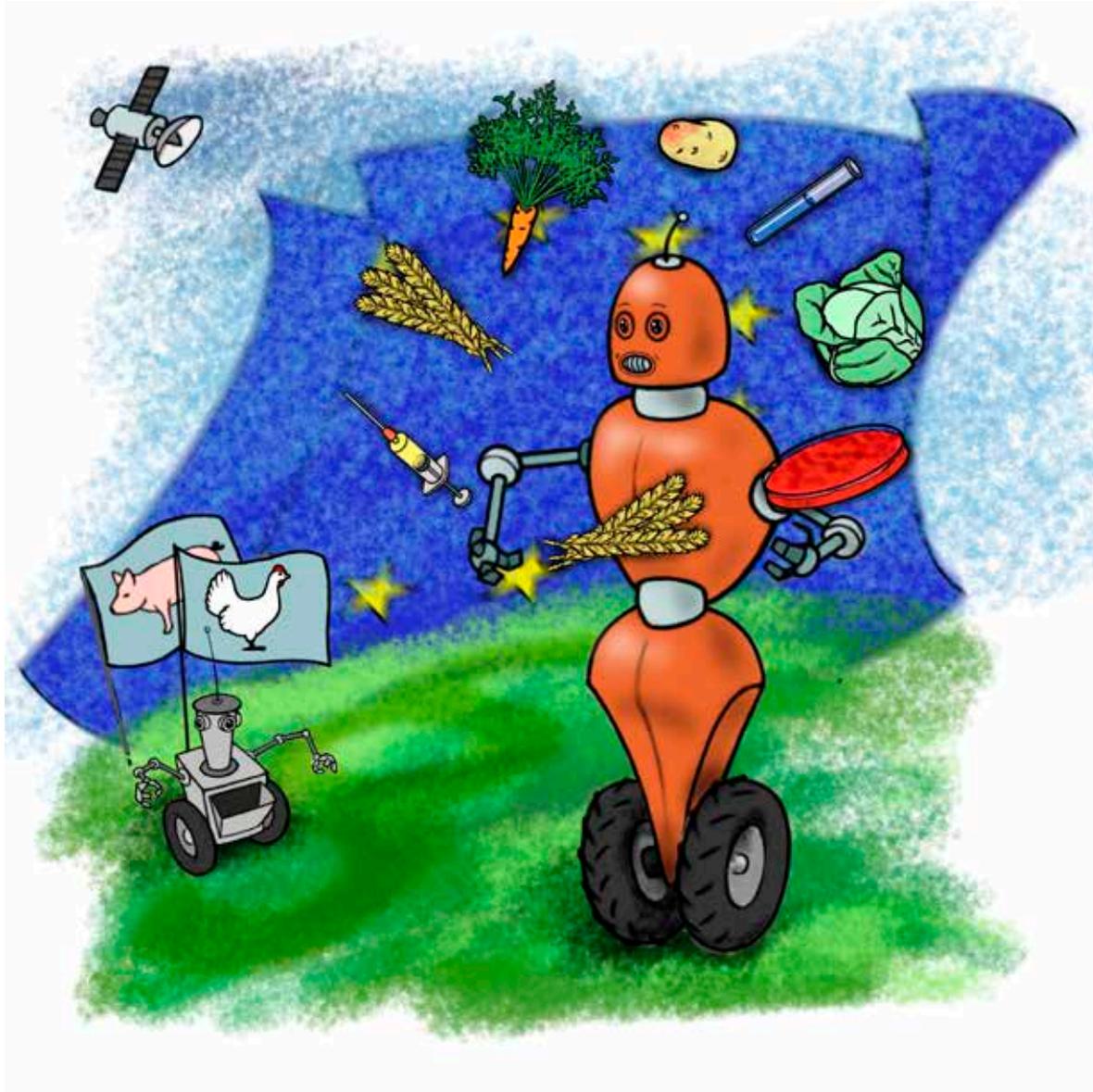
Hendrickson, M., James Jr, H.S., Heffernan, W.D. 2014. Vertical Integration and Concentration in US Agriculture. *Encyclopedia of Food and Agricultural Ethics: 1799-1806*.

Jordbruksverket. 2016. Jordbruksstatistisk sammanställning.

Morell, M. 2011. Farmland: ownership or leasehold, inheritance or purchase. Antonson, H. and Jansson, U. (Eds.), *Agriculture and Forestry in Sweden since 1900. Skogs- och lantbrukshistoriska meddelanden*, vol. 54, p. 56-74. Stockholm, Royal Swedish Academy of Agriculture and Forestry.

Table 1. Number of companies according to size (hectares of arable land)

	1990	1999	2013
<b>All farms</b>	96,560	80,119	67,146
<b>&gt;0-2</b>	—	—	3,935
<b>2.1-5.0</b>	14,957	11,344	10,142
<b>5.1-10.0</b>	19,020	15,229	13,857
<b>10.1-20.0</b>	20,832	16,656	12,439
<b>20.1-30.0</b>	12,177	9,295	6,022
<b>30.1-50.0</b>	14,223	11,445	6,778
<b>50.1-100.0</b>	11,348	10,969	7,368
<b>&gt;100</b>	4,003	5,181	6,605



## Scenario: A future scenario characterised by competition

**I**t is 2030. Transnational agribusinesses are flourishing in Sweden, mostly as a result of the harmonisation of EU laws, liberal trade agreements, technological developments and a continuous striving for improved profitability and lower food prices. In particular, the harmonisation of EU legislation and changes in the Land Acquisition Act have resulted in agribusinesses gaining a power hold during the 2020s over the food sector, both with regard to production and the distribution of food to trade and consumers. Swedish farmers' efforts to make their production profitable meant that in the 2010s, they called for a harmonisation of EU legislation. This story assumes that this harmonisation was based on the lowest standards. That means that instead of demanding that other countries must apply Sweden's more stringent rules, it was easier to create equal conditions throughout the whole of the EU. However, at the same time, this strategy meant that the future of Swedish farmers was controlled by technology-driven rationalisation and agribusinesses. This led to poorer export conditions, problems with food safety and domestic competitiveness, and in the end, a dismantling of the traditional lifestyle where food production is based on family farms.

Changes in Swedish legislation also affected developments. A change in the Land Acquisition Act which made it easier for legal entities, for instance, limited companies, to purchase farmland had disastrous consequences for the survival of family farms.

During the last 15 years, Swedish agribusinesses have made huge investments in new technology so as to increase their production capacity and gain competitive advantages. The companies have taken on loans with variable, low interest rates in order to buy land and automated machinery for, for example, field work and robotised animal care. For the few but large agribusinesses that dominate the production of cheap products in Sweden in 2030, the margins are better than ever. To minimise labour costs and increase profitability, the agribusinesses have replaced workers in agriculture with GPS-controlled robots and drones. However, this has led to many people becoming unemployed in rural areas which were already characterised by a high level of unemployment. The demographic structure of Sweden's rural areas with few children and young people means there is often no one to take over the few family farms that have not yet been bought up by agribusinesses.

Other factors such as the financial conditions for production and the lack of alternative work opportunities create problems for family farms. People have moved to cities and towns to look for work so as to make a living which has made it hard for small communities to maintain even the most basic forms of service, such as schools and healthcare. Many rural communities have therefore become poor, from both a social and economic point of view. In many small towns in rural parts of Sweden, blocks of flats and houses stand empty and derelict.

The agribusinesses have begun to challenge the four supermarket chains in Sweden by integrating vertically. This means that they are gradually integrating several different parts of a product's food chain into the same company. They are now using the same strategy that they used to automate production to pack and deliver products direct to customers which shuts out some of the food chain's traditional players, such as butchers, wholesalers and retailers. With the help of wireless cameras and internet, consumers can follow how their fruit and vegetables are growing and see when they are harvested. By taking over or shutting out the traditional wholesalers, the agribusinesses have begun to increase their margins and profitability. Their advanced technology, in combination with harmonised trade-focused legislation, also means they could produce sufficient food to feed Sweden's entire population.

The majority of Swedish consumers are in the cities. They spend as little money as possible on

the food they buy and they care very little about where it comes from while well-off Swedish consumers still want food of "top quality" and are prepared to pay extra for it. However, many of these turn to high-tech agribusinesses rather than to family farms to buy the food they prefer. In the agribusinesses' laboratories, technology such as 3D printers and electrospinning are used to customise food to suit consumers' preferences when it comes to flavour, consistency and cooking properties. The test-tube meat that is created in laboratories, for example, beef, chicken, lamb and fish, is seen as being environmentally neutral and ethical for animals even though it is expensive. Traditional farms still produce agricultural products such as fruit and vegetables and they also rear animals on a small scale. The meat that is produced at the farms is not necessarily tastier but it is somewhat different from laboratory meat and some people prefer it.

The traditional competitive advantages of the family farms are now becoming less significant. This means they do not have sole rights to production methods which are perceived as being organic, genuine, authentic and environmentally friendly. The agribusinesses have found ways of mechanising production and making it more cost-effective and they have succeeded in convincing consumers that their methods are environmentally friendly. A diminishing share of Swedish consumers still value "genuine" products and they buy local products but it is becoming increasingly difficult to know what products they should buy since most claim they

have been authentically produced. In 2030, family businesses make it clear that they are not agribusinesses and those that are profitable focus on niche products on a small scale or on creating close customer relationships with the wealthy members of the urban population.

### **The survival of agricultural companies in an over-exploited world**

The agribusinesses are very aware that innovation is the key to competitive advantages and they have made major investments in new technology. Because of that, they are leading the innovation process with regard to production and they have also taken the lead when it comes to identifying and living up to the market's wishes and brand development. Thanks to a good supply of economic capital, they invest in flexible and automated machinery that enables varied production and reduces labour costs. Their size also gives them a number of economies of scale, for example, lower operational costs and good opportunities to negotiate with decision-makers and salespersons at the next stage.

The agribusinesses that already control most of the cheap end of the food market in Sweden in 2030 also see opportunities to enter the more expensive food market. They do so by setting up or purchasing high-tech laboratories.

In these laboratories, technology is used to produce products that have been adapted in detail to suit what wealthy customers want and they are skilled in handling innovation processes. One component of this production is

animal protein which is produced in the form of cultured muscles in laboratories, that is to say, meat production without breeding or slaughtering. This development is supported by certain analysts who believed even back in the 2010s that test-tube meat would revolutionise and reshape animal husbandry in a way that we have not seen since the transition from the hunting and gathering society to agricultural society. Since this is a question of meat being produced in the form of cultured muscles in laboratories, the development of this production is also supported by some people who want to reduce animal suffering but at the same time want to continue to eat animal protein. However, the production is based on cells from animals, so it is not entirely "animal-free". Compared with outdoor meat, meat that is produced in a laboratory is believed to be better for the global environment since it may imply less emission of greenhouse gases, and fewer animals in the production process means that a smaller share of land is needed to produce feed. Some people also believe it is safer and healthier for people to eat laboratory-cultured meat because the laboratory environment means less risk of the bacteria and diseases that occur in traditional animal husbandry and meat production. This is used by the laboratory companies as selling arguments to Swedish consumers who care about what they eat.

The agribusinesses' supply of resources and experience of handling vertical food supply chains increase their chances of being successful,

as long as their brand and they themselves can handle the rapid growth. In order to strengthen their control of the market further, the agribusinesses use their close contacts with decision-makers and lobbying to modify demands concerning organic food products and animal welfare – this is not out of an altruistic desire to do good but as a way of tackling competition from local producers and family farms. Their relatively low production costs and the environ-

mental problems that agriculture has in other parts of the world (for example, long periods of drought and extreme precipitation) also create opportunities for them to take over external markets. This can further increase the economies of scale they enjoy in Sweden's food industry.

Because of the dominance of the agribusinesses, the laboratories that produce food in Sweden are in a difficult situation in 2030. They have to make large capital investments or

## Laboratory-cultured meat

The first laboratory-cultured hamburger was served in London in 2013 at a cost of £250,000. In 2015, the creators claimed that the same hamburger would have cost £10 if it had been on the market. If laboratory-cultured protein is to become a reality and be produced for consumption, a number of barriers must be removed, for example, production costs, the ethical problem of using stem cells to produce food, and consumers' acceptance. Nevertheless, laboratory-cultured meat is being seriously discussed as a possible way of replacing today's meat production. However, it is most likely that other vegetable and animal sources of protein based on, for example, pulses and insects will

have a greater impact.

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merge in order to be able to stay on the market and retain the sector's strong economic growth. Many laboratories have therefore been bought up by either agribusinesses or other companies such as Google Inc. and Amazon. As acquisitions of this kind become increasingly common, the pressure on the remaining independent laboratory companies increases. Those that choose to remain independent have to specialise in specific protein sources and unique combinations of flavour and consistency.

The remaining family farms that still exist in 2030 are also heading for a dismal future. They know that they too are producing food that certain customers want but the majority of consumers have a positive attitude to technology-focused agribusinesses and food that has been manufactured in laboratories. The family farms that still exist need to constantly renew their production and diversify their crops. However, to do that they need a supply of capital which the banks are no longer willing to give them.

Competition and lack of demand from consumers has meant that most of the remaining family farms focus on other things apart from food production. They do produce some food but this production is often supported by them also doing other work that is not related to farming. They try to achieve profitability by managing nature preservation areas and offering cultural and recreational activities to international tourists and the domestic urban population.

By diversifying their activities, these family farms are both suppliers of services and producers.

### **Cracks in the system in 2030**

Because of resistance to antibiotics, ten times more people die from food-related infections in 2030 compared with 2015. As a result, Swedish decision-makers have tried to stop irresponsible use of antibiotics by proposing new laws and regulations but these are voted down time and time again by the EU Commission. Sweden's new minister of agriculture is becoming increasingly concerned about over-production and has therefore proposed a ceiling for certain everyday goods, but this was rejected by the EU and the agribusinesses' lobbyists.

Even if the economic growth of Sweden's food production is still acceptable, southern and eastern Europe and large parts of Asia have begun to return to agricultural economies that are characterised by self-sufficient farms. Foreign demand for Swedish crops and products has therefore gone down during the 2020s. There is growing concern that massive over-production may flood the Swedish market and cause drops in prices, first in the market's lower segments and then in the higher ones. In contrast to how it used to be, Swedish agricultural companies have a high level of debt and they are not prepared for a sudden drop in demand. Should this happen, the banks will demand that loans be

repaid. Those who cannot pay, in particular family farms, may then be forced to sell their land at a loss. In order to minimise risks, the family farms are opening up for share farming which means that local consumers are tied closer to the farms through partnership. The small proportion of well-off consumers who are interested in this buy seasonal shares from the farmers before the growing season starts. They thereby commit themselves to a whole season's harvest. Consumers who are willing to invest are prepared to pay almost twice as much for locally produced products. This strategy means that responsibility, risks and harvests are distributed among several stakeholders.

The agribusinesses' solution to the crisis situation in food safety is marketing campaigns to convince consumers that they are taking measures against the use of antibiotics, and generous food discounts to consumers (apparently to alleviate the food crisis but in actual fact to dump their over-production). However, the consequence of this situation is that it is hard for them to invest in future technology.

High-tech companies that cultivate food in laboratories are taking advantage of the food crisis in Sweden but they are also starting to feel the effects of lower demand on the export markets. Several years of large production lines have led to lower costs but also to an excessively large supply. To counteract that, they are starting to lower their prices as they strive to win market shares from the agribusinesses, at the same time as they cut down on investments in new technology and production lines.

# Different solutions in an over-exploited world

In a future world dominated by agribusinesses, high-tech companies are involved in production and family farms are at risk of being knocked out or forced to change foot and become suppliers of services instead. Whether this is viewed as being a desirable future situation or not depends on whose perspective one takes.

Some people believe the future will be tough for individual farmers and farming communities compared with how the situation is today (2016). With this perspective, the family farms that still exist will be under heavy competition and will operate in difficult working conditions in rural areas that have been abandoned and where many links to our past have been severed. By today's standards, rural areas will be barren and will exist in the shadow of a strong urban societal norm. This is regarded as being a loss for the whole of society. Other people believe that the only thing that is constant over time is change. The fact that new generations of producers and consumers who take over after us have other values implies new opportunities and

solutions. With this perspective, it is positive for society that new lifestyles and jobs are created - in both the service and production economies - and that consumers (as a result of lower food prices) will have more money left over to spend on other things.

Many of today's researchers see the current patterns of foodstuff production and consumption as being negative from an environmental point of view. They also exacerbate social problems linked to justice, working conditions and work distribution. It is also difficult to create profitability in the Swedish agricultural sector. The new technology used by the agribusinesses and high-tech companies could be a solution to this. Mechanised drones and small, precision-focused tractors can be run on solar energy and controlled by GPS. Because they are small, they are easy to handle and because they use a relatively small amount of energy, they can help to reduce the total environmental impact of food production. For some people, laboratory-cultured meat does not only mean a future where meat can be

produced in an environmentally friendly way; it can also be made in a “humane”, nutritious and safe way.

Another way of responding to today’s situation could be to strive for local economies where producers and consumers are linked closer together. Local economies can give a good overview of the environmental and social effects of food production and also strengthen links between the populations of rural and urban areas. One way of doing

this is to develop the organisation forms and distribution channels of family farms by, for example, creating closer customer contacts through farm shops, networks for home deliveries and common farmers’ markets. Digital platforms can be used to facilitate the matching of producers and consumers. Increasing cooperation among producers may also strengthen family farms while educational campaigns, recreational areas and cultural events can stimulate an interest in local primary production and processing.

## Finally...

The driving forces behind the fiercely competitive future scenario in this story are market globalisation, harmonised legislation, new technology and a continuous striving for improved profitability.

Most people agree that all these challenges have not been handled in the right way. Because the easiest way to predict how the future will be is to create it oneself, we feel it is important that Swedish politicians and consumers decide for themselves what sort of future they want to be part of and then work proactively to make that future a reality.

To avoid the risk of a one-sided development of Swedish food production with widespread

dependency on external markets for both inputs and sales, it is important to create preconditions so that different forms of businesses can exist side by side. With a long-term perspective, it seems reasonable to favour a more differentiated agriculture that focuses on different functions and forms of business. By focusing on, for example, food production and services, it may be possible to have an agricultural industry where both agribusinesses and family farms can develop side by side.

## Discussion questions

- Does it make any difference to you how the food you eat has been produced? Do you believe you can influence what food is produced and how it is produced? Could you imagine eating laboratory-cultured food? Why/why not?
- What collective values - apart from the production of food - does Swedish agriculture contribute to?
- In the future, is it more important that agriculture uses resources more efficiently, with less climate impact and making less use of animals in production than maintaining traditional agricultural activities? Does one necessarily have to exclude the other?

*In this story of the future, Swedish production conditions are controlled primarily by multinational agribusinesses and decision bodies at supranational level (that is to say, the EU, WTO and UN).*

- Do you think these institutions are capable of controlling the development of Sweden's food production? *Try to find arguments for and against.*
- In such a situation, what are the risks for Swedish family farms and Sweden's rural areas? Are there also possibilities?



# Self-sufficiency?

Throughout the post-war period and up until the 1990s, national self-sufficiency of food was the basis of Sweden's agricultural policy. Because of a strong market liberal turn in the early 1990s, Sweden chose to abolish the goal of self-sufficiency. After being a matter of no interest since then, self-sufficiency with regard to food is now on the political agenda again as a result of changes in security policy.

In this story, we examine situations where different forms of self-sufficiency could become a reality in 2030. Three different scenarios are described where self-sufficiency has been pushed forward for different reasons: 1) as an effect of policy decisions aimed at reducing the vulnerability of food supplies within the EU, 2) for environmental policy reasons since a certain

degree of local self-sufficiency can be an effective way of using resources effectively, 3) as a result of a crisis preparedness measure within a newly formed Nordic union.

What we eat varies in the three scenarios and self-sufficiency is defined in different ways. Society is also self-sufficient on different geographical scales: the EU, the Nordic region and at a more local level. In the text's three alternative future scenarios, the reasons for self-sufficiency and how it is shaped are therefore different, as are the consequences for consumers and Swedish agriculture.



## Scenario 1: Self-sufficiency makes the EU less vulnerable

In this scenario, EU stands strong and trade within the EU is lively. Self-sufficiency here means that the EU member states jointly produce the food needed to feed the people of Europe. Hence, the purpose of the EU's agricultural policy is to increase self-sufficiency to reduce the risk of disruptions to food supplies. The Western world has a strong economic position but low ambitions when it comes to climate and environmental regulations. There is a global lack of resources such as land and inputs (for example, phosphorus) and clean water.

Basically, the EU countries have the necessary capacity to produce food for their people. In order to be self-sufficient with regard to inputs for agriculture and to stop dependency on fossil fuels, the EU has invested in the production of bio-fuel and high-quality fodder protein which will replace imported soya in animal feed. Inputs such as phosphorus and fuels are expensive which pushes food prices up.

Eating habits in Sweden have diversified even more between different social classes. People who can afford to do so are able to purchase what they want while others have to spend a large part of their disposable income on food to be able to eat a varied diet. Agriculture in Sweden is focused mainly on the production of milk and cereals. The EU no longer permits national legislation that negatively affects production possibilities in the agricultural sector. Sweden's former legislation for animal

protection has therefore been abolished. In practice, this has meant that animal welfare standards have been reduced in Sweden. Hardly any vegetables are produced in Sweden any more; they are imported from central and eastern Europe where the climate is more suitable for such production and there is a greater supply of labour. In southern Europe, due to shortage of fresh water production of vegetables is no longer profitable.

From a resource-effectiveness point of view, the increased specialisation within the EU countries has been beneficial – different products are being produced where production conditions are suitable. However, at the same time, specialisation is leading to a less diverse agricultural landscape and a loss of biodiversity. There is also an increase in the transport of food and inputs. Competition is reduced as fewer producers produce a certain product. Some food-stuffs, for example, vegetables, are becoming more expensive as competition goes down and demand is high. All EU countries, including Sweden, are becoming more dependent on the EU countries being able to reach consensus in important agropolitical issues and the possibility of individual countries becoming self-sufficient is going down as a result of increased specialisation.



## Scenario 2: Ambitious environmental policy lead to local self-sufficiency

In this future scenario, strict climate and environmental regulation has been implemented, both globally and within the EU. An indirect effect of this is increased local self-sufficiency of food. Global climate policy has managed to steer the world onto an effective pathway towards net zero emissions of carbon dioxide and the pressure on land resources is decreasing. The political world order is characterised by passionate commitment to the environment which is also strongly supported by the citizens of many countries including Sweden.

Technological solutions for returning phosphorus and other nutrients to farmlands have been developed and are used extensively. Therefore, supply of inputs for agriculture is relatively good and their prices are relatively low. EU governance has meant that the energy and transport systems have transformed very rapidly. In this future, food is produced to a large extent in the region where it is consumed, especially products where transports are a major cause of negative impact on the environment. Local food systems make it easier to recycle plant nutrients such as phosphorus and nitrogen to farmlands which is important since the release of nitrogen and phosphorus from wastewater treatment plants to watercourses is heavily taxed.

Thanks to new technology and state investments in small-scale plants for the production of bio-energy, the manufacture of fertiliser, slaughtering, mills, packaging and processing, different regions in Sweden have become self-sufficient to a large extent. Political investments in small-scale plants is a result of strong commitment among a large share of the population, policy instruments in the form of, for example, high taxes on emissions of carbon dioxide and nutrients, and the government's ambition to increase employment in agriculture and the food industry. Since Sweden already held a leading position in many sustainability areas when the strict global policy to protect the environment was introduced, technology and know-how in primary production, food processing and food safety are exported to other countries.

The regional food systems in Sweden mean that eating habits differ substantially in different parts of Sweden. More meat, fish and dairy products are eaten in the north compared with the rest of Sweden but also quite a lot of vegetables that are produced in resource-efficient systems that use waste heat from milk farms, dairies and other industries. Less milk and beef are consumed in the densely populated Mälardalen area.

Roots and vegetables and vegetables are produced in the cities, often in integrated systems with fish and insect cultivation. The cultivation beds are located in basements and on the roofs of housing and office areas and are looked after by companies that drive around and tend to the plots. Substantial amounts of cereals are still grown in Skåne. Fruit cultivation has increased dramatically since imported fruit has become very expensive. Large amounts of apples and pears are grown and also kiwi, plums, peaches, nuts and many new crops that have been introduced by newcomers to Sweden that have previously worked in the agricultural sector. The cultivation of pulses for human consumption, many types of lentils and beans, is expanding rapidly in southern Sweden. In the region of Västra Götaland, a plant cultivated meat has been set up and in Gothenburg there are several commercial plants for the cultivation of fish, shellfish, insects, mussels, algae and microorganisms that are refined into attractive food products. In the Västmanland region, a company called “Hi

Tech Food Science” has become very successful in exports related to high-tech food production. The food that is consumed in this region consists to a large degree of such products.

Because food production has become regionalised, the range of regional products is growing fast. Restaurants that specialise in local and regional food are experiencing a major boom. Not only the traditional dishes of steak and breaded plaice are offered at restaurants in small towns now; they also offer food handicraft that is strongly linked to the food produced in the region. Sweden now has more than 1000 products that are protected by EU brand protection.

## From protected market to free trade

During the post-war period right up until the 1990s, Sweden's food market was regulated to protect Swedish agriculture from international competition and thereby secure the country's ability to be self-sufficient. A high degree of self-sufficiency during peacetime was seen as being a guarantee for a high degree of self-sufficiency in wartime as well. Agropolitical government inquiries came to the conclusion that between 80 and 90 percent of consumption must be produced in Sweden, especially important product groups such as dairy products, cereals, animal feed, meat and certain minerals and vitamins via fruit and vegetables. Substantial stocks of food were also built up and large amounts of inputs for agriculture, such as diesel, oils, spare parts and agricultural chemicals, were also stored in case they would be needed during a crisis situation.

During the 1980s, market liberal criticism of Sweden's preparedness policy began to develop. When Sweden joined the EU in 1995, the self-sufficiency goal (also known as the production goal or the preparedness goal) was abolished and Sweden has had no plans for food preparedness or stocks of food or inputs since the end of the 1990s. Finland, on the other hand, who joined the EU at the same time, has retained both self-sufficiency goals and preparedness stocks. Swedish agriculture's share of the total consumption of food in Sweden has steadily decreased since Sweden joined the EU. In today's open food market, there are no clear links between production and amount of consumption within a certain area. Therefore Sweden's supply of food is secured by trade on the open market.



## Scenario 3: A Nordic union has been formed as a result of crises

**I**n this future scenario, an acute crisis in food supplies has arisen. China and India are strong global players who control large parts of global trade and have a strong influence on international organisations. There is a global shortage of goods, land and water. The EU split up long ago and its economic development is weak, as is Sweden's. An armed conflict arises in the Baltic Sea area and Sweden and Finland decide to get involved for political reasons and out of solidarity. Because of the war, trading collapses and for a period of time, Sweden finds itself in an isolated situation. Interstate trading in northern and eastern Europe collapses. As a result, the Nordic states decide to form a Nordic union. One important area for cooperation is a common agricultural policy which includes common external border protection, and a will to attain Nordic self-sufficiency of food.

Domestic supplies of food must be rapidly built up, and also domestic supplies of fuel and other input items. This means that agricultural production is given high priority so as to secure the supply of food. Agricultural policy is shaped so that the Nordic countries are completely self-sufficient with regard to important staple goods such as cereals, root vegetables,

pulses, milk and meat and – as far as possible, inputs for the production of these items. This is achieved through a combination of import regulations and subsidies to farmers. Subsidies are given which priority to farmers that focus on local cycling of nutrients since such systems are more less dependent on imported goods. Nordic production is protected by common external border protection in the form of import restrictions. For example, it is forbidden to import products that have not been produced in accordance with Nordic environmental and animal protection legislation.

In many places, land that was fallowed during the 20th century is now being cultivated again and abandoned pasture land is now once more in use. Some arable land is being used to grow raw materials for bio-fuels which can be used to substitute for petrol and diesel. Otherwise, the cultivation of food that is directly edible for humans has priority over the cultivation of animal feed. The production of pork and chicken is decreasing while the production of beef on natural pastureland is increasing. The diet of the Swedish people is based mainly on cereals, beans, root vegetables and eggs and supplemented with dairy products and beef. In gardens

and vegetable plots in towns, everyone who is able to grows vegetables and fruit for household use and many people have hens to secure the household's need for eggs and poultry meat. Large amounts of apples, carrots, cabbage and onions are grown, and various kinds of legumes. Traditional root vegetables have become popular again as a substitute for the imported vegetables. Food has become very expensive and the range is now more limited. Coffee and tea are only drunk on special occasions. Certain goods are rationed and most families have a very limited range of food that is served in the home. However, better-off families can still get hold of most of the items they want via an expanding black market.

Exotic fruit such as oranges and bananas is a luxury item that is produced on a small scale in greenhouses on Iceland. Vegetables requiring a lot of sun and heat are becoming luxurious, seasonal items.

The lack of a varied diet means more and more people are beginning to grow food for their own use and also to sell on a small scale. Vegetable growing in towns are increased dramatically with vegetable plots on roofs and balconies. Many small-scale, local initiatives where locals sell home-grown vegetables and other products are developing. Because of close cooperation among the Nordic countries, they can niche their production on the products that best suit their respective environmental conditions. Sweden produces primarily cereals and milk and some meat from natural pastureland, while Norway sells oil and mineral fertiliser to the other Nordic countries which means the shortage of energy is not as great as it would have been otherwise.

## Discussion questions

- In what situations could self-sufficiency have priority over free trade?
- In what situations could a high degree of self-sufficiency be possible even if there were no explicit policy strategy to achieve it?
- To what extent should food production be controlled by the market or the state?
- What are the benefits of a high degree of self-sufficiency? Are there any disadvantages?
- When could self-sufficiency be resource-effective? Does this apply to all foods or only certain types of food?
- To what extent should we be dependent on the import of foodstuffs and inputs for producing food in Sweden?
- To what extent are we prepared to change our diet?

**Future Agriculture** is an interdisciplinary research platform at SLU (the Swedish University of Agricultural Sciences), in which researchers, together with the agricultural sector, authorities and nongovernmental organisations, develop research to address the sustainable use of natural resources with emphasis on agricultural production, including farm animals, and land use.

[framtidenslantbruk@slu.se](mailto:framtidenslantbruk@slu.se)  
[www.slu.se/framtidenslantbruk](http://www.slu.se/framtidenslantbruk)



SLU, the Swedish University of Agricultural Sciences has activities all over Sweden. Its main locations are in Alnarp, Skara, Umeå and Uppsala.

Tel: 018-67 10 00 • Fax: 018-67 20 00 • Corp. ID no: 202100-2817