Climate change adaptation pressure heats up for food and agriculture companies

Climate change often has negative consequences for the food industry. Higher temperatures, more extreme weather and increasing water scarcity pose a risk to crop yields. This creates challenges for food manufacturers and can drive up food inflation. Climate adaptation measures on farms are now necessary for safeguarding past progress in crop yields

Dried cornfields in Northern Italy following prolonged water shortages which caused damage to areas most exposed to the heat and most difficult to irrigate

What squid exports tell us about the impact of climate change on the food sector

For fishermen in Belgium and the Netherlands, squid has been a remarkable success story in an otherwise declining market. While we often associate calamari and polpo with the Mediterranean, increased water temperatures in the North Sea actually provide a great breeding ground for baby squid. For fishermen in Belgium, squid has even become their biggest catch in terms of volume in 2023, moving up from fourth place in 2019. Consumers in Belgium and the Netherlands haven't

suddenly changed their culinary habits, however, so the majority of the squid end up being exported to countries like Spain and Italy.

This simple example shows why adapting to climate change is crucial. For food companies, there are two reasons why adaptation should be high on their strategic agenda. Firstly, global temperatures are rising and changes in weather patterns occur more often, which changes the operating enviroment for farmers and fishermen. Secondly, the exposure of food production to climate change is high compared to other sectors like services, and this resonates with food manufacturers and traders since they heavily rely on agricultural input.

The impact of climate change on agriculture raises the question of what food producers and wholesale traders can do to ensure a sufficient supply of raw materials in the future. This article provides an answer to that question based on desk research, data analysis and a series of conversations with companies operating in the food industry.

The need for climate adaptation in the food sector

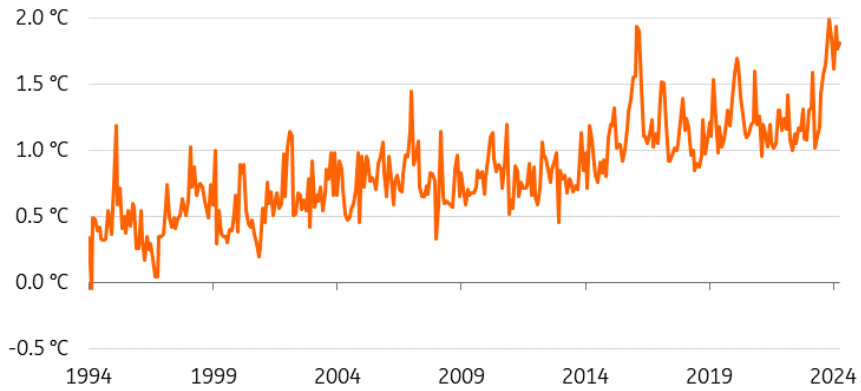
Weather conditions and water availability are crucial for agricultural production and Europe is now the fastest warming continent according to the European Environment Agency (EEA). Due to climate change, extreme heat and precipitation are also becoming more frequent, and more areas in Europe are struggling with water scarcity. The result is increasing competition for water and measures to curb its usage. These structural changes have consequences for trading companies and the food processing industry. According to the EEA, the most pressing risks to the European food system are in crop production in the form of lower crop yields and crop failures. Southern Europe faces greater risks than northern Europe. But there are also risks to livestock farming, fisheries, and aquaculture, such as heat stress in animals and the spread of animal diseases.

Rising temperatures cloud the forecast

Climate change brings about various shifts in weather patterns, and the common denominators are typically higher temperatures in combination with a higher frequency of weather extremes such as heatwaves, heavier rain and prolonged droughts. In the food sector, these extremes are often feared more than the higher temperatures because of their unpredictable character and the fact that they're simply more difficult to adapt to.

Rising temperatures

Temperature deviation from the long-term average in the Northern Hemisphere, monthly data up to and including April 2024



Source: NASA, Our World in Data, ING Research

Economic consequences of climate change for farmers, producers and consumers

The consequences of climate change end up on the plates of farmers, food producers, trading companies and ultimately consumers through a number of routes.

Consequences for farmers include the following:

- **Crop yields change**: crop yields are mainly impacted negatively by higher temperatures. Higher temperatures worldwide are negative for corn yields, for instance – but for wheat, the effect seems positive on balance.
- Growing season is getting longer: higher temperatures are extending the growing season for arable farmers and fruit and vegetable growers in many temperate regions in Europe. But in Northwest Europe, this effect is (partially) cancelled out by more rainfall in spring, which restrains arable farmers from accessing their land. An early growing season also brings a higher chance of damage from night frosts.
- **Disease pressure is increasing**: the combination of warmer and wetter weather leads to higher disease pressure for crops and animals and increases the demand for effective control methods.
- Income differences are increasing: more frequent weather extremes lead to more variation in crop yields and greater income differences between farmers.
- **Financial risks are rising**: greater unpredictability results in greater financial risks.
- **Increased competition for inputs**: more concerns about access to and availability of water in agriculture. Competition with other purposes (such as nature conservation) and other sectors (e.g., tourism) is growing.
- **Greater investment needs**: there is a greater need for measures such as irrigation, drip irrigation and machines that can be used on the land in wet conditions.
- **Different crop choices**: farmers may choose other crops based on changes in weather patterns and water availability.
- **Reason to stop farming**: climate change can be a reason to quit farming.

Consequences for food wholesalers and producers:

- **More uncertain crop forecasts**: for food processors, crop forecasts are an important source for production planning. More weather extremes make that planning increasingly uncertain.
- **Negative impact on raw material quality**: if crop growth cycles are disrupted more often, the processing industry is more likely to have less supply that meets its quality criteria (such as size).
- **Higher disease pressure increases uncertainty**: possible outbreaks of plant and animal diseases increase uncertainty about the supply of raw materials elsewhere in the value chain.
- **Adjust production volumes**: when farmers make different crop choices or leave their farms, it means that food manufacturers may need to adjust their production volume or look for alternative suppliers.

Consequences for consumers

- **Higher prices** of certain products.
- **Lower availability** of certain products.

To reduce negative consequences, companies in the food sector can make various adjustments. This is also known as climate adaptation, and these include measures with the following aims:

- Reducing **exposure**, such as diversifying suppliers.
- Reducing **susceptibility**, such as growing other crops.
- Providing a better or faster **response to weather extremes**, such as automatic alerts if disruptions are expected in a key sourcing region.

Weather conditions are a regular obstacle

The fact that extreme weather conditions are an obstacle to production in the food sector is clearly illustrated in data from the Dutch statistical office. In 2013, 2018 and 2023/24, 30% of Dutch farms reported suffering from weather conditions. In 2013 and 2023/24, these obstacles were mainly due to extremely wet weather, and in 2018 due to extreme heat and drought. The food industry is the largest buyer of agricultural products and the weather can also be an obstacle for these companies. The data shows that this is the case, although to a lesser extent.

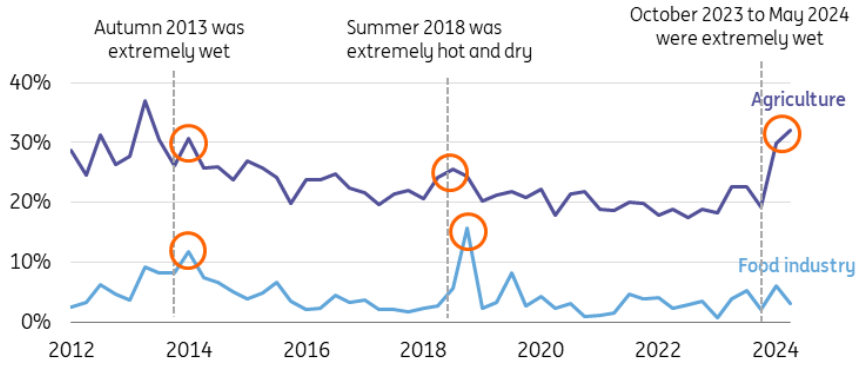
Why is the impact on production in the food industry lower than in agriculture? The main factors include:

- The presence of inventories dampening the impact of supply shocks.
- The opportunity to turn to similar raw materials from other regions and countries.
- The possibility of substituting one raw material for another.

If that is not possible, it could mean that food producers have to reduce production – for trading companies, it could mean turning over less volume or having to offer alternatives to their customers.

Extreme rain and drought can disrupt production in both agriculture and the food industry

% of Dutch companies experiencing disruptions in production due to weather conditions, quarterly data up to April 2024



Source: CBS, KNMI, ING Research

Growing concerns about water availability

Water is crucial for growing crops and keeping animals. It is also used extensively in production processes and is a basic ingredient of many foods. However, due to the combination of population growth, climate change, and economic growth, water is becoming scarcer and more expensive.

The business rate for water at Dutch water companies increased by approximately 20% in 2024. For food producers, this can mean an annual cost increase of tens of thousands to sometimes hundreds of thousands of euros. In addition, there is incidentally less water available at peak times and new connections or extensions of existing connections for drinking water are sometimes not granted. At the same time, water restrictions in dry periods can have a major impact on agriculture and therefore also have consequences for food producers and trading companies. The general expectation is that restrictions will be increasingly necessary in the future, especially in countries that struggle with (extreme) water stress, such as Greece and Spain. For the food sector, more efficient use of the available water is therefore an important step towards being more resilient to the effects of climate change.

Historical development of crop yields gives cause for hope

In conversations with entrepreneurs in the food sector, it's often mentioned that climate change is causing the supply of raw materials to fluctuate more and become more unpredictable. Furthermore, it's regularly stated that prices are rising and fluctuating more due to climate change. To test these hypotheses, we analysed the development of yields per hectare and the prices of 20 crops and products in the EU over a period of more than two decades.

The good news is that for almost all 20 crops in our analysis, in the EU crop yields per hectare are trending upwards despite climate change. This implies that through technological innovation, genetic advances in crops, and increasing knowledge and specialisation, farmers are better able to grow crops even under changing conditions.

Fluctuations in yields have increased in a number of crops

Fluctuations in yield per hectare have increased on average for a number of crops since the beginning of the century. On a European scale, this is the case with strawberries, peppers and lettuce, among other things. While these crops can be grown in greenhouses, the majority of the cultivation in important production countries (such as Spain and Italy) is often in the open field. At the European level, supply is therefore vulnerable to weather influences. At the same time, the fluctuations in yields per hectare for various other crops – such as sugar beet, carrots and tomatoes – have actually narrowed in recent decades.

Unfavourable conditions in one place can be compensated by more favourable conditions elsewhere. In practice, weather extremes often occur in a specific period in a specific area. The fluctuations may be greater within a season or within certain countries or regions, and this is certainly a point of attention for traders and manufacturers who source the majority of their raw materials from a specific region.

Climate change is one of the drivers of price volatility

Prices of many foods naturally fluctuate due to weather conditions, and climate change can amplify those fluctuations. For example, recent spikes in prices of olive oil, cocoa, potatoes for French fries and orange juice concentrate are strongly linked to weather extremes exacerbated by climate change. However, price volatility can also arise from other causes such as export restrictions, logistical problems and wars. The high volatility in world wheat market prices in recent years is a good example of this. Speculation can also reinforce a trend once it has started.

For the 20 crops and products in our analysis, there is often no clear trend in the volatility of prices on an annual basis. However, what we do see is that the price range for some crops is much larger than for others. For example, this range is relatively small for oranges and grapes, but large for potatoes, onions, tomatoes, sunflower seeds and durum wheat.

For most agricultural crops, yields per hectare are increasing

Trend in the EU over the period 2000-2022

Crop	Trend in yield per hectare	Fluctuation in annual yields	Bandwidth for prices
	Increasing/decreasing	Increased/equal/decreased	Large/medium/small
Potatoes	▲	►	◄-----►
Strawberries	▲	▲	◄---►
Apples	▲	▲	◄---►
Beans	▲	►	◄-►
Green peas	▼	▼	◄---►
Table grapes	▲	►	◄-►
Durum wheat	▲	▼	◄-----►
Cucumber	▲	►	N.B.
Olives (for oil)	▼	▼	◄---►
Peppers	▲	▲	N.B.
Pears	▲	►	◄---►
Rapeseed	▲	►	◄---►
Oranges	▲	▼	◄-►
Lettuce	▲	▲	N.B.
Sugar beet	▲	▼	◄---►
Wheat	▲	►	◄---►
Tomatoes	▲	▼	◄-----►
Onions	▲	▼	◄-----►
Carrots	▲	▼	◄---►
Sunflower	▲	▼	◄-----►

Eurostat, ING Research

How are food companies adapting? An insight into industry use cases

Based on conversations with entrepreneurs, we outline in a number of practical examples how these companies respond to the consequences of climate change in their supply chain.

1. Potato, fruit and vegetable companies look to deepen relationship with growers

The fact that there are clear climate risks in the cultivation of crops is emphatically evident in discussions with companies that process potatoes, fruit and vegetables. Apart from diversifying sourcing, another recurring strategic choice is to seek closer cooperation with growers. On the one hand, this cooperation provides a better insight into the state of the crop on the land; on the other, it helps them to make plans together on how they can reduce their vulnerability to the negative effects of climate change (such as drought).

2. Dried fruits and spices: climate change affects quality and increases the need to diversify suppliers

Subtropical fruits, nuts and spices are good examples of products that often come from outside Europe and find their way to companies in the food industry, such as bakeries and meat processors via trade. One of the dilemmas posed by climate change is that farmers are more likely to face higher disease pressure due to the combination of wetter and warmer weather. To secure their harvest, they will be more inclined to use more pesticides. However, this increases the risk that raw materials no longer comply with strict European residue directives, which in turn leads to

a smaller suitable supply. For food producers and trading companies, good contacts with alternative suppliers in the same region or elsewhere are often very valuable.

3. The fishing industry sometimes sees fish move to other areas and can create markets for new species
Adapting to changing conditions is a constant for many fish processors and wholesalers. Companies in the Netherlands have broadened their scope to include other species such as salmon and cod, pangasius, tilapia and tropical shrimp. As a result, purchasing has become much more geographically dispersed. Furthermore, the strong growth of farmed fish has also made supply more predictable. As seawater warms, fish populations adapt, for example by migrating. Since farmed fish do not have the freedom to migrate to cooler waters, more research is being done into what higher water temperatures mean for farmed salmon and cod. These insights influence both the working methods and the location of aquaculture companies.

Consumers more likely to see the consequences of climate change reflected in prices

Climate change is also on consumers' plates in the form of food prices and, in exceptional cases, also because products are temporarily unavailable. In scientific research on the effect of climate change on food prices, one of the main conclusions is that higher temperatures contribute to higher prices. This effect is strongest in very hot summers such as in 2022 and 2023. For example, it is estimated that, due to the heatwaves in 2022, food prices in Europe increased by 0.7 percentage points.

We expect the effects of climate change to be reflected most strongly and fastest in the prices of unprocessed products (such as potatoes, vegetables, fruit), basic staple products (such as flour and sugar) and tropical products (such as coffee and chocolate). Such products account for 30% of a Dutch consumer's shopping basket, but are likely to represent a larger share of shopping baskets in southern and eastern Europe.

Overview of the most climate-sensitive products in the shopping cart

Source: ING Research

Strengthening purchasing relationships and steering towards more climate-resilient production methods makes climate risks more manageable

For companies operating in the food sector, we draw up several conclusions based on this analysis.

- Climate change has multiple economic consequences for the food sector. Without timely adjustments, weather extremes and water scarcity increase the risk of crop failures in agriculture. The consequences of this resonate in the food industry and increase concerns about the availability of agricultural raw materials.
- Businesses have always adapted to changes such as weather patterns. The rising trends in crop yields over the past 20 years show that this has been achieved in the past. However, as the rate of global warming picks up and more weather extremes occur, the risk that companies will not be able to keep up with change is growing.
- Food manufacturers can overcome risks to their production by reducing exposure to climate change in their supply chain, reducing sensitivity to weather influences and by making sure that they can respond very quickly in case of weather extremes in key sourcing areas. This can be done, for example, by supporting more climate adaptations among farmers directly or through suppliers. But it can also be achieved by spreading out their suppliers more.

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