The vulnerability of

the European agriculture and food system

for calamities and geopolitics

A stress test

Report and advisory document
to the Dutch Minister of
Economic Affairs, Agriculture and Innovation

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A stress test

A. Report

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Wouter van der Weijden

Summary of report and advice

Food security
During the 1960s and 1970s, the EU succeeded in becoming largely self-sufficient in food production, thus assuring its food security for the most part. However, it is unclear which areas of food security are still vulnerable and/or whether there are there new vulnerabilities. In this report we have focused on emergencies and geopolitical shocks that can have a major impact on food *security*, i.e. food *volume*. We have not included emergencies that affect food *safety* (such as a nuclear disaster) or emergencies that have a much broader effect than on food chains alone (such as a flu pandemic or power failure).

Achilles heels
The EU is only about 50% self-sufficient in vegetable oils, and its self-sufficiency in soya for animal feed is virtually zero. This makes the EU vulnerable to *external* emergencies, especially the collapse of soya imports due to crop failures overseas or geopolitical shocks. Due to its relatively high level of soya imports, the Netherlands is probably the most vulnerable of all Member States.
In addition, the EU remains vulnerable to *internal* calamities, especially:

- large-scale production declines in agriculture (including grassland) caused by a prolonged drought or a severe volcanic eruption. This would primarily affect cattle and dairy farming;
- large-scale epidemics of contagious livestock diseases.

The Netherlands is less vulnerable than other Member States on the first point, but more vulnerable on the second.

Possible calamities
To study the damage caused by potential calamities, the Platform for Agriculture, Innovation and Society commissioned several research assignments at three institutes of Wageningen UR. Plant Research International, together with the Department of Development Economics, developed an indicative model to quantify the consequences for agricultural production and prices. The Platform supplemented these studies with its own research, workshops, a roundtable discussion and bilateral consultations with experts.

Collapse of soya imports
The potential damage caused by the collapse of soya imports is significant: a sharp drop in the production of pork, poultry and eggs, followed by recovery based on other – more expensive – animal feed. This will result in severe price fluctuations for pork and poultry; according to the indicative model will double within several quarters. The production decline would probably go hand-in-hand with a wave of bankruptcies in the livestock and meat sectors. The price shocks will probably be amplified by side effects such as speculation and widespread hoarding. With high prices, increases in theft and smuggling can also be expected. Moreover, smuggling leads to an increased risk of introducing livestock diseases.

Prolonged drought
The potential damage to production caused by a prolonged drought is also significant. Cattle and dairy farming will be especially affected because cows primarily eat roughage, and the import

and transport of roughage is much costlier than that of concentrates. Moreover, the EU has a buffer for concentrates in the form of grain exports. Cattle and dairy farmers will consequently dispose of cattle, causing the price of beef to initially decline by 15%, followed by a sharp rise to 140% in the fourth year. Milk production will decline, resulting in prices price increases to 160% in the second year. After this, the prices will decline because cattle and dairy farmers will increase their production in response to the higher prices. The milk price will rise to 140% in the second year, before starting to decline. Here as well, side effects can amplify the price fluctuations.

Severe volcanic eruption
The effects of a severe and prolonged volcanic eruption are closely related to the scale of the disaster. If only Europe is affected by the eruption, then the effect may be roughly similar to a prolonged drought in Europe. But if the scale is much larger, then production declines will also occur elsewhere, which will drive up prices on the world market. This would make it much more expensive for the EU to "buy itself out of trouble". Moreover, it is unclear if this would even be possible in an era of geopolitics. The consequences would be even higher prices for agricultural products, more severe price shocks, greater damage to the livestock, meat and dairy sectors, and higher food prices for consumers.

Prolonged drought + collapse of soya imports
A double calamity could be even more damaging, especially if a collapse of soya imports coincided with a prolonged drought or a serious volcanic eruption. The chances of such a coincidence are obviously much smaller, but the consequences could be far greater. According to the indicative model, prices for pork would peak at 200%, poultry at 210%, beef at 163%, eggs at 186% and dairy products at 184% of the initial levels. However, due to differences in the life cycles between the various types of livestock, all price peaks would not occur simultaneously, which would soften the impact on prices and consumers somewhat. Nevertheless, meat and dairy consumption would decline severely, especially in low-income groups. In this scenario, the EU would become a net importer of grain, and that could lead to sharply increased prices on the world market.

Large-scale epidemics of livestock diseases
In the area of livestock disease epidemics, the EU (especially England and the Netherlands) has experienced severe problems in recent years, primarily with BSE, swine fever, foot-and-mouth disease and avian influenza. The damage was extensive: large-scale culling of animals, major damage to the sector and the economy, and severe commotion. The cost ran into the billions of euros, partly because consumers lost confidence in the safety of beef, pork and chicken. Epidemics on an even much larger scale are conceivable, for example in case of coordinated bioterrorism attacks on European livestock with a virus for which no vaccine exists (such as African swine fever) or which is also hazardous for people (such as anthrax). In that case, the economic damage could be up to hundreds of billions of euros, not to mention the impact on society. With a large-scale epidemic with high mortality, the indicative model predicts price increases for meat up to 200% or more of the initial level. If consumers lose confidence in the safety of meat, then prices could increase less or even decline, but that would actually make the damage to the sector and the economy even more severe.

Food security
None of the scenarios would result in a serious threat to food security in the EU. After all, there are buffers on the demand as well as the supply side, including increasing import of grains and feed. In principle, sufficient quantities of meat and dairy products will still be available for everyone. However, there is a risk: meat and dairy products could become unaffordable for lower income groups, especially in cities in the least prosperous Member States. This will not necessarily lead to health problems for most groups, but children will risk malnutrition due to deficiencies of iron and vitamin B12. To prevent such malnutrition, interventions are required, e.g. food distribution.
Additional stress tests are required to map out weaknesses in the European agriculture and food system.

Probabilities of calamities
The probabilities of calamities cannot be quantified with any precision; at most, an order of magnitude can be indicated. For a *severe volcanic eruption* and a *prolonged drought* the probability is once in 100 years. This probability appears to be low, but is actually much higher than the probabilities that are assumed in national security policy for other serious disasters. For example, the security policy in Netherlands assumes a probability of once in 10,000 years for flooding of the *Randstad* (the urban agglomerations of the western part of the country).

The probability of a *large-scale livestock disease epidemic* cannot be calculated, but has increased due to the expansion of the EU and the growth in international traffic and transport. Moreover, the probability of a bioterror attack has certainly not decreased, considering the dissemination of the required expertise and the emergence of global terrorism and radical animal activism. A "bioterror 9/11" is not an imaginary risk.

Neither can the probability of the *collapse of soya imports* be calculated, but it has increased due to geopolitical developments. For example, China is importing larger and larger volumes of soya from the USA and South America. If social unrest threatens as a result of higher food prices, China could decide to purchase *all* soya offered for sale on the world market. On the supply side, in 2007/2008 and 2010 it turned out that the food-exporting countries could rapidly restrict their exports in case of high internal food prices, also due to fears of social unrest. As a result, they can drive up prices on the world market, an effect that can be amplified if traders and countries start making panic purchases. This can lead to malnutrition in net food-importing developing countries.

In case of high prices on the domestic market, grain and feed traders in the EU will also start exporting less and importing more. The EU may then amplify this market response by imposing export tariffs and/or suspending import tariffs, as it has done several times previously. As a result, the EU can also contribute indirectly to high food prices, malnutrition, food riots and political instability, for example in North Africa and the Middle East. This could turn in impact the EU in the form of reduced security and increased immigration.

Stabilising policy is required
In short, the EU has three reasons to prepare for serious disruptions in the feed supply and in livestock health:

- making the system – especially the livestock, meat and dairy sectors – *less vulnerable* to physical calamities and the whims of geopolitics;
- assuring the affordability of dairy products and meat for *vulnerable population groups*, especially urban children in the least prosperous Member States;

- preventing the EU from shifting the consequences of calamities to the world market, and hence to *food-importing developing countries*.

The EU is inadequately prepared for sudden food scarcity. In the "disaster cycle" of prevention - preparedness - response - recovery the EU has the following weaknesses, among others:

- regarding prevention: inadequate policy to prevent a sudden collapse of soya imports and to counteract the threat of bioterrorism on the livestock sector;
- regarding *preparedness*: the reduction of stockpiles and mandatory land set-aside. Moreover, private companies are also maintaining lower inventories due to their just-in-time delivery;
- regarding response: the absence of European disaster planning for scarcities of feed and food.

The EU is inadequately prepared for calamities. More preventive policy and more preparedness are both required.

Preventive policy

Prevention against *crop failures* caused by drought or a volcanic eruption is virtually impossible. The best prevention against *soya scarcity* is for the EU to start growing more protein-rich animal feed. This can take place through three types of measures:

- promoting the *production of protein crops* through innovation, subsidies and, if necessary, an import tariff. The latter is possible only if trading partners are compensated, for example by offering additional market access for meat, dairy products or sorghum;
- promoting the production of *energy crops* that can provide *protein suitable for animal feed as a by-product*. This is already taking place due to the biofuel blending mandate (mandating a biofuel percentage up to 10% in 2020) and can be strengthened by requiring a substantial proportion of the biofuels to be produced in the EU. However, research is required to study the sustainability of this option;
- selective relaxation of the ban on the use of *meat-and-bone meal in animal feed*. This ban was implemented in 2000 due to the BSE crisis. The European Commission wants to allow meat-and-bone meal from poultry to be used in pig feed and the reverse. As a rough estimate, this could replace 4-11% of soya imports.

Prevention of *large-scale livestock disease epidemics* is possible by implementing security policy against bioterrorism, by limiting long-distance transport of livestock and by mandating minimum distances between livestock farms. Through such preventive measures and buffers, the EU can reduce the severity of price fluctuations affecting animal feed, meat and dairy products, limit the damage to the livestock, meat and dairy sectors, limit the incentives for criminality and speculation and minimise the risk of malnutrition among vulnerable groups.

Preparedness

Preparedness primarily requires buffers. Obviously, there are already buffers on the demand side, such as wasting less food and eating less meat. There are also buffers on the supply side, such as using grass from roadside verges and nature reserves, exporting less grain and importing more grain. It is possible to strengthen the latter response, but as stated previously this is potentially harmful for food-importing developing countries.

Another potential buffer is for the EU to suspend import tariffs on meat and dairy products or to expand the import quota. This would not only limit price increases for European consumers, but also for livestock farmers, which would hamper recovery. Moreover, in the international arena such a measure is not easy to roll back. As a result, the EU could risk merely

exchanging its structural dependency on feed imports for dependency on imports of meat and dairy products. This measure should therefore be applied cautiously. Limiting *both* dependencies appears to be a better option.

Until recently, the EU also maintained two other buffers: 1) large stockpiles of grains, milk powder and meat, and 2) an area of mandatory set-aside land. But these buffers have largely been eliminated as part of the liberalisation of Common Agricultural Policy (CAP). The EU is apparently confident that any shortfalls can be easily filled by purchases on the world market. But this could turn out to be a miscalculation in an era of increasing geopolitics. A better option would be a *no-regret* policy, where the EU also takes account of other scenarios besides continuing liberalisation.

Such a policy implies that the EU would restore the previous buffers. This is not intended to restore the controversial income policy for farmers, but as a measure to cope with shortages. For the first year of scarcity, grain and feed stockpiles would be a suitable buffer; for a possible second year, set-aside land would offer a solution. Another possibility would be an area of extensively used arable land and grassland. An additional advantage of such buffers is that they can provide significant benefits in terms of environmental quality and biodiversity.
The private sector can also be held responsible for buffers. The EU would make agreements with companies in the food chain about maintaining minimum inventories. However, this is in direct conflict with their pursuit of just-in-time delivery. A compulsory inventory, such as existed until recently for the sugar industry, can also be reserved as an option.

In a broader context, the EU could encourage businesses in the food chain to increase their resilience to feed scarcity, from both a biological and an operational perspective. The intensive animal husbandry sector in the Netherlands is relatively vulnerable due to its dependence on borrowed capital.

Moreover, the resilience to livestock diseases could be increased by developing new vaccines (especially marker vaccines and vaccines against diseases for which a vaccine is still lacking) and by prescribing buffer capacity on livestock farms, slaughterhouses and rendering plants.

By means of preventive policy and an adequate policy response, the EU – in case of scarcity of animal feed or a large-scale livestock disease epidemic – could reduce severe shocks in production and prices, and consequently limit the damage to the sector, vulnerable groups of European consumers and food-importing developing countries.

Developing countries

Obviously, for developing countries more policy is required. The EU and the Netherlands can help by making their food supply more shock resistant. They have already started doing so by putting agriculture higher on their development agendas. The Netherlands has rightly established a link between food security and climate change.
Other options are the following:

- In the WTO, every country should retain the right *to protect its domestic food production* against rapid growth in imports. During the Doha round, that was a break point, particularly between India and the USA. At least as important are the already overly rigid loan conditions of the World Bank and IMF on this point, which should be relaxed.
- Make the *WTO rules more scarcity resistant.* In particular, food-exporting countries should be allowed to retain the right to reduce exports during times of high domestic prices, but within certain limits. This also applies to the EU. In this way, the market would remain

predictable, and this could in turn help to prevent panic buying, trade policy anarchy, domino effects, excessive price fluctuations and unnecessary stockpiling.

- Make global agreements to prevent destabilising forms of *speculation* (especially from the financial sector) on agricultural futures markets. This can be done through transparency and through regulation where necessary.
- World-wide, coordinate *stockpiles* as well as *reserve production capacity* through land set-aside schemes and/or flexible blending mandates for biofuels.
- Make global agreements to stabilise the *level of investment in agriculture* at a sufficiently high level. Although the crisis of 2007/08 was partly the result of excessively low investment, during the years to come there is a small risk of overinvestment leading to overproduction and low prices; as a result, history could repeat itself. Investments should not only focus on technology, but especially on strengthening institutions, such as land rights and access of small farmers to credit and expertise.
- Introduce and monitor compliance with adequate *codes of conduct for land grabbing and biofuels*, both of which affect local food security.

Political opportunities

This report and advice link up with the ongoing Dutch national programmes on National Security and Scarcity and Transition. Internationally, the report and advice anticipate the forthcoming reform of the CAP, the forthcoming conferences of the G20, the regulation of commodity markets and the final phase of the Doha Round of the WTO. These opportunities must be seized to make the food systems of Europe (including the Netherlands) and developing countries more shock resistant

1. Introduction

Food crisis

Since World War II, the world has experienced two global food shocks: in 1972/74 and again in 2007/08. In 2007/08 the prices of agricultural products doubled or tripled to near record heights.[1] Although most consumers in wealthier countries were easily able to pay the higher prices, in developing countries there were severe food shortages: the number of people suffering from hunger rose by 130 million[2] to 1.02 billion, and food riots broke out in 30 countries in Asia, Africa and the Americas, and several governments were destabilised. In 2010 food prices rose again, this time to even higher levels, food riots broke out in North Africa and the Middle East, and governments were toppled in Tunisia and Egypt.

Causes

The food crisis of 2007/08 did not have a single cause, but a combination of structural and incidental causes:[3]

- high prices for energy and fertiliser;
- a shift in the interest of investors from stock markets to commodities;
- drought in Australia and other regions;
- low food reserves (stockpiles). The so-called stock-to-use ratio of total grains and oilseeds had declined from 30% to less than 15%.[4] This was a consequence of low investments during the previous decades, caused by low prices. These low prices were in turn caused by overproduction in, and dumping by, Western countries;[5]
- a sharp rise in the demand for biofuels as a result of government incentive policy, especially in the USA and to a lesser extent in the EU.

The crisis was exacerbated because various states – due to their fear of food scarcity and political unrest – began to restrict exports and/or promote imports. The growth in welfare and meat consumption in China and India is often cited as a cause of price spikes, but that is a gradual trend that began in the 1990s and cannot explain the sudden price increase. In total, therefore, 5+2=7 factors played a role, although various analysts and politicians have emphasised different aspects depending on their interests and ideology.[6] The high energy and

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1 FAO 2009. *The State of Food and Agriculture*. Rome. www.fao.org/docrep/012/.../i0680e00.htm

2 FAO estimate for 2008 compared with 2005/07, before food prices peaked in mid-2008 and before the financial crisis that began shortly thereafter. After a further rise in 2009, the level in 2010 fell back to the level of 2008, but was still 130 million higher than in 2005/07. See: FAO 2010. *The State of Food Security in the World*. http://www.fao.org/publications/sofi/en/

3 See IFPRI 2010 *Reflections on the Global Food Crisis*. http://www.ifpri.org/publication/reflections-global-food-crisis

4 Low reserves often go hand-in-hand with periods of strongly fluctuating prices. See: OECD-FAO 2010. *Agricultural Outlook 2010-2019*. www.agri-outlook.org/

5 Dumping due to subsidised exports is referred to in: G. Meester & C. Neeteson 2008. *Voedselcrisis: hoge prijzen van voedsel: mogelijke oorzaken en oplossingsrichtingen.*[Food crisis: high prices for food: possible causes and solutions] Nota Ministerie van LNV. In the USA, there was also criticism of corporate dumping: some companies hold such a strong market position that they can purchase grain at prices below the cost of production, and then sell the grain for even lower prices on the world market. See: C. Smaller & S. Murphy 2008. *Bridging the Divide: a human rights vision for global food trade.* Institute for Agriculture and Trade Policy. www.iatp.org/iatp/publications.cfm?refid=104458

6 Example 1: in May 2008, when President Bush suggested that high food prices were caused by the strong growth of the Indian middle class, Indian politicians promptly pointed to the market for biofuels in the USA and the overconsumption by American citizens (*Agrarisch Dagblad*, 5 May 2008). Example 2: market-

food prices also interacted with the worldwide financial crisis that began in 2007 and that resulted in the biggest economic recession in the West since the 1930s (Box 1.1).[7]

Box 1.1 Energy crisis, food crisis and financial crisis

The energy crisis (2005 to 2008), the food crisis (2007/08) and the financial crisis (2007-present) did not cause each other, but did enhance each other:

- rising energy prices caused higher fertiliser prices, which slowed agricultural production, which in turn led to upward pressure on agricultural prices;
- due to the high energy prices, household finances came under pressure, and the number of mortgage foreclosures increased in the USA. This led to the start of the credit crisis;
- when the profits on the stock market began to fall in 2007, investors turned to the energy and commodities markets, forcing food prices even higher.

Moreover, efforts to control one crisis can exacerbate another crisis. For example, the US Fed tackled the crisis by means of *quantitative easing*, which amounts to creating more dollars. This keeps interest rates low and makes it more interesting for investors to enter markets where prices are rising, such as the markets for energy and grain.

Source: interview with Jeffrey Sachs in NRC Handelsblad, 7 December 2008.

Box 1.2 Similarities between the food crises of 2007/08 and 1972/74

In the USA, there were important similarities between the food crisis in 2007/08 and that in 1972/74:

- increasing energy prices
- low interest rates and a low exchange rate for the US dollar
- shrinking food reserves
- bad weather
- a sudden increase in demand.

The increased demand in 1972/74 was caused by a crop failure in Russia, which then promptly purchased 25% of the American wheat crop. In 2007/08, the cause was the increased demand for biofuels in the USA itself, which had been rising since 2005. The demand for biofuels was generated by the government, and consumed one-fourth of the maize harvest in the USA.

In view of the above causes, new food crises are certainly possible. Moreover, the weather has become less stable as a result of climate change.

Source: D. Headey & Shenggen Fan 2010. Reflections on the global food crisis: how did it happen? How has it hurt? IFPRI. www.globalfoodsec.net/static/text/ifpri_reflections.pdf

oriented economists often point fingers at government interventions such as export bans and the biofuel blending mandate. Other economists, along with France and many NGOs, emphasise the role of speculators and the shrinking volume and obscurity of food reserves, and actually called for more government intervention. According to the OECD, FAO and IPRI, speculation plays an insignificant role.

7 OECD-FAO 2010. Other frequently-cited causes of the financial crisis were: the low interest rates of the US Fed, political pressure on mortgage banks in the USA to provide more generous loans, unbridled growth in complex and obscure financial products, deregulation and lack of oversight of financial markets, enormous growth in derivatives traded without supervision outside the exchanges, overly optimistic credit ratings and perverse bonus systems for management. Here as well, there was a mixture of too much and too little government intervention.

Recent developments

After mid-2008, agricultural prices fell sharply. There were two causes: 1) the increased agricultural production in response to higher prices, and 2) the fall in demand that resulted from high prices, the recession and reduced support for biofuels in some countries.[8] The reduced interest of speculators may also have played a role. According to the FAO, between 2008 and 2009 the number of people suffering from chronic hunger fell by 98 million.[9] In the meantime, however, the world had been shocked into awareness about food security. The OECD and FAO (2010) have not excluded the possibility of new price shocks during the coming decade. For example, this could be the result of Russia and the Ukraine – regions known for their widely fluctuating harvests – becoming more important players on the wheat market.

Figure 1.1 Development of world food prices since 1990. Based on the *Food Price Index* of the FAO. Source: http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/

During the summer of 2010, grain prices again rose sharply as a result of drought, heat waves and even grain fires in Eastern Europe, along with flooding in other parts of Europe. Russia halted grain exports, which contributed to grain shortages in Egypt. In Mozambique, food riots broke out. In December 2010, the world food index of the FAO – which takes account of the prices for grain, meat, sugar, dairy products and vegetable oils – reached its highest level since 1990.[10] Together with smouldering social and political unrest, in the first months of 2011 this led to a wave of demonstrations in many North African cities and in the Middle East. Revolutions took place in Tunisia and Egypt, and a civil war broke out in Libya. These events resulted in a flood of refugees.[11]

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8 OECD-FAO 2010.

9 http://www.fao.org/news/story/jp/item/45210/icode/

10 agd.nl 5 January 2011.

11 In Tunisia and Egypt, dictators have made way for less dictatorial regimes. However, this does not mean that high food prices promote democracy; food riots can also break out in more democratic countries, and that can lead to the opposite, for example to a military coup.

After 2007/08, many countries began to take measures to counteract the risk of food scarcity, not only by banning exports, but also by subsidising food imports and food production. This created a new source of instability. Wealthy countries also began purchasing farmland in Africa, Asia and South America. More recent price increases have already elicited new policy. For example, India wants to give poor people the right to subsidised food and to increase the interest subsidy for its farmers.[12] And the EU wants to temporarily create more space for importing grain and sugar.

Is the EU also vulnerable?

In this context, one can ask if the EU is also vulnerable for food crises. Food security was the primary aim of the original Common Agricultural Policy of the EU. That aim had already been realised around 1980, when the EU became self-sufficient in most of the "major" agricultural products. But it is unclear to what extent the European food supply is resilient to *calamities* such as large-scale drought, long-lasting volcanic eruptions, major outbreaks of livestock diseases or the sudden collapse of imports due to natural disasters or geopolitical discontinuities. This question is even more relevant because the vulnerability will increase due to various global trends (see the following chapter). Moreover, in case of scarcity, traders in the EU will quickly begin exporting less grain and importing more. As a result, the EU could pass on its internal problems to food-importing developing countries.

This report

In 2009, the Platform Agriculture, Innovation and Society published a policy memorandum and advisory document on one of the trends that could lead to problems with food security: phosphate scarcity.[13] The conclusion of that report was that phosphate scarcity will become an immense global problem, but not in the current decade. We can also add that trends in water scarcity, climate change and the exhaustion of genetic resources will probably not have a major impact before 2020. However, the agriculture and food system of the EU is already vulnerable to certain calamities, such as a collapse of soya imports or a large-scale livestock disease epidemic. Neither the Common Agricultural Policy (CAP) of the EU nor the recent reform options for this policy, which were recently formulated by the European Commission, as yet take sufficient account of these threats (Box 7.9). The same applies to the recent report of the High Level Expert Group on Milk.[14]

The present report can be seen as an initial “stress test” of the agriculture and food system, to some extent comparable to stress tests conducted on banks and nuclear plants. We limit ourselves to the consequences of calamities on the *volumes* of feed and food. The consequences for food *safety* are no less relevant, but would require a separate report.

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12 W. Brummelman. *India bezorgd over stijgende inflatie* [India concerned about rising inflation]. *NRC Handelsblad* 28 February 2011.

13 H.A. Udo de Haes, J.L.A. Jansen, W.J. van der Weijden & A.L. Smit 2009. *Fosfaat - van teveel naar tekort.* [Phosphate – from excess to shortage]. Steering Committee for Technology Assessment.

14 *Report of the High Level Expert Group on Milk* 2010. The group publishes advisory reports on how market stability, incomes and market transparency can be improved. These reports focus on agreements: establishing standard contracts, improving the negotiating position of producers, providing a role for sector organisations and ensuring transparency. But they do not say anything about excessively *high* prices, calamities and geopolitics. http://ec.europa.eu/agriculture/markets/milk/hlg/report_150610_en.pdf

In the present report, we will consider the following:

- a series of trends that are expected to increase the risks for the food system in this century;
- calamities that could occur during the next decade;[15]
- consequences of the most relevant calamities;
- possibilities and limitations of the market;
- policy options to limit the risks;
- passing on the consequences to developing countries and options to limit this undesired effect.

This report and advisory document are intended, in part, as a contribution to the debate on the reform of the Common Agricultural Policy (CAP) of the EU that began in the autumn of 2010. This project was also initiated in response to the introduction (by France) of the food security issue at the G20. In addition, we linked up with the National Security Strategy of the previous coalition government in the Netherlands,[16] and with the Scarcity and Transition programme that the previous government initiated at the request of the First Chamber of Parliament.[17] Both of these initiatives considered a scenario involving a sudden scarcity of soya.[18] In the present report, we looked at a broader range of possible calamities.

[15] This approach is possibly too optimistic for the micronutrient zinc, which is essential for agriculture and food, and is also used in industry. Within a few decades, zinc will become scarce and expensive. See: M.A. Keyzer, W. van Veen & R.L. Voortman 2009. *Nutrient shortages and agricultural recycling options worldwide, with special reference to China.* Contributed paper at the 2009 EAERE conference. http://www.webmeets.com/files/papers/EAERE/2009/1030/Nutrientshortages.pdf

[16] Strategie Nationale Veiligheid [National Security Strategy]. www.regionaalcrisisplan.nl/bestanden/file32028243.pdf. Letter from the Minister of the Interior and Kingdom Relations *Nationale Veiligheid.* Tweede Kamer 30821 nr. 10.

[17] Projectgroep Schaarste & Transitie 2009. *Schaarste en transitie - Kennisvragen voor toekomstig beleid.* [Scarcity and transition – Knowledge questions for future policy] Ministry of Housing, Spatial Planning and the Environment and Ministry of Foreign Affairs. The document refers to phosphate as an important scarcity problem in the next century. It also pays attention to the relationship between scarcity and geopolitics.

[18] A. Burger. 'Voedselzekerheid en nationale veiligheid'. [Food security and national security] *Magazine nationale veiligheid en crisisbeheersing* January/February 2011.

2. Risk-increasing trends

Most experts[19] expect three developments in the agricultural markets during the coming decades:

- prices that remain higher than the historical trend;
- higher price volatility;
- higher prices for agricultural inputs.[20]

Below, we refer to a number of global trends that in the coming decades could cause further increases in agricultural prices and/or their volatility, increase the probability of calamities and may undermine food security, possibly in Europe as well.

Growth in world population, welfare and meat consumption

The world population is expected to grow from its current 6.8 billion to 9 billion in 2050. Average welfare will also increase. Up to a specific welfare level, this almost certainly goes hand-in-hand with increased meat consumption. As a result, the demand for food and feed will rise sharply.

This situation is different in the EU, where the population is expected to grow slowly or may even shrink, and where meat consumption is still increasing, but only very slightly. However, as long as the EU continues to purchase large quantities of soya on the world market, it will encounter increasing competition from other buyers, especially from Asia. This can lead to higher price spikes and stronger fluctuations.

Globalisation

The globalisation of food production is leading to regional specialisation, which means more concentrated production. This concentration will take place partly in areas with the best production conditions. This can lower the costs of production. Concentration will also take place near ocean ports. This trend is not due to the beneficial production conditions at these locations, but their logistic advantages. In both cases, the *risks* will also become concentrated, especially political risks and physical risks such as extreme weather conditions, plant and animal diseases and volcanic eruptions.

For example, if more than half of global soya and sugar production takes place in South America, then the entire world will become more vulnerable for potential calamities in that region.[21] A second example: some analysts expect that the USA will be replaced as the world's largest wheat producer during the next 10 years by three countries bordering the Black Sea: Russia, the Ukraine and Kazakhstan.[22] This will probably result in a more volatile

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19 See, for example, European Commission 2011. *Tackling the challenges in commodity markets and on raw materials*. Brussels.

20 The factor of higher prices for inputs alone makes it uncertain that farm incomes will improve. Moreover, price increases for agricultural products are often transmitted only partially to farmers.

21 For example, on the topic of sugar, the OECD and FAO (2010) stated: "The growth underway in Brazil implies further concentration in sugar production and trade that is not without risks to sugar users and a potential source of additional price instability." Brazil is also expected to be responsible for 60% of meat exports from non-industrialised countries.

22 Russia is a different story. Although it has the largest area of uncultivated land after Brazil, some 40 million ha., it still imports about half of its food. Russia is moving gradually towards self-sufficiency. In 10 years, it aims to be 95% self-sufficient in grain and 80% self-sufficient in oil seeds. The FAO and OECD even expect Russia to become a net exporter of both commodities. See: C. Bron, *Rusland droomt van zelfvoorziening* [Russia dreams of self-sufficiency] *agd.nl* 7 January 2011. It is still uncertain whether Russia is going to commit itself to becoming a grain exporter (perhaps as part of a cartel with the Ukraine and Kazakhstan) or if

supply, because in that region the weather tends to be unstable – as shown again in the summer of 2010 – and the politics may be unstable as well.

Globalisation also goes hand-in-hand with increasing transoceanic flows of goods, people and livestock. This increases the risk of invasions of pathogens and parasites of crops and livestock, as well as their vectors. Recent examples of such invasions in the Netherlands are the bluetongue virus and the corn rootworm. Moreover, the increasing transport flows also increase the risk of genetic crosses between related pathogens, resulting in new, even more virulent strains.

Liberalisation

The previous CAP stabilised internal prices in Europe, but at the cost of instability of world market prices. In a sense, the EU exported price instability. The ongoing liberalisation of the CAP has had the opposite effect.[23] Worldwide, liberalisation offers each country additional food security in the sense that it has more possibilities to purchase additional food and other commodities in case of scarcity. A less beneficial effect is that the EU – following the example of the USA – has largely eliminated its intervention stocks that it built up since 1975. This makes the EU even more vulnerable.

The buffers held by private parties have also become smaller. The food industry is keeping smaller stocks in order to reduce storage costs and be able to deliver products *just in time*. This efficiency is therefore both a strength and weakness.

Vulnerable world trade system

The world trade system has turned out to be vulnerable for recession and food scarcity. During the most recent recession, the G20 repeatedly made agreements to counteract protectionism. Nevertheless, 30 countries – including Russia, the USA, China and India and Brazil – implemented a total of 278 protectionist measures, of which only 20 had expired or been abolished by May 2010.[24] The rise of nationalism is almost inevitable in case of food scarcity.

The WTO cannot do much against such protectionist measures, and in the case of developing countries its hands are tied. Moreover, the importance of the WTO is declining due to the emergence of regional free trade zones: the first such zone was the EU (which now includes 27 Member States and perhaps even more in the future), which was followed by NAFTA (Canada, USA and Mexico) and ASEAN, then SADC (Southern Africa) and in the near future APEC (Asian-Pacific region). More bilateral trade agreements are being prepared as well. In 2004, the USA signed such an agreement with Chile and is now negotiating with Peru. The EU recently signed an agreement with South Korea and is currently negotiating with Mercosur (Argentina, Brazil, Uruguay, Paraguay and Venezuela).

Resource nationalism, state companies and geopolitics

After the fall of the Berlin Wall in 1989, the illusion took hold that the world was on its way towards a single global market. This illusion now appears to be over, for two reasons: the above-mentioned regionalisation of free trade and the emergence of state-owned companies. Partly or fully state-owned companies (from China and elsewhere) and heavily government-subsidised companies (from Brazil and elsewhere) are becoming increasingly influential on the world market. They operate with political aims as well as economic ones. For example, in

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it is going to use the additional grain for expanding livestock production, for which it is still far from self-sufficient.

23 G. Meester, verbal communication.

24 European Commission. *EU calls on trading partners to remove protectionist barriers.* Press release 28 May 2010.

China and Russia state-owned companies have the political aim of preventing inflation of food prices and social unrest. In addition, state-owned companies sometimes strive for geopolitical power.[25]

This leads to a comparison with the energy sector, where geopolitics became manifest as far back as the oil crisis of 1973. The Gulf War of 1991 and the Iraq war of 2003 also had an energy-geopolitics component. In recent years, various large countries, including China, Australia and Canada, have announced plans to strengthen their naval power to secure imports of energy and other resources (Box 2.1).

In the meantime, businesses from 20 countries are actively participating in *land grabbing* in 24 countries in Asia, Africa and South America. These include partially and fully state-owned companies – Chinese, Korean and Saudi Arabian. China is paying for this land not only with cash, but also by building infrastructure. For example, it is investing $8 billion in railway infrastructure in soya-producing regions in Argentina. During times of food scarcity, *powerplays* can be expected with economic means, and if necessary political ones. Until now, the EU has remained passive in this respect. It has largely used up its intervention stocks, relying on the world market, while at the same time China, India, Russia and the Ukraine have built up large stocks.[26]

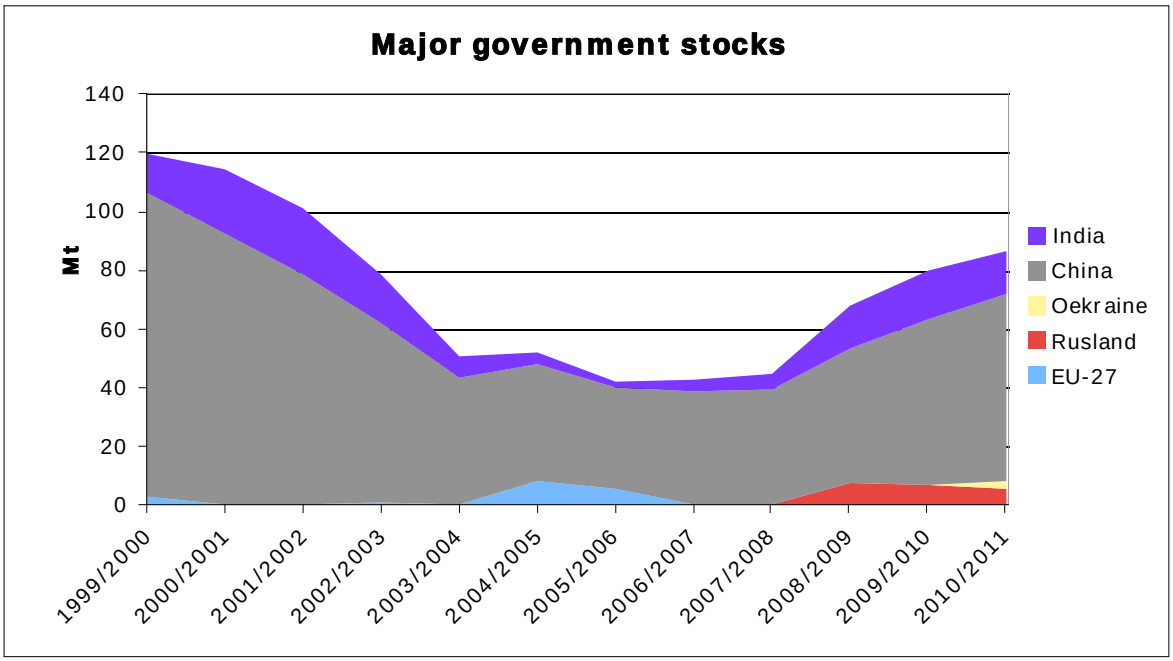

Figure 2.1 Development of important government stocks of wheat 1999-2010. Source: Cefetra.

[25] For example, the British energy consultancy Wood Mackenzie reported that the Chinese government ordered Chinese energy concerns to use all opportunities created by the economic crisis to buy up oil, gas and resource companies (*NRC Handelsblad* 15 June 2010).

[26] Russia has engaged in multiple powerplays with its neighbouring countries regarding exports of natural gas. As an indirect effect, EU Member States, especially Bulgaria, were victimised. Now that Russia, together with the Ukraine and Kazakhstan, has an opportunity to pass the USA as the largest wheat exporter, a powerplay with grain is not unthinkable.

Interrelationship with financial markets

In recent decades, the financial markets have grown rapidly. Not only investment banks and pension funds have developed rapidly, but also hedge funds. During the past decade, hedge funds have increasingly focused on the trade in derivatives based on commodities, such as energy, wheat, soya and maize. Between 2003 and 08 they increased their purchases on these markets from €13 billion to €170-250 billion.[27]

Box 2.1 Maritime geopolitics in the 21st century

China has been expanding its navy for a number of years with the aim of securing supply routes, especially the sea route to the Middle East. For the first time since 1421(!) China sent warships to the Indian Ocean, this time to control piracy. For that matter, the Chinese fleet is working together with fleets from the EU and the USA. In his latest book, Robert Kaplan predicted that the Indian Ocean will become the focus of geopolitics in the 21st century. This prediction appears to be tenable for oil and gas. By 2010, more than 25 countries had sent warships to the Indian Ocean and the Gulf of Aden – probably not just to control piracy. Moreover, it may not be mere coincidence that NATO requested a former CEO of an oil company – Jeroen van der Veer from Shell – to chair a commission to formulate a strategy for the coalition. Australia also expects that world powers will begin to struggle for control in the Indian Ocean. It is building a navy and army that should be able to provide security far from its coasts.

For agricultural products, however, it appears that the Indian Ocean will be less important than the routes between China and South America; these routes pass through both the Pacific and Atlantic oceans (see Figure 4.4). Securing these routes is why China wants to build a railway from the Pacific through the middle of Colombia to the Caribbean – creating an alternative for the Panama Canal – and why it is investing in a railway from the Argentinean coast to the resource-rich interior. The route from India to South America is also likely to become important. This route does pass through the Indian Ocean and continues into the Atlantic Ocean.

Due to the melting of the Arctic icecap, new sea routes via the Arctic Ocean are expected to open up in the summer. These routes appear to be especially important for shipping between Canada and Russia and between Europe and East Asia. For transporting agricultural products from the Americas to East Asia and South Asia, this route has very few advantages.

Sources:

China investeert 7,9 miljard dollar in Argentijns spoor. [China invests $7.9 billion in Argentinean railway] NRC Handelsblad 14 July 2010.

Chinese fregatten naar Somalië. [Chinese frigates sent to Somalia] NRC Handelsblad 4 May 2009.

Kaplan, R. 2011. Monsoon – the Indian Ocean and the future of American power. Random House, New York.

Schenkel, M. Strijd tegen piraten is ook geostrategie. [Antipiracy it is also a geopolitical strategy] NRC Handelsblad 8 February 2011.

Rademaker J.G.M., A.L.E. Arbouw & D.A. Swijgman 2007. China als militaire mogendheid. [China as a military power]. HCCS, Den Haag (www.hcss.nl/en/.../Notitie_China_eindstudie%20Rademaker.pdf)

The activities of these players were not the primary cause of the rising food prices in 2007/08, but they probably amplified and accelerated this trend (Box 8.4). Because such players do not have any interest themselves in physical stocks, they can behave as if they were gambling at a casino[28], thus making prices even more volatile with their huge capital investments.[29] A fundamental risk of this situation is that markets are created which are driven less and less by fundamentals such as supply and demand, and more and more by prices and price speculation.

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[27] European Commission 2011. *Tackling the challenges in commodity markets and on raw materials.* Brussels.

[28] In the debate about the role of investment banks, hyperbole is often used. According to CEO Blankfein of GoldmanSachs, the banks are doing "the work of God", but according to mega-investor Warren Buffett they are deploying "financial weapons of mass destruction". These claims seem to be conflicting, but a prophet of doom might claim that *both* statements are true.

[29] The French president Sarkozy summarised the situation perhaps too concisely: "Scarcity creates speculation and speculation creates scarcity".

For example, if the bond markets are in decline or if the exchange rate of the US dollar falls, investors can turn to agricultural futures markets, and then exit these markets when other markets offer better profit opportunities. As a result, they can destabilise the global food system (see Box 8.4).

Interrelationship with the energy market

Fossil energy reserves are finite, but will still last for centuries. However, those reserves of gas, oil and coal that can be *easily extracted* are becoming scarce. This means that energy will become increasingly expensive, even more so because the demand will continue to rise. In many sectors, including agriculture, this will raise the cost of production.

In addition, the markets for *food, feed and fuel* are becoming increasingly interconnected. High energy prices promote the production of energy crops, which in many regions compete with food and feed crops, and can therefore drive up food prices.[30] Although only 2% of the total area of farmland is currently used for growing energy crops, this proportion is increasing because the USA, Brazil and the EU are requiring producers of transport fuels to blend higher and higher percentages of biofuels. This primarily concerns bio ethanol from maize (USA) and sugarcane (Brazil) and bio diesel from rapeseed (EU).[31] Another factor is that the big players on the energy market have much more capital to invest than their counterparts on the markets for *food* and *feed*.[32] As a result, price spikes for energy will increasingly be followed by price spikes for food.

Water scarcity

Worldwide, agriculture is responsible for 85% of fresh water use.[33] Large areas of farmland in China, South Asia, the Middle East and North Africa are irrigated (often in government funded projects) by means of overextraction of groundwater and river water resources. According to the World Bank, approximately 175 million people in India and 130 million in China rely on food that is produced through overextraction of groundwater resources. Saudi Arabia has become self-sufficient in wheat thanks to groundwater resources that are now becoming depleted.[34] In addition, there are more and more competing claims on water from cities, energy production (biofuels, hydroelectric dams, extraction of shale gas) and industry. As a result, agricultural production is becoming even more vulnerable for drought. During the

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30 The effect of biofuels on food prices is sometimes played down, but that does not appear to be justified – at least not in the USA. See: J. Engwerda. *Biobrandstof beïnvloedt voedselprijzen wel degelijk* [Biofuels indeed affect food prices]. *agd* 11 March 2011. In a reaction to the oil disaster in the Gulf of Mexico in June 2010, President Obama urged an accelerated transition to a biobased economy (http://www.whitehouse.gov/issues/energy-and-environment). This could drive prices for maize and other grains even higher. The USA has already decided to increase the blending mandate for ethanol from 10% to 15% (ICIS.com 13 October 2010). In 2010, the USA was using 38% of its maize to produce ethanol, and that percentage will probably rise.

31 A significant amount of land is used to produce biofuels. In the EU, the planned 10% blending mandate in 2020 would require an area of energy crops covering 20-30 million ha, equivalent to 20 to 30% of the total area of farmland in the EU. Depending on policy, a significant percentage of this production will take place overseas, where yields are lower. As a result, the required area will be even larger.

32 Shell and Cargill have jointly invested in the Wisconsin-based company Virent Energy Systems, which aims to be the first in the world to produce biopetrol directly from plant sugars (*Agrarisch Dagblad* 15 June 2010). In addition, Shell has embarked on a joint venture with the Brazilian company Cosan, which produces ethanol from cane sugar (*Agrarisch Dagblad* 26 August 2010).

33 See: http://www.clubgreen.nl/vraag/water-footprint.html

34 A. George. *Earth economist: The food bubble is about to burst.* Interview with Lester Brown in *New Scientist* online 10 February 2011.

coming decades, this will also become an increasing problem in southern Europe and parts of eastern Europe.[35]

Climate change

The increasing CO_2 concentration in the atmosphere will potentially have a positive effect on the production of rice, wheat and soybeans. At any rate, this effect has been demonstrated in greenhouse experiments. This is why some greenhouse growers deliberately enrich the greenhouse atmosphere with CO_2.

Climate change – which is caused primarily by CO_2, methane and nitrous oxide emissions – may initially increase agricultural production. But recent research suggests that – due to climate change – production of maize and wheat has already increased less since 1980 than would have been the case without climate change.[36] At any rate, with additional temperature increases, production is expected to decline. Moreover, it is expected that every temperature increase will lead to increased frequency and severity of extreme weather phenomena, such as prolonged drought. This will increase the probability of food crises across the world. The IFPRI expects that climate change will reduce the yields of the most important crops, and will impact South Asia most severely.[37] For Europe in the coming decades, various experts predict that production will decrease in southern regions due to water scarcity, but will increase in the north due to higher temperatures.[38]

Diminishing returns

Although large areas of farmland still have an enormous potential for increased production, we must consider that productivity does not increase in terms of *percent*, but in a *linear* fashion: every year, there is the same production increase in terms of weight on average. So even if linear productivity growth continues, this means that the growth percentage will diminish. Moreover, the production of some crops – especially wheat – has reached its biophysical ceiling in an increasing number of regions. This was shown on a recently published world map of the so-called yield gap.

In Northwest Europe, Northeast China and parts of the USA, this gap has become narrow (Figure 2.2). In the EU, the rate of increase has declined during the past decade, and the European Commission expects further decline.[39] In China, the productivity increase of rice is also falling in the most important production areas.[40] In 2009, Shihavi Pandey, head of the Plant Production and Protection Division of the FAO, cited the following figures: since 1961, the productivity per hectare has increased by 2.3% per year, but between 2009 and 2030

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35 AEA 2007. *Adaptation to climate change in the agricultural sector. Report to the EC Directorate-General for agriculture and rural development.* http://ec.europa.eu/agriculture/analysis/external/climate/final_en.pdf

36 D.B. Lobell, W. Schlenker & J. Costa-Roberts 2011. Climate Trends and Global Crop Production Since 1980. *Science* 5 May 2011: 1204531.

37 G.C. Nelson *et al.* 2009. *Climate change: Impact on agriculture and costs of adaptation.* IFPRI, Washington DC.

38 Misguided climate *policy* can also be a source of instability. This is especially true for the global trade in CO_2 emission rights. Agriculture could participate by trading carbon storage in the soil, in plant roots and in trees/shrubs (such as olive and coffee plantations). However, the Institute for Agriculture and Trade Policy in Minneapolis has expressed the fear that this trade could lead to increased price volatility, partly due to speculation. This could lead in turn to instability in agricultural systems. See various publications at: www.iatp.org/climate

39 European Commission 2010. *Prospects for agricultural markets and income in the EU 2010-2020.* http://ec.europa.eu/agriculture/publi/caprep/prospects2010/fullrep_en.pdf

40 World Bank 2007. *World Development Report 2008.*

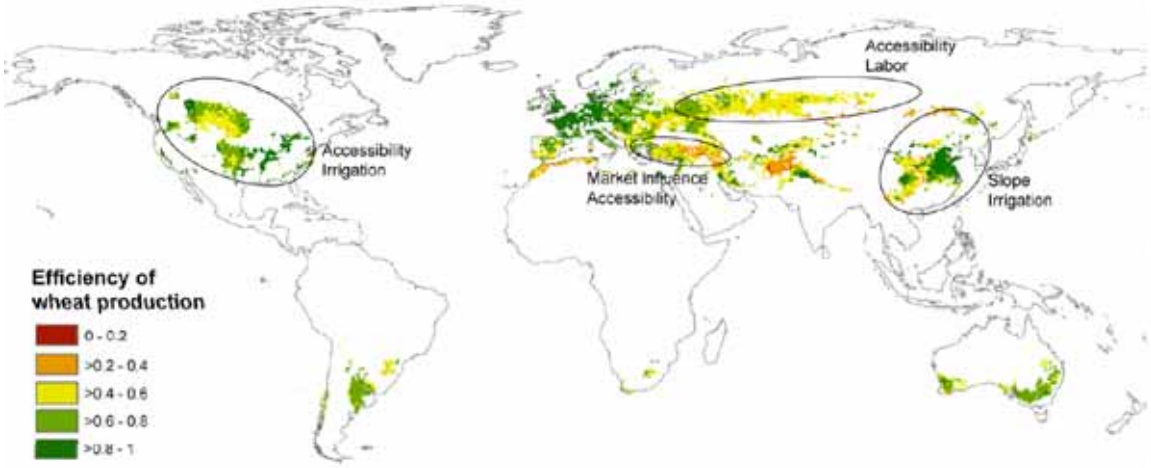

Figure 2.2 Efficiency of wheat production, with the most important factors per global region. Source: K. Neumann 2010. *Explaining agricultural intensity at the European and global scale*. Thesis. Wageningen University.

this will fall to 0.9% per year. This is not only due to the phenomenon of linear increase in production, but also to the decline in soil quality.[41]

Land degradation

In Africa and South America, large areas of uncultivated land are still available, but bringing this land into production will increasingly lead to conflicts with nature conservation policy. Moreover, 5-10 million hectares of farmland are lost every year worldwide due to erosion, pollution, salination or depletion of nutrients.[42] This reduces production and also makes agriculture more susceptible to extreme weather conditions, such as drought. In the EU this problem is still limited, but in Africa 75% of the farmland is affected by nutrient scarcity. In China the opposite problem is occurring on a large proportion of farmland: overfertilisation with phosphate and nitrogen, which also constrains production.[43]

Scarcity of phosphate and micronutrients

During the course of this century, phosphate will become increasingly scarce and expensive. There are two reasons for this: 1) depletion of easily extracted mineral reserves, and 2) the increase in agricultural production, especially if the production of energy crops continues to rise.[44] High phosphate prices will start to slow the growth in agricultural production, especially in the many regions where farmers have little purchasing power. This can force food prices higher.

The EU has only small reserves of mineral phosphate – located in Finland – and is therefore especially vulnerable. If the EU can continue to purchase sufficient phosphate, then this will quickly have a negative impact on agriculture in less prosperous countries.

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41 J. Engwerda. *FAO wil einde aan intensieve grondbewerkingen* [FAO wants to stop intensive soil cultivation practices]. *Agrarisch Dagblad* 11 February 2009.

42 World Bank 2007. *World Development Report 2008: Agriculture for Development.*

43 R.L. Voortman 2010. *Explorations into African Land Resource Ecology. On the chemistry between soils, plants and fertilizers*. Dissertation, VU University Amsterdam.

44 H.A. Udo de Haes *et al.* 2009. *Fosfaat - van teveel naar tekort.* [Phosphate – from surplus to shortage]. Beleidsnotitie van de Stuurgroep Technology Assessment van het ministerie van LNV. www.platformlis.nl

There are indications that the mineral reserves of some *micronutrients* will become scarce even faster than those of phosphate. These minerals include boron, copper, manganese, molybdenum, cobalt and zinc. For agriculture, zinc will probably be the first bottleneck.[45]

Depletion of fish stocks

Due to overfishing, more and more fish stocks in the oceans are becoming depleted. This also makes the fish supply more vulnerable to calamities. If fish becomes scarce, it may increasingly be substituted by meat, thus increasing the claims on farmland. Alternatively, aquaculture can partially compensate for declining stocks of wild fish, but farmed fish are frequently fed with fish meal from caught fish. Herbivorous fish are often fed with agricultural products such as soya, and therefore compete with food and feed production.

Loss of biodiversity

Worldwide, biodiversity has been declining for decades in terms of numbers of wild species and crop varieties. Some species are becoming extinct due to loss of habitat. Crop varieties are disappearing due to causes such as increasing scale of production, technological development, liberalisation of agricultural markets,[46] the advance of patent rights in plant breeding and the concentration of power in multinational seed companies.[47]

This development is a threat to the long-term resilience of agriculture. For example, the extinction of *species* can lead to a lack insect pollinators – including bees – that are crucial for crops. In addition, the reservoir of natural enemies of pests and diseases is also shrinking, which reduces the opportunities for biological control.

The loss of diversity of *crops and livestock* can result in pests and diseases being able to spread more quickly and on a larger scale.[48] It also makes it easier to deliberately spread pests and diseases through warfare or terrorism. Moreover, fewer wild varieties will remain that can be used for breeding crops and livestock that are more resilient to pests, diseases and changing physical conditions. Gene banks can only prevent some of this genetic impoverishment.

Risk-*reducing* factors

Of course, besides the above mentioned series of risk-increasing factors, there are also factors that can *reduce* the risk of calamities. Several of these can be cited here:

- advances in knowledge and technology, especially in pest and disease control, efficient use of nutrients and water, and crop varieties and production systems with more resilience to variable conditions;
- genetic technology may possibly lead to higher production per hectare, though this is not yet clear;
- some degraded land may be improved, compensating for degradation elsewhere;

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45 Voortman, *op. cit.* For that matter, phosphate and zinc were not cited in the recent proposal of the European Commission (2011) *Tackling the challenges in commodity markets and on raw materials.* The time horizon of that study was 2020.

46 One example is Mexico, the home of maize. Following NAFTA, the Mexican market was flooded with GM varieties, which replaced or genetically "contaminated" many indigenous varieties. See: F. Ackerman *et al.* 2003. *Free Trade, Corn, and the Environment: Environmental Impacts of US – Mexico Corn Trade Under NAFTA.* Tufts University. Medford MA 02155, USA. http://ase.tufts.edu/gdae

47 The use of GM crops does not lead by definition to loss of genetic diversity, because transgenes can be built into a wide range of varieties. But for seed companies, this approach will not be lucrative in many cases.

48 One example is wheat in the south-eastern region of the USA. Recent research into wheat lines that still have resistance genes to the gall midge *Mayeticola destructor* has shown that only 5 of the 21 genes remain active (*agd* 28 January 2011).

- further progress in information technology, which can help with early warning and taking timely measures;
- liberalisation can also have a stabilising effect, though this will be counteracted by the destabilising effects mentioned previously.

Conclusion

On balance, it appears that the risks for agricultural production will increase. In the following chapters, we will focus on the vulnerability of agriculture and food in the EU until 2020. However, because the EU will quickly pass on any food and feed shortages to the world market, which will primarily impact food-importing developing countries, we will also pay attention to this process.

3. Research questions and methods

In this report, we have focused on the following the questions:

- To what extent will the EU remain self-sufficient in food in the mid-to-long term (10 years), assuming a scenario of continuing liberalisation?
- Which relevant physical calamities and geopolitical shifts could occur until 2020, both in the EU and elsewhere?
- What would be the consequences of these calamities and shifts for agriculture and food security in the EU?
- To what extent can the market, with its self-regulating capacity, solve the problems itself? Where will market failures be expected and where will government interventions be required?
- Assuming that the EU market will respond to scarcity by exporting less grain and importing more, and the European Commission will possibly stimulate that response as well, what would be the consequences for developing countries?
- Which preventive and reactive options does the EU have to reduce the risks for itself as well as for developing countries?

To answer the above questions, the Platform commissioned various research projects at Wageningen UR (Box 3.1).

Box 3.1 Background reports*

Bindraban, P.S., C.P.J. Burger, P.M.F. Quist-Wessel & C.R. Werger 2008.
Resilience of the European food system to calamities.
Plant Research International & Development Economics, Wageningen UR**.** [49]

Burger, K. 2009.
Food calamities and governance – an inventory of approaches.
Development Economics, Wageningen UR.

Burger, K., J. Warner & E. Derix 2010.
Governance of the world food system and crisis prevention.
Wageningen UR.

Jansen, D.M., C.P.J. Burger, P.M.F. Quist-Wessel & B. Rutgers 2010.
Responses of the EU feed and livestock system to shocks in trade and production.
Plant Research International, Wageningen UR.

Meuwissen, M.P.M., K. Burger & A.G.J.M. Oude Lansink 2010.
Resilience of food companies to calamities – perceptions in the Netherlands.
Business Economics & Development Economics, Wageningen UR.

*All reports can be downloaded from www.platformlis.nl

[49] At the request of the Second Chamber of Parliament, Gerda Verburg, the former Minister of Agriculture, Nature and Food Quality of the Netherlands, prepared a commentary on this report. *Tweede Kamer vergaderjaar 2008-2009, 21 501-32, nr 323*. In this commentary she referred to three options to compensate for a possible collapse of soya imports: growing more soya substitutes (as long as this does not impinge on nature reserves), growing crops that produce both energy and animal feed, and maintaining larger stocks (within the framework of international agreements).

In addition, the Platform held two workshops and a roundtable discussion with experts:

- a workshop about the possible calamities and their potential impacts;
- a workshop and a roundtable discussion with experts about geopolitics and global governance.

Finally an extensive desk study was performed and individual interviews were held with experts in specialised areas. Many discussions were also conducted within the Platform itself.

4. Possible calamities

Assumptions

Many more calamities are conceivable than we can include in this report. We have therefore limited the scope. First, we have limited our time horizon to 2020. Second, we have made the following assumptions:

- No technological revolutions will occur in agriculture, but the trend towards increasing production per hectare will continue for the time being on most farmland around the world.[50] The efficiency improvements in the livestock sector (production per kg of feed, etc.) will also continue for the time being.
- No global disasters will take place such as a world war or a collision with a large meteorite.
- The common market of the EU will remain intact, and a few more smaller states will join.[51]
- The EU will take additional steps towards liberalisation. The external trade in grain, oil seeds and protein crops will become a free market. Exports of grain will increase because productivity is continuing s to rise, while the internal demand for food and feed is falling. Although the demand for grain for bio-ethanol is increasing, this is not enough to counteract both of the above factors. The grain price in the EU will remain around the level of the world market, and exports will continue to increase.[52]
- However, during the next 10 years the EU will continue to protect its livestock production against cheap imports from the world market (especially from South America). Although the EU is conducting negotiations with the Mercosur countries that could lead to some of the European production of meat and dairy products shifting to South America, it is assumed that this shift will not be of major importance during the next 10 years.[53]

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[50] OECD and FAO (2010) expect a rapid increase in production in Latin America, but only a small increase in the EU-27. The increase in production in China, India, the USA, Russia, Ukraine, sub-Saharan Africa and Australia is expected to fall in between these two extremes. For the most important rice-producing regions of China, they expect that productivity will stagnate. Within Europe, as a result of climate change they expect that production in the south will stagnate, but will actually increase in the north.

[51] In recent years, the Euro has been under pressure due to the debt crisis that followed the credit crisis. Occasionally there have been calls for splitting the Euro zone, for example into a northern Euro zone and a southern Euro zone. Some have gone so far as to propose a reinstatement of the old currencies. Even that would not mean the end of the common market, though it would hamper its operation. Such a scenario appears unlikely for the next decade.

[52] The expectation is that the EU will begin to export more wheat because the intervention price has fallen below the world market price, and internal demand is also falling. See : G. Meester 2010. *Future developments and policies.* In: A. Oskam, G. Meester & H. Silvis 2010. *EU Policy for agriculture, food and rural areas*. Wageningen Academic Publishers.

[53] The negotiations could be slowed by the demand of the European Parliament that the Commission should take account of the differences in sustainability (*agd* 27 January 2011). CopaCogeca, the European umbrella organisation of agricultural associations and cooperatives, is also very concerned. It has warned that free trade with Mercosur could lead to a collapse of the European beef sector and a smaller poultry sector. Food security in the EU could also be threatened as a result of climatological and political risks – the latter applying specifically to Argentina (*agd* 8 March 2011). Minister Bleker from the Netherlands has requested the European Commission to "...take account of our offensive and defensive agricultural interests (including animal welfare)". (*agd* 15 March 2011).

- Until 2020, trends such as climate change, freshwater scarcity and phosphate scarcity will have some influence, but will not have a *major* impact on agricultural production in the EU and the world, and will not affect the vulnerability of the food system for calamities.[54]

Self-sufficiency

To what extent is the EU currently self-sufficient in food, and to what extent will it remain so during the next 10 years?

Table 4.1 illustrates the degree of self-sufficiency of the EU for a number of important agricultural products. The EU is either self-sufficient or a net exporter for most commodities; it is even a major exporter of grain and powdered milk. But the EU is dependent on imports for three products: maize (80% self-sufficiency), vegetable oil (64% self-sufficiency) and especially soybeans and soybean meal (only 2% self-sufficiency). Soybean meal is used primarily as animal feed. In 2005/06, the self-sufficiency of the EU-27 in protein-rich raw materials for animal feed was 23%.

Table 4.1 Production, consumption and trade of several important food products in the EU-27 in 2007.
Source: European Commission 2009. *Prospects for agricultural markets and income 2008-2015*.

Product (million tonnes)	Production	Consumption	Self-sufficiency (%)	Net import (= import – export)	Net import in % of consumption
Grain, of which:	257.7	267.9	96.2%	4.3	1.6%
Wheat	119.9	117.4	102.1%	-6.5	-5.5%
Maize	48.2	63.1	76.4%	12.9	20.4%
Butter	2.2	2.1	104.9%	-0.1	-5.9%
Cheese	8.9	8.4	106.0%	-0.5	-6.0%
Meat	43.6	42.9	101.6%	-0.6	-1.5%
Soybeans	1.1	44.1	2.5%	43.1	97.7%
Vegetable oils/fats	22.2	39.2	56.6%	17.1	43.6%

A frequently expressed concern about continuing liberalisation is that the EU would no longer be self-sufficient because most European products would not be able to compete, for example with products in South America. This concern seems to be exaggerated. Meester[55] ascertained that the EU can already compete in terms of price on the world markets for wheat, beef and powdered milk, although not yet for butter. He expects that the self-sufficiency for wheat will continue to increase because productivity will rise, while demand falls. However, it must be noted that farmers are still receiving significant farm payments that strengthen their competitive position. But according to Meester and according to Bindraban *et al.* (2008), even with the extreme scenario of *complete* liberalisation – thus without farm supplements – the

[54] This assumption is probably too optimistic. In an interview in *New Scientist online* (10 February 2011) Lester Brown stated that climate change and regional water scarcity could have a major impact on global agricultural production and prices, even in the short term.

[55] G. Meester in: A. Oskam, H. Meester & H. Silvis *op. cit.*

EU would continue to be self-sufficient, once again with the exception of vegetable oil and soya. However, it is conceivable that the improvement in self-sufficiency could be slowed as a result of increasing immigration flows, for example as a result of unrest in North Africa and the Middle East.

The high level of self-sufficiency certainly means a high level of food security, at least if the calamities in question take place elsewhere in the world. However, the dependence on imports of soya means that production of pork, poultry and eggs is vulnerable for calamities taking place elsewhere. This applies much less to the production of beef and dairy products, for which relatively little soya is used.

Possible calamities until 2020

Which calamities could threaten food security in the EU during the coming decade?

The literature on this topic refers to the following calamities:

- food terrorism, for example the intentional introduction of contagious livestock diseases by terrorists, organised crime or frustrated employees;
- livestock diseases, including zoonoses (such as a bird flu pandemic);
- a disruption in the supply of fuel, electricity or water;
- a disruption in infrastructure, including transport;
- an abrupt climate change: a small Ice Age, nuclear winter or volcanic aerosols;
- extreme weather conditions;
- bankruptcies in the food industry.

A concise summary has been made by Meuwissen, Burger & Oude Lansink and by Burger (references in Box 3.1).

At the request of the Platform, Meuwissen *et al.* also conducted a survey of food companies and stakeholders in the Netherlands about the resilience of enterprises in the sector (Box 4.1). The following points of concern emerged: electricity, road transport, drought, collapse of soya imports and prolonged loss of key suppliers. Partly based on the above, we see the following calamities[56] as the most relevant risks for quantitative food security in the EU until 2020:

1. Production losses in the EU due to *natural disasters*, such as prolonged drought, floods, volcanic eruptions, plant diseases and livestock diseases.[57]
2. Production losses in the EU from *intentional* disasters, especially large-scale epidemics of plant and animal diseases[58] as a result of bioterrorism.
3. Collapse of soya imports due to *societal causes in the EU*: more stringent GMO policy of the EU, prolonged strikes in European ports, or port blockades, due for example to striking fishermen or inland shipping operators.
4. Collapse of soya imports as a result of *natural disasters in soya-producing regions*, especially South America and the USA.
5. Collapse of soya imports due to *societal causes outside the EU*: warfare, terrorism, prolonged shutdown of ports in major exporting countries due to strikes or blockades, a supply boycott by soya companies, a currency war or geopolitics.[59]

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[56] A lightly written overview of potential global disasters and their consequences can be found in: M. Keulemans 2008. *Exit Mundi - Het einde van de wereld.* [Exit Mundi – the end of the world.] Bruna, Utrecht.

[57] Volcanic eruptions could occur inside or outside Europe. Because an eruption on Iceland would primarily affect Europe, we have classified a volcanic eruption as an internal calamity.

[58] The veterinary term for an epidemic amongst animals is an *epizootic*. Here we will use the more customary term *epidemic*.

[59] The threat of a currency war is once again topical due to the pressure of the USA on China to revalue the Yuan and due to the quantitative easing by the USA, which essentially amounts to printing additional dollars.

Box 4.1 Corporate governance and the food chain in the Netherlands

At the request of the Platform, Miranda Meuwissen (WUR) conducted a survey on the resilience of the food sector involving 20 food companies and 20 other stakeholders. The response rate was high, indicating that resilience is seen as important in the sector.

The companies were asked to select the most important threats to food security *in the EU* from a list of 11 potential threats. The most frequently selected threats were:

- prolonged disruption of the power supply
- prolonged crisis in road transport
- low stocks coinciding with prolonged drought in the EU.

When asked to name the most important threats for *their own companies*, the most frequent responses were:

- prolonged disruption of the power supply
- prolonged loss of key suppliers
- collapse of soya imports
- prolonged crisis in road transport.

Potential threats with lower scores were: prolonged drought in the EU, prolonged drought in the EU combined with high oil prices, extreme cold in Western Europe as a result of a change in the Gulf Stream, prolonged unavailability of the Rhine River for inland shipping, a pandemic that affects all personnel and a prolonged shutdown of the Rotterdam harbour.

In their Business Continuity Plans, companies took only partial account of calamities. All companies took account of a long-term shutdown of the Rotterdam harbour and 75% took account of a pandemic, but only 40% accounted for the loss of key suppliers, 30% for prolonged power disruption, 25% for an interruption in soy imports and 20% for a crisis in road transport.

For *risk management*, the companies primarily referred to: [60]

- alliances with suppliers
- broad sourcing
- company energy generation
- larger stocks of raw materials.

The companies saw an important role for the government, especially in ensuring larger stocks of raw materials. For the Dutch government, they saw an additional role in upscaling, company energy generation, horizontal alliances and local suppliers and customers. For the EU, they primarily referred to broad sourcing, additional financial reserves and company energy generation.

Source: Meuwissen, Burger & Oude Lansink (2010).

6. A human flu pandemic that causes prolonged societal disruption.[61]
7. A crash in the European energy supply[62] and/or communication networks (telephone, Internet, social media, TV, radio) due to an accident or a cyber attack.[63]

The most severe threat for the intensive animal husbandry sector in the EU, and especially the Netherlands, would be a free fall in the value of the Euro with respect to the dollar, which would suddenly make soya much more expensive.

60 The "other" category had the highest score, but that was a collection of ad hoc options, none of which received a high score.

61 So far, the consequences of the pandemic of swine flu (H1N1 virus) and avian influenza (H5N1 virus) have not been very severe. In the case of swine flu – which is officially known as New Influenza A (H1N1) – that was partly due to large-scale vaccination. Chinese scientists have recently warned about recombinants of swine flu and the avian influenza virus H9N2. Y. Sun *et al.* 2011. High genetic compatibility and increased pathogenicity of reassortants derived from avian H9N2 and pandemic H1N1/2009 influenza viruses. *PNAS* DOI: 10.1073/pnas.1019109108.

62 In 2005, PriceWaterhouseCoopers predicted that large power disruptions, similar to the disruption on East Coast of the USA in 2003, will occur more frequently in the future as a result of inadequate investments in infrastructure and aging power plants. Especially in the USA, billions of dollars of investment are required,

8. A financial crisis, such as a crash of the European banking system[64], the payment system, the stock markets or the commodities markets.[65]

In this report, we do *not* address the calamities referred to under items 6-8. This is because the consequences of a pandemic go far beyond agriculture, and therefore exceed the mandate of our Platform. This also applies to the consequences of a crash in the energy supply and/or communication networks and a crash of the financial system. Consequently, five categories of calamities remain, which can be reduced to two:
1. A decline in the internal agricultural production of the EU.
2. A collapse of soya imports.

Opportunities

What are the probabilities that the calamities listed under points 1-5 will actually occur? Most of these probabilities cannot be quantified. Moreover, unprecedented calamities (*Black Swans*) can also occur; their probability is theoretically impossible to calculate.[66] But for some calamities, it is possible to roughly estimate the probability (at least in terms of an order of magnitude).

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but also in the EU and China (*de Volkskrant* 19 April 2005). On behalf of the Rathenau Institute, Ecofys studied the shortcomings in the energy debate. One of the ascertained shortcomings was that the political and public debate on the availability of energy sources is too limited. The problem of "geopolitical relations and assured energy supply" has received too little attention. See : R. de Vos, C. Hendriks & R. Coenraads 2005. *Verkenning energie*. [Energy outlook] Rathenau Instituut, Den Haag.

63 See: A. Hommels, J. van den Hoven, J. Nekkers & F. Grotendorst 2004. *De kwetsbaarheid van de informatiesamenleving.* [The vulnerability of the information society] Rathenau Institute. The report concluded that society has been less vulnerable to disruptions in the ICT infrastructure than could be expected. However, "Over the long term, the growing dependence on ICT systems and infrastructures could be problematic for society. Due to the increasing complexity of such systems, this dependence is also increasing. As a result, it is becoming more difficult to make assessments and to intervene. The dependence is also increasing because alternative – i.e. older – technologies are becoming less and less available or are being used less and less". Among other recommendations the report suggested maintaining more backup systems along with the corresponding expertise. The report did not pay specific attention to agriculture and food security.

64 In the autumn of 2008, such a crash was imminent in the UK and the USA. To prevent a crash, the American government took measures such as purchasing $700 billion worth of toxic assets from banks, while the British government spent 50 billion pounds to nationalise banks. See: N. Mathiason & H. Stewart. "Three weeks that changed the world". *The Guardian* 28 December 2008. (http://www.guardian.co.uk/business/2008/dec/28/markets-credit-crunch-banking-2008)

65 Speculators can rapidly drive up the prices of agricultural commodities and cause temporary shortages, but sooner or later they must sell their stocks. Similarly, financial speculators must – sooner or later – sell all the derivatives they have purchased. Speculators can therefore cause a short-term crisis but hardly a prolonged one, although amplified price fluctuations can have harmful effects on production and investment.

66 This term was coined by philosopher Nassim Taleb in his well-known book *The Black Swan: The Impact of the Highly Improbable* (2007). Black Swans are surprise events that have a major impact and for which an explanation must be sought afterwards. In the four possible combinations of *known* and *unknown*, Black Swan events fall into the category *unknown unknowns.* According to Taleb, such events have had an enormous impact on history. Positive examples include the Internet and the personal computer. Negative examples include World War I and the terror attacks on 11 September 2001.
In the context of agriculture, we could refer to BSE as an example of a Black Swan. The disease broke out in 1986. Only later was it shown that BSE is not caused by a virus or bacterium, but by *prions*: proteins that can set off a chain reaction in the brain. The first hypothesis about the existence of prions had only been published in 1982.

Box 4.2 Cyberwars

According to Secretary General Rasmussen of NATO, every day the organisation has to cope with approximately 100 digital attempts to break into the computer system. The American Ministry of Defence has even reported 6 million attempts per day. These are not only attempts to acquire secret information, but also attempts to disrupt the systems.

The latter was the case during a cyber attack with the highly advanced Stuxnet virus in the summer of 2010, which aimed at computers using special Siemens software. This software is used around the world to operate many industrial processes such as power plants and oil and gas pipelines. No fewer than 10,000 systems were infected, the majority of them in Iran. The probable targets were ultracentrifuges and nuclear power plants. According to the *New York Times*, the virus was developed by the USA and Israel, and had been tested in Israel. For that matter, not all installations in Iran were disrupted.

In the Netherlands, the nuclear plant in Borssele was promptly warned about the virus by Govcert, an organisation that keeps track of cyber criminality in the Netherlands on behalf of the government. Comparable attacks on the European dairy or meat industry, but from other sources, are also conceivable.

The Dutch government has announced that it will pay extra attention to cyber security as part of the national security programme. Many Dutch organisations, public and private, have already participated in the international exercise Cyberstorm III under the leadership of the USA. The aim was to practice the response to a broad cyber attack.

Sources:

NAVO-chef erkent fout in Afghanistan. [NATO leader acknowledges mistakes in Afghanistan] *NRC Handelsblad 8 October 2010.*

De kerncentrale draait een beetje op Windows - Hackers mikken op kwetsbare schakels in industrie. [The nuclear plant operates partially on Windows – hackers aim at vulnerable links in industry] *NRC Handelsblad 25 September 2010.*

M. Hijink. Het Stuxnet-virus brengt cyberoorlog in nieuwe fase: de aanval op industriële doelen. [Stuxnet virus takes cyber warfare to a new level: attacks on industrial targets] *NRC Handelsblad 12 October 2010.*

M. Hijink.'G20 moet over cybercrime beslissen'. [Hijink: "G20 must decide about cyber crime". *NRC Handelsblad 24 November 2010.*

http://www.nytimes.com/2011/01/16/world/middleeast/16stuxnet.html

Brief van de Minister van Veiligheid en Justitie over Nationale Veiligheid. [Letter from the Minister of Security and Justice on National Security] Tweede Kamer, vergaderjaar 2010-2011, 30 821, nr. 12.

Probability of natural disasters in the EU

The probability of *floods* affecting farmland in the EU is high: every year, there are one or more cases. The consequences for agriculture can be serious, but are usually limited to the local area. In the period 1998-2009, England and Romania in particular were affected by flooding (Figure 4.1). But there appears to be only a small probability that such a large area of farmland would become flooded that the production at the *European level* would be greatly reduced and prices would rise sharply. Moreover, grassland is resistant to flooding.

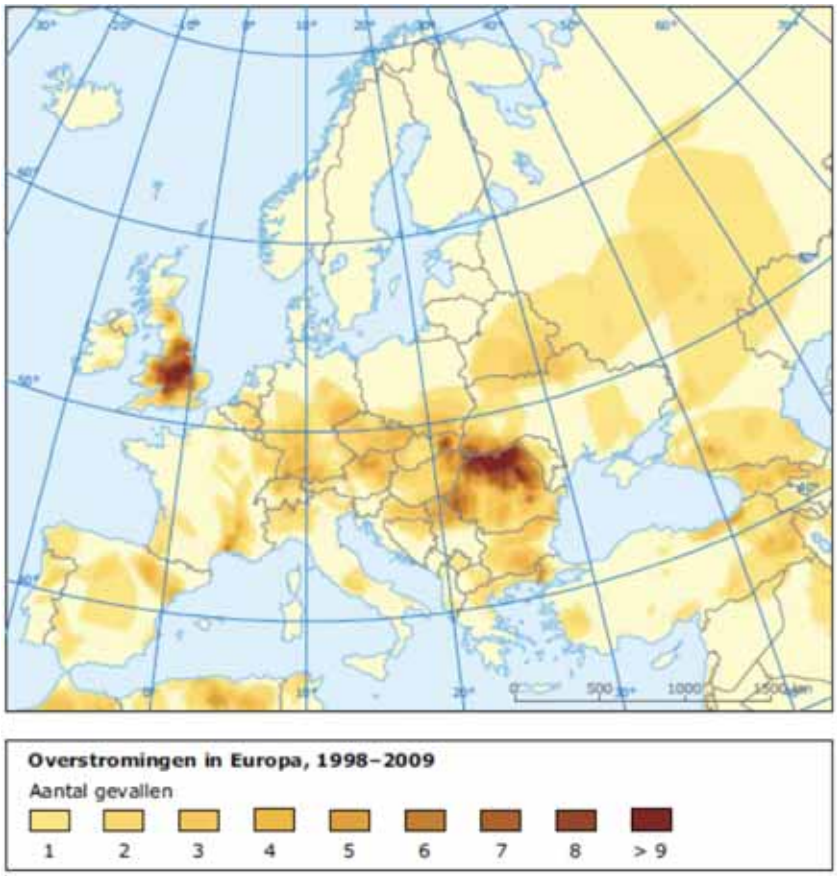

Figure 4.1 Floods in Europe 1998-2009. Number of cases.
Source: SOER 2010. *The European Environment. State and Outlook Report*. EEA.

However, flooding on a larger scale is conceivable in coastal areas as the result of a tsunami, which could follow a large undersea earthquake or volcanic eruption. The probability of such an event is highest in regions where earthquakes are common, such as Italy, Greece and Turkey.[67] Around 1600 BC, powerful earthquakes and tsunamis destroyed the Minoan civilisation on Crete and other parts of the Mediterranean. Closer to northern Europe, on 6 April 1580, an earthquake with a magnitude of about 6.2 on the Richter occurred in the Dover Strait. The earthquake was felt in the Netherlands, Belgium, England, Germany and northern France, and caused a 4 m tsunami that flooded the northern French cities of Calais and Boulogne. In the North Sea region, the most recent large tsunami took place at least 5000 years ago, when large areas of the coast were flooded.[68]

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[67] The earthquake *itself* cannot cause large-scale damage to agricultural production. After all, agriculture is a diffuse sector. However, local clusters and vital infrastructure could be destroyed; for example the greenhouse horticulture cluster in the west of the Netherlands would be devastated. But this could hardly cause food scarcity at the European scale.

[68] In the 1960s, Norwegian researchers discovered an enormous undersea landslide off the coast of Norway, which they called the Storegga landslide. This landslide is 290 km wide and has a volume of 5580 km^3. It is one of the largest undersea landslides ever discovered. It actually consists of three separate landslides. The oldest took place approximately 30,000 years ago, and the second and third between 8000 and 5000 years ago. They were probably caused by earthquakes. All three landslides are so big that they must have caused enormous tsunamis. Geological research in Scotland and Norway has found unusual sand layers 7200 years old. These are attributed to the second undersea landslide.
(http://www.kennislink.nl/publicaties/tsunami-waarschuwingssysteem-hebben-wij-er-een-nodig-in-de-noordzee)

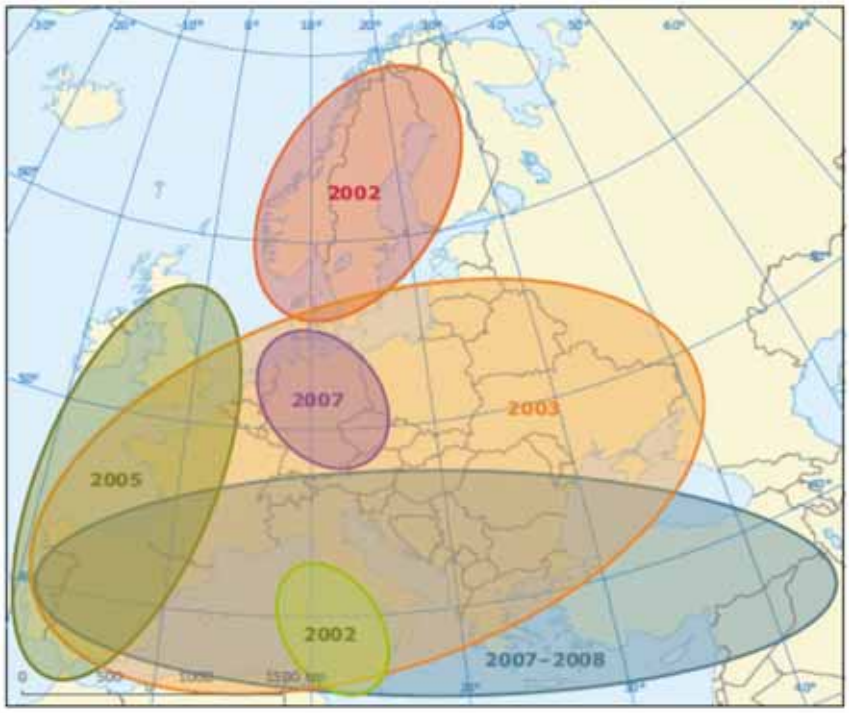

Figure 4.2 The most important droughts in Europe 2000-2009.
Source: SOER 2010. *The European Environment. State and Outlook Report*. EEA.

Box 4.3 The 10 most severe volcanic eruptions of the past millennium

The severity of the volcanic explosions is often expressed in terms of the Volcanic Explosivity Index (VEI). Based on this index, the 10 most severe volcanic eruptions worldwide of the past millennium are:

Volcano	Country	VEI	Year
Tambora	Sumbawa, Indonesia	7	1815
Kuwae	Vanuatu	6	1452
Laki	Iceland	6	1783
Krakatau	near Java, Indonesia	6	1883
Novarupta (Katmai)	Alaska	6	1912
Mt. Pinatubo	Luzon, the Philippines	6	1991
Mt. Agung	Bali, Indonesia	5	1963
Mt. Saint Helens	Washington State, USA	5	1980
El Chichón	Mexico	5	1982
Mount Hudson	Chili	5	1991

The frequency of *all* these eruptions was once per 100 years on average, the frequency of the six *most severe* eruptions was once per 167 years on average.

Source: Wikipedia http://en.wikipedia.org/wiki/Volcanic_Explosivity_Index

For the Netherlands, such a tsunami could be disastrous.[69] However for a tsunami, the same logic applies as for flooding: at the European scale such an event would probably not lead to such a rapid drop in production that scarcity and extremely high food prices would result.

The probability of a prolonged *drought* currently appears to be in the range of 1/10 years to 1/100 years. Figure 4 shows that there was a single large-scale drought during the period 2000-2009: in 2003. The Royal Dutch Meteorological Institute looked at the situation in the Netherlands during the period 1906-2007, when a drought with a severity equalling that from 2003 occurred once every 10 years on average.[70] If the probability of a drought is independent of the probability during the preceding year, then the probability of having such a drought in two *subsequent* years is approximately 1/100 years. An extremely severe drought, such as that from 1976, occurs on average once every 90 years in the Netherlands. But on the European scale, this drought affected a much smaller area than the 2003 drought, so the probability of a *large-scale* drought is smaller, and the probability of *two* severe drought years in a row is smaller still. However, the probabilities are likely to increase as a result of climate change.

Equally relevant is the probability of a severe, prolonged *volcanic eruption* with a global impact: this probability is in the order of 1/100 years (Box 4.3). We cannot say that the entire world lives *on* a volcano, but we can say that it lives *under* a volcano.

The probability *of a large-scale plant disease epidemic* also appears to be small. In the workshop held by the Platform on 20 April 2009, J. Schans from the Plant Protection Service stated that the probability of such an epidemic is very small as long as there is good governance, i.e. sufficient knowledge of plant diseases, adequate crop protection and a diversity of healthy seed lines and vegetative propagation material.

During the next 10 years, however, it is not clear that these conditions will be satisfied in all Member States of the EU. Moreover, new pests and diseases can always emerge. Recent examples are the wheat diseases stem rust and yellow rust.[71] Since the 1950s, wheat varieties have become available that were resistant to stem rust, but this resistance was broken by the Ug99 variant, which was discovered in Uganda in 1999, and has since spread to South Africa and the Middle East. New resistant varieties of wheat have been developed, but these resistances have already been broken in South Africa.[72] Two virulent strains of the yellow rust fungus have also been discovered that spread rapidly from Morocco to Uzbekistan in 2009 and 2010. These strains can spread so rapidly due to the genetic uniformity of the wheat varieties in that region.

The probability of an *epidemic of a contagious livestock disease* is significant and has increased due to the expansion of the EU, increasing European and global traffic and transport and increased clustering of intensive animal husbandry operations. Since 1997, the Netherlands has been struck six times by such epidemics: swine fever in 1997, BSE beginning in 1997, foot-and-mouth disease in 2001, avian influenza in 2003, blue tongue after 2006 and Q fever after 2008. BSE and Q fever are zoonoses, and also affected humans, while one

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69 The report of the *Deltacommissie* (Delta Committee or Veerman Committee) took account of risks caused by climate change (sea level rise) and storm floods, but did not say anything about undersea earthquakes and tsunamis. The probability of a storm flood can be calculated, but this is almost impossible to do for a tsunami (http://www.deltacommissie.com/doc/2008-09-03%20Advies%20Deltacommissie.pdf). The disastrous tsunamis in the Indian Ocean (December 2004) and Japan (March 2011) could be a reason to take an especially critical look at the risks for countries bordering the North Sea. The risk of a major tsunami does not appear to be lower than the 1/100,000 years probability that the Delta Committee established as security norm for the *Randstad* (urban agglomerations of the western part of the Netherlands).

70 KNMI 2008. *Risicosignalering droogte.* [Ascertaining the risk of drought] See: http://www.knmi.nl/klimatologie/achtergrondinformatie/pnv_droogte_250309.pdf

71 FAO 2010. *Food Outlook*. http://www.fao.org/docrep/013/al969e/al969e00.pdf

72 *Agrarisch Dagblad* 24 May 2010.

veterinarian died of avian influenza. One of the experts consulted by the Platform estimated the probability of an outbreak of Classical Swine Fever at approximately 1/15 years.[73] The probability of an epidemic of *any* livestock disease is certainly higher than this. On the other hand, the probability that such an epidemic will occur on the pan-European scale is much lower. But an order of magnitude of 1/100 years for a large-scale outbreak appears to be a realistic estimate.

The probability of *combinations* of calamities is certainly much smaller than that of a single, separate calamity, especially if the probabilities are mutually independent. For example, assuming that the probability of a serious volcanic eruption is 1/100 years and the probability of a serious drought is 1/20 years, and assuming that these probabilities are mutually independent, then the probability of *simultaneous* occurrence is 1/2000 years. Obviously, this is not a high probability, but it is still higher than the probabilities of serious calamities generally used in national security policy. Moreover, the probabilities are not always independent. One calamity can increase or decrease the probability of another, or amplify or attenuate its consequences. Here are three examples of such mutual amplification:

- If the livestock sector in the EU is affected by a serious livestock disease or a feed shortage, then prices of animal products in the EU will rise faster than animal products that are imported, legally or illegally. This can lead to the introduction of contagious livestock diseases. For example, in 2003 more eggs were imported from Spain following a severe outbreak of avian influenza in the Netherlands. As a result, more people became sick due to salmonella contamination.[74]
- A serious drought has consequences not only for agriculture, but also for aspects such as inland shipping (due to low river levels) and for electricity production (due to a shortage of cooling water). This can result in additional damage to agriculture (e.g. problems with milk refrigeration) and food security.
- Besides causing outbreaks of fungal diseases of plants, floods can also be accompanied by plagues of mosquitoes that can transmit viruses from animal-to-animal and from animal-to-human. Examples of such vector-borne diseases are West Nile fever, Rift Valley fever, Chikungunya, dengue and various types of malaria.

Probability of intentional disasters in the EU

The damage caused by an outbreak of a *plant disease* can be greatly increased if the virus is deliberately spread across a large area. The probability appears small, but is not negligible due to the dissemination of knowledge and the emergence of global terrorism.[75] Bioterrorism may emerge if other forms of terrorism are counteracted more effectively. In January 2011, the then second-in-command of Al Qaeda urged terrorists to think of new weapons to sabotage the economic and industrial systems of the West.[76] Plant diseases could be a powerful weapon.

However, this applies even more to *livestock diseases*, because these could have a greater societal impact. Bioterrorism is strikingly absent from the National Security Strategy of the Netherlands,[77] but that does not appear to be justified. For example, in 2001 a single

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[73] Maassen, cited in: Bindraban *et al.*, op. cit.

[74] A. de Koeijer, oral communication during workshop on Calamities and Food Security, 20 April 2009.

[75] A group of European agricultural economists wrote about European agriculture: *"If there is a food security threat it is the possible disruption of supplies by natural disasters or catastrophic terrorist action."* G. Anania *et al.* 2003. *Policy vision for sustainable rural economics in an enlarged Europe.* Akademie für Raumforschung und Landesplanung.

[76] www.nationalterroralert.com/2011/.../al-qaeda-calls-for-new-attacks-on-west/

[77] The first version of the National Security Strategy (2008) paid attention to terrorism and to biological warfare, but not to terrorism with biological weapons. In later versions, more attention was paid to the risks

Box 4.4 What is a *relevant* probability of a calamity?

A probability of a calamity affecting the food system of 1/100 years does not appear to be very relevant. But this probability is actually much higher than the probabilities assumed in national security policy for other serious disasters. In its National Security Strategy, the Netherlands uses probability classes, where the lowest class, "highly improbable", applies to probabilities of less than 1/10,000 years. In its water security policy, the Netherlands aims for a maximum allowable probability of 1/250 years for localised flooding and 1/10,000 years for densely populated areas. Due to the high level of uncertainty in probability calculations, the Delta Committee, in its report *Een veilige toekomst voor de Nederlandse Delta* [A secure future for the Dutch delta] (2008), even proposed changing the allowable probability to 1/100,000 years – at least for the Randstad with its large population and great economic importance. In comparison, the coastal protection policy for New Orleans was based on a maximum probability of a severe hurricane of 1/100 years, which was shown to be totally inadequate after hurricane Katrina in 2005.

This appears to be a good reason to take serious account of any major calamity with a probability of 1/100 years and to take precautionary measures.

Sources:
Deltacommissie 2008. Een veilige toekomst voor de Nederlandse Delta [A safe future for the Dutch Delta]. www.deltacommissie.com/
KNMI 2008. Risicosignalering droogte. [Ascertaining the risk of drought]: http://www.knmi.nl/klimatologie/achtergrondinformatie/pnv_droogte_250309.pdf
Schreuder, A. 2010. Veiliger, niet waterdicht. [Safer, but not watertight] *NRC Handelsblad 15 November.*
Warner, J., personal communication
Werken met scenario's, risicobeoordeling en capaciteiten in de Strategie Nationale Veiligheid 2009 [Working with scenarios, risk assessments and capacities in the National Security Strategy 2009].

individual caused panic across the USA and other countries by sending letters containing anthrax bacteria, which ultimately caused five deaths.[78] These bacteria could also be used against cattle. During the same period, one animal activist in the USA and one in New Zealand threatened attacks on cattle with the foot-and-mouth disease virus.[79] A small group of trained terrorists – regardless of their ideology – could be capable of simultaneously spreading viruses among livestock in various regions in Europe. A "bioterror 9/11" is not just a hypothetical risk.[80] Such a terror attack could be a disaster for the livestock, meat and dairy sectors, and could disrupt traffic and transport, cause severe economic damage and create

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of a flu epidemic, intentional disruption of the power supply, and extremists from the right, the left, salafists as well as animal activists. The government has also applied the security strategy to the themes of scarcity, economic crisis and terrorism. See: Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, undated. *Factsheet Nationale Veiligheid.* [National security fact sheet] Here as well, no mention is made of terrorism using biological means against people, crops and livestock. Neither is bioterrorism mentioned in the *Nationale Risicobeoordeling - Bevindingenrapportage 2010* [National Risk Assessment Findings 2010] nor in the recent Letter on National Security from the Minister of Security and Justice. *Tweede Kamer, vergaderjaar 2010-2011, 30821, nr. 12*.

78 Source: A.J. Jacobi & A. Timen (2004). *Poederbrieven in 2003: stand van zaken*. [Anthrax letters in 2003: current state of affairs] *Infectieziekten Bulletin* nr 4: 137-140.

79 Wikileaks has revealed that the USA considers the production locations of vaccines against foot-and-mouth disease in England, France and Argentina to be essential resources for the USA. (*agd.media* 28 December 2010).

80 Over the long-term, it also appears that genetic technology can be used to manufacture biological weapons. The threshold for using genetic technology has been lowered. The cost of the technology has fallen, and genetic technology experiments are already part of the biology curriculum at a number of Dutch and French high schools. L. Brouwers. *Biologieles: zelf aan de schepping knutselen.* [Biology class: tinkering with creation.] *NRC Handelsblad* 4 February 2011.

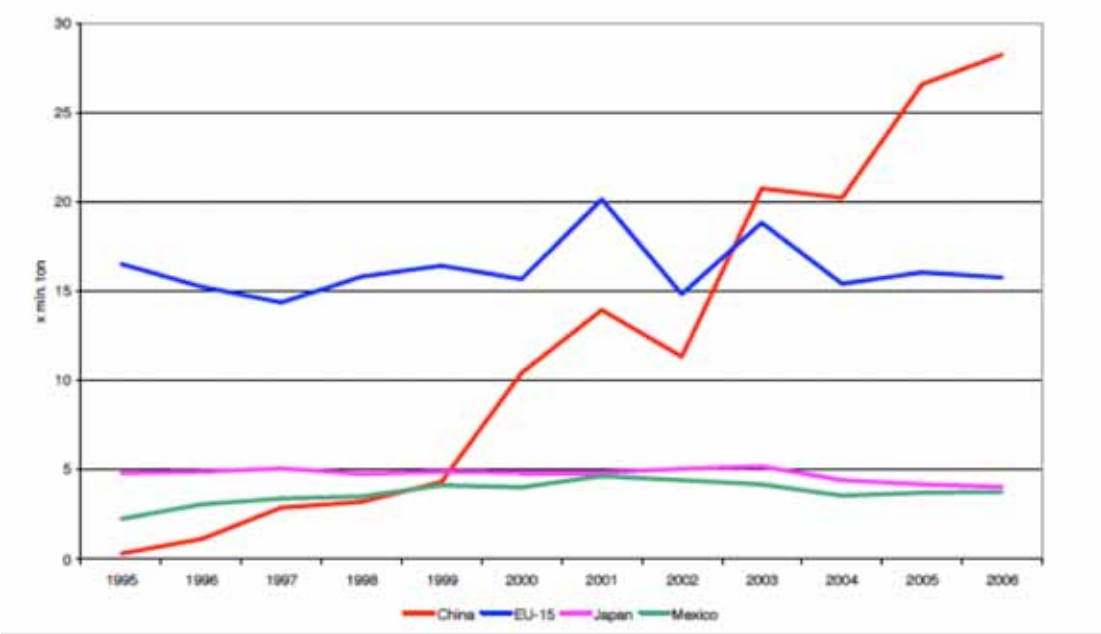

Figure 4.3 Largest importers of soybeans in the world, 1995-2006. Source: S. van Berkum & P.S. Bindraban 2008. *Towards sustainable soy*. LEI-rapport 2008-080.

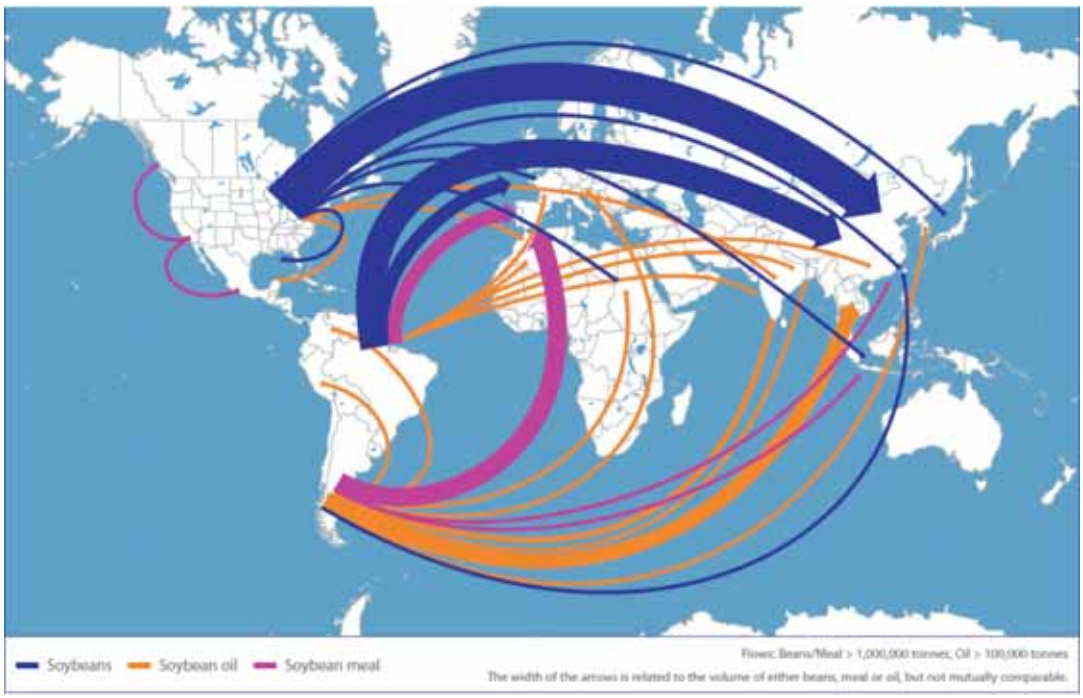

Figure 4.4 World-wide soya trade flows 2009. Source: Rabobank Group 2010. *Sustainability and security of the global food supply chain.*

widespread panic. If the attack involved a zoonotic disease such as anthrax, then the damage and panic could be even more severe.[81]

Probability of collapse of soya imports due to societal causes in the EU

A shutdown of soya imports due to *harbour strikes or blockades* is certainly conceivable, but it is very unlikely that a *prolonged* shutdown would take place simultaneously at *all* of the larger European ports. One bottleneck could be that the shutdowns could take place at ports that are specialised in specific goods, but at the European scale that is also unlikely to be a major problem.

The probability of a prolonged shutdown of soya imports due to a *more stringent GMO policy* also appears to be low because such a ban would probably be relaxed as soon as the prices of feed, meat and dairy products began to rise rapidly. If Greenpeace should try to prevent the relaxation of such a GMO ban, public anger could be directed against the organisation. In other words, transgenic food or feed becomes more acceptable when people are unable to afford high food prices.

Probability of the collapse of soya imports due to external causes

The probability of *harbour strikes or blockades in soya-exporting countries* is significant, but the probability that *prolonged* strikes or blockades would occur simultaneously at *all* soya exporting ports in South America is negligible.

Also negligible is the probability that soya farmers and traders in South America and/or the USA would be able to organise a *prolonged and large-scale supply boycott* (like the brief boycotts in Argentina in recent years). After all, such a boycott has a boomerang effect, even more so because the value of the stockpiled soya declines as the boycott continues. The probability that the striking companies will maintain a solid front will then rapidly decline.

More probable, although not quantifiable, is the collapse of soya imports due to a *crop failure in South America*.[82] This probability is increasing because soy is largely grown in extremely large-scale monocultures with a narrow genetic basis, which creates ideal conditions for pathogens and pests.

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[81] For that matter, a terrorist conspiracy is not even necessary. One of the remarkable facts in recent decades is how much societal commotion and damage a single, violent individual (lone wolf) can cause. In recent Dutch history, there was the kidnapping and murder of Ahold CEO Gerrit Jan Heijn (1987) by a single criminal, the murder of politician Pim Fortuyn (2002) by an animal rights activist and the murder of journalist/filmmaker Theo van Gogh (2004) by a radical Islamist. In the USA, there were the mail bombs sent by the UNA bomber (1978-1995) and the anthrax letters sent by a researcher (2001). Remarkably, these attacks – with the exception of the murder of Theo van Gogh – were committed by highly educated individuals. Also remarkable is that the anthrax letters turned out to have been sent by an employee of a military laboratory. Similarly, an employee of a veterinary laboratory could steal and spread a very contagious livestock virus. In the Netherlands, there was the case of the nuclear physicist Khan, who in the 1970s smuggled key information about nuclear fuel enrichment to his home country of Pakistan.

[82] In recent decades soya production in South America has been infested by the fungi species *Phakopsora pachyrhizi* – which causes Asian soybean rust – and *Cercospora sojina* – which causes frogeye leafspot. http://www.bayercropscience.com/bayer/cropscience/cscms.nsf/id/AsiSoyRus_Agro/$file/asian_soybean_rust.pdf

Table 4.2 Several examples of calamities (not including wars) since 1783 for European agriculture and their economic consequences. Sources: Bindraban *et al.* (2008), wikipedia, K. Jónasson, *NRC Handelsblad* 24 April 2010, and J. Zeilinga de Boer & D.T. Sanders 2002. *Volcanoes in human history*.

Calamity	Physical consequences	Economic and social-societal consequences
Eruption of Laki (Iceland) in 1783	On Iceland itself, emissions of sulphuric acid, nitric acid and fluorine from the volcano killed half of the cattle and three-fourths of the sheep. Sulphuric acid mist in the northern hemisphere affected vegetation and lowered the temperature in 1783-85, especially in Europe and North America. Worldwide, it became 1°C colder. Crop failures occurred in Europe, especially France. Due to flows of cold air, crop failures also occurred in Japan.	At least 1/4 of the population of Iceland died of starvation. There were also famines in Europe (especially France) and Japan. Grain prices rose to unprecedented levels.
Eruption of Tambora (Indonesia) in 1815	Worldwide drop in temperature and disruption of precipitation patterns, including the monsoon in India. In the Northern Hemisphere, the temperature in 1816 was 10°C lower. In North America, there was a "year without summer", with snowstorms during the summer months. Crops failed and livestock starved due to feed shortages. Cold, wet summer in Europe with crop failures, especially in the Alpine region.	There were 70,000 fatalities in the region due to volcanic ash and crop failures. The northeast region of North America experienced food shortages and emigration. Soup kitchens in New York fed the hungry. Famine in India contributed to the first major cholera epidemic. Food prices skyrocketed, famine was widespread in Europe, especially in cities. Serious food riots occurred at some locations.
Invasion of *Phytophthora* in Europe, ranging from Ireland to Prussia and from Sweden to France, including the Netherlands (1845-1850)	Most of the potato crop failed, especially in Ireland, Scotland, Belgium and the Netherlands	About 10% of the Irish population died (partly because food exports continued). Millions of emigrants left Ireland and Scotland, which also suffered falling birth-rates. Riots occurred in various cities, also in the Netherlands. Food shortages catalysed revolutions in various European cities in 1848.
Drought 1976 in Northwest Europe	Production fell in the Netherlands by 30 to 50% on average	
Chernobyl nuclear disaster 1986	Production from 784,000 ha farmland was lost. Production from 694,000 ha forest was lost.	
Livestock diseases: BSE since 1986	EU beef exports in 1995-96 fell 13% below average. Worldwide, 170 people died from Creutzfeldt-Jacob disease, most in the UK where the epidemic began.	Economic damage €2.8 billion per year (approximately €90 billion in total, including expected future costs). Meat prices came under pressure due to declining consumer confidence.
Heat wave 2003	11.4% decline in grain production, 60% decline in feed production in EU-15.	Economic damage €13 billion.
Forest fires in Greece 2007	2% lower world production of olives.	Economic damage €123 million.
Drought and forest fires in Russia 2010	30% of grain harvest was lost. Grain exports banned, food riots in Egypt.	Economic damage €7.4 billion.[83]

[83] $10.1 billion was converted to euros according to the exchange rate in February 2011. This is equivalent to 0.8% of the economic growth in Russia. http://www.bbc.co.uk/news/business-11084236).

Box 4.5 Worldwide effects of the most severe volcanic eruption in the past millennium: Tambora in 1815

On 5 April 1815, the largest volcanic eruption in modern history began: the Tambora volcano on the island of Sumbawa (in modern-day Indonesia). The eruption lasted more than a month and had worldwide consequences even more severe than the eruption of Krakatau in 1883:

- the summer was exceptionally cold, especially in the Northeast region of North America and in Western Europe; in North America, the year 1816 became known as the "year without summer";
- in the Northeast region of North America, crop failures occurred almost everywhere and the entire maize harvest was lost;
- many people starved and many farm animals died as a result of cold and shortage of feed;
- food prices skyrocketed;
- many farmers killed their livestock or sold them for crippling prices;
- in Western Europe, from Germany to Ireland, the summer was abnormally cold;
- there was famine in Ireland and a typhus epidemic broke out;
- famine also affected in the Alpine region, and in Switzerland people resorted to eating sorrel, moss and cat meat. The government provided information about poisonous and edible wild plants;
- on Java, 1817 and 1818 were exceptionally dry years;
- the monsoon in East Asia and South Asia deviated from the usual pattern, with a dry summer and heavy rain in September.

According to some authors, the altered weather also contributed to the first cholera epidemic, which began in 1816 in the Ganges Valley and reached Europe in 1823. The resistance of the population to disease had been weakened due to the lack of food. But these types of causal relationships are often difficult to prove.

Sources:

de Jong Boers, B. 1995. Mount Tambora in 1815: A volcanic eruption in Indonesia and its aftermath. Indonesia 60: 37-60.

Zeilinga de Boer, J. & D.T. Sanders 2002. Volcanoes in human history. Princeton University Press, Princeton.

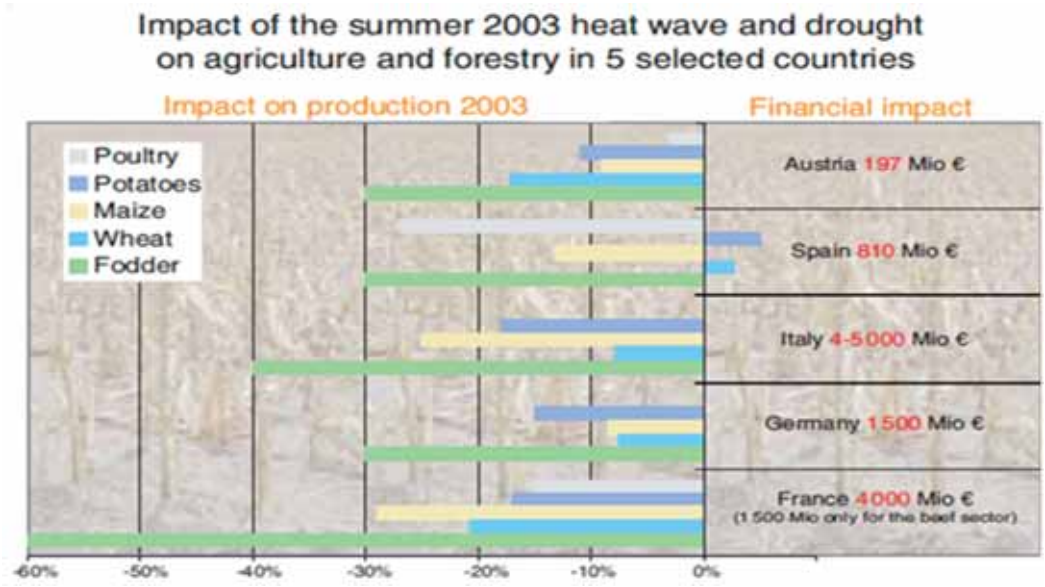

Figure 4.5 Physical and economic effects of the heat wave and drought of 2003 on agriculture and forestry in five Member States of the EU. Source: COPA COGECA 2003. *Assessment of the impact of the heat wave and drought of the summer 2003 on agriculture and forestry*.

The probability of *mega-purchases by state-owned companies in China* is also increasing[84] due to rising meat consumption in China, increasing soya imports (Figure 4.3) and the enormous purchasing power of that country. China imports much more soya from South America than Europe does (Figure 4.4). Therefore, if Argentinean and Brazilian exporters were required to choose between China and Europe, they would probably choose their largest buyer.

Historical examples

We will end this chapter with several historical examples of calamities in European agriculture. Table 4.2 contains a list of these calamities. Note that this list is rather arbitrary, so it *cannot* be used to prove that calamities have occurred more frequently since 1950.

The eruption of Tambora in 1815 had a major impact on food security in Europe. After this event, the most important disruption was caused by the invasion of the *Phytophthora* fungi in 1846/47, which caused a devastating epidemic of potato blight in the Netherlands, Belgium and especially Ireland. During the next 10 years, the Irish population declined by half due to famine, emigration and lower birth rate. Belgium was also struck by famine.

During both world wars, there was massive famine in Europe as well. But if we look at the calamities *after* World War II, none of them posed a serious threat to food security in Europe. All disasters could be alleviated by:

- substitute purchases elsewhere in the EU and on the world market;
- substitution of one type of meat (in this case beef) by another (pork or poultry).

The European food system is therefore highly resilient with respect to internal calamities.

However, the consequences for agriculture itself were more serious. Here are some figures on drought: in 1976, agricultural production in the southern region of the Netherlands fell by more than 50% relative to a year with optimal precipitation. During the drought of 2003, the production of grain in the EU-15 fell by 11.4%. The effect on feed production was even greater, ranging from a drop of 30% in Germany and Spain, to 40% in Italy, to 60% in France. Due to feed shortages, milk production declined (also during the subsequent winter). In Spain, for example, the number of chickens fell by 15 to 20%. The total financial damage was estimated at €13 billion.[85] The cattle and meat sectors in particular suffered severe damage.

For agriculture, the damage from a natural disaster is often partially compensated or even overcompensated. This is due to the market response: the shrinking supply leads to higher prices. But this effect occurs only if demand remains steady. This was not the case during the BSE crisis that began in 1986, which led to loss of consumer confidence and loss of demand As a result, the damage was enormous. In the Netherlands alone, the financial damage through 2004 was between €550 and €940 million.[86] The total costs in the EU-15 –

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[84] For that matter, the Chinese domestic soya market is characterised by the opposite situation: the import and processing of soya is not dominated by state-owned companies, but by the four western grain giants Archer Daniels Midland, Bunge, Cargill and Louis Dreyfus ("ABCD"), along with Wilmar International. Together, in 2009 they control 80% of the Chinese market. See: J. Engwerda, *Buitenland verdringt sojasector in China.* [Foreign companies dominate soya sector in China] *Agrarisch Dagblad* 6 May 2009. If there is soya scarcity in China, these agri-concerns will buy up most of the soya on the market, but probably not everything because they must also maintain good relations with other important clients. But if social unrest threatens, a fully or partly state-owned Chinese company would be ordered to buy even more soya at any price.

[85] Olesen, J.E. 2006. *Climate change as a driver for European agriculture. SCAR-Foresight in the field of agricultural research in Europe. Expert paper.*

[86] C. Rougoor in: W. van der Weijden, R. Leewis & P. Bol 2007. *Biological Globalisation - Bio-invasions and their impacts on nature, the economy and public health*. KNNV Publishing, Utrecht.

including expected costs in the future – have been estimated at €90 billion.[87] This gives pause for thought. The BSE epidemic has now lasted a quarter of a century despite strong – although late – intervention by national governments and the EU in the 1990s, but is still not entirely over and is still involves high costs.

In the next chapter we will address five cases we have analysed in additional detail.

[87] E.P. Cunningham (ed) 2003. *After BSE - A future for the European livestock sector*. Trinity College Dublin, Ireland & European Association for Animal Production.

Box 4.6 Could the Netherlands feed itself if imports of food and feed were to stop?

Since the grain crisis at the end of the 19th century, Dutch agriculture has focused more and more on livestock. This went hand-in-hand with increasing imports of animal feed from overseas. The strategy turned out to be vulnerable when overseas imports collapsed during the First and Second World Wars. Moreover, during World War II, food was exported to Germany. The Netherlands had to intervene drastically in production and distribution in order to continue to feed the population (see Box 6.2). When grain prices rose to record heights in 1972, the question again arose about whether the Netherlands would be able to feed its population without imports of commodities for animal feed.

At the beginning of the 1980s, agricultural economist Theo Bakker attempted to answer this question with the aid of a specially developed technical (not economic) autarky model. This now classic model was based on figures from 1976 and was published in 1985. Both demand and production were modelled. Bakker studied four scenarios:

1. *Self-sufficiency at the lower limit*

In this scenario the question is: what is the minimum production area that is required for a basic diet following the collapse of imports of animal feed, also assuming energy scarcity? The population receives just enough calories (2350 per day) to stay alive. The ration is extremely scant: mostly grain with a little fat and a tiny amount of pork. Drastic changes take place in agriculture. The livestock sector is largely replaced by the production of crops, especially grain, oil seed and clover (as a green manure). Assuming this very drastic modification of consumption and production, the available area of farmland is more than sufficient; in fact, half of the area (the better half) is sufficient. The direct + indirect energy consumption is only 21% of the actual consumption in 1976.

2. *Self-sufficiency at the upper limit*

The scenario focuses on the question: which food assortment can we produce to maximum levels on our entire area of farmland? In that case, many more potatoes, sugar beets and grass are grown, and in addition to pigs, there is room for 1 million dairy cattle. Nearly 30 million people can be fed in this way. However, the energy consumption is five times higher than in the previous scenario.

3. *Self-sufficiency at a responsible level*

This scenario assumes a healthy, balanced diet and has a somewhat less Spartan character than Scenario 1. It requires three-fourths of the total area of farmland, of which half is used for dairy cattle, pigs and laying hens. The energy consumption is 76% higher than in the first scenario.

4. *Self-sufficiency at a familiar level*

This scenario is based on the usual diet in 1976, with more meat and sugar. It requires the entire area of farmland. Compared with the previous scenario, there is more livestock, and a larger proportion of the farmland is used to produce food. More legumes and sugar beets are grown as well. The energy consumption is 25% higher than in the previous scenario.

Bakker's conclusion was that the Netherlands, under self-sufficiency conditions, can in principle feed its population, and even more. However, he noted that the self-sufficiency is not complete: imports of artificial fertiliser and fuels are still required. Moreover, drastic government intervention would be needed to implement the required changes in production and distribution.

Since 1976, the situation has changed: production per hectare has continued to rise, the total area of farmland has fallen by approximately 10% (despite the expansion in the reclaimed polder of southern Flevoland), the population has grown and the diet has changed, and now includes even more meat and other products. The livestock sector and soya imports have both grown significantly; as a result, the collapse of imports would have even more far-reaching consequences. It would be interesting to repeat the study with this more recent data.

Nevertheless, although interesting, a national study has become less relevant. The Netherlands is now part of the EU, which has expanded greatly and will possibly expand still further. It is now more relevant to focus on the EU level, which we have done in this report. In addition, besides accounting for technical relationships, we have also taken account of markets and prices

Source: Th. M. Bakker 1985. Eten van eigen bodem - een modelstudie. [Food from our own land – a model study] Theses from LEI no. 1. LEI, Den Haag.

5. Five cases of calamities and their consequences

The Platform commissioned detailed studies about five cases:
1. prolonged and widespread drought
2. severe volcanic eruption
3. collapse of soya imports
4. a combination of drought and collapse of soya imports
5. a large-scale livestock disease epidemic.

Case 1: Prolonged and widespread drought

In the summer of 1976, north-western Europe experienced a severe drought. It is possible that such a drought could be even more prolonged and widespread. Using an indicative model (Box 5.1), Jansen *et al.* attempted to quantify the consequences of a drought that reduced production on farmland and grassland in the EU by 25% on average during two subsequent years. Such a drought would be more widespread and twice as long as that in 1976. The probability of such an event is low. On the other hand, the model somewhat underestimated the consequences because it assumed that the prices of grain and soya in the EU would not rise due to increased imports.

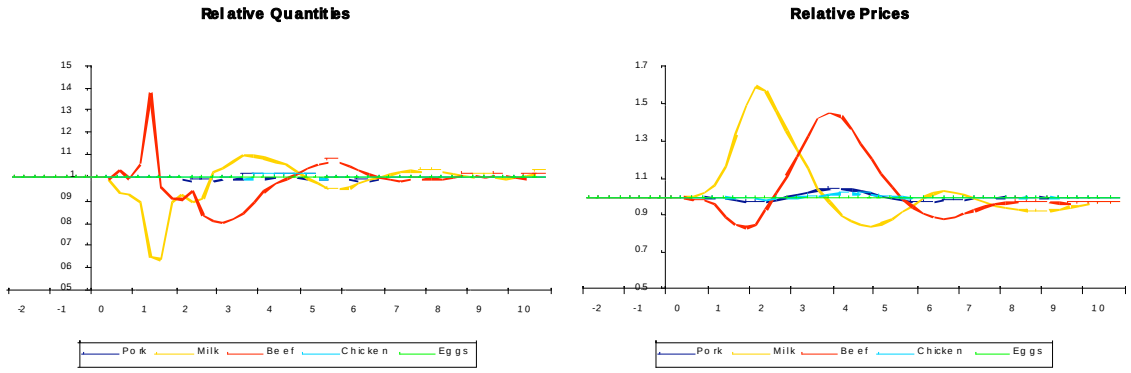

Figure 5.1 Effects on the prices of meat, milk and eggs of a two-year drought (years 0 and 1) in the EU, which leads to a drop in arable and grassland production of 25%. Source: Jansen *et al.* 2010.

Calculated effects on production and prices

As consequences for the sector, the indicative model indicated severe price and production shocks. More specifically:

- During the first year, there are few changes because dairy farmers could still harvest sufficient forage (grass and maize) for the autumn.
- During the first quarter of the second year, stocks run out and acute shortages begin to occur. Farmers are compelled to dispose of more cows, calves and yearlings than normal.
- As a result, milk production suddenly declines by up to 40% during the sixth quarter, while beef production rises by up to 40%.

- Milk will become scarce and the price peaks at 160% of the initial level after two years, while beef will initially become 15% cheaper as livestock farmers dispose of animals.
- During the sixth quarter, dairy farmers will begin to respond to the higher price by increasing production. During the fourth year, production will actually rise 10% above the initial level.
- In contrast, beef production will decline sharply in response to the low beef price and because fewer milk cows and calves are being slaughtered. After three years, the production of beef will hit its lowest level at 20% below the initial level.
- Due to the larger milk supply, the milk price falls; in the fifth year it actually drops below the initial price level, followed by weaker fluctuations leading to price stabilisation after nine years at the initial level (the model returns to equilibrium).
- In the fourth quarter, the price of beef rises sharply and peaks at 40% above the initial level after four years, and then starts to decline. After nine years, the price again stabilises.
- The prices for chicken and pork only fluctuate slightly. This is because chickens and pigs consume little roughage. The prices still move in response to the beef price, because beef is partially replaced by chicken and pork as it becomes more expensive.

Remarkably, the model shows that a two-year drought continues to affect the market for nine years. This has to do with the long lifespan of dairy cattle.

Other consequences for the sector

Considering the limitations of the indicative model (Box 5.1), even more consequences are expected. Because feed is a major cost item on cattle farms, prolonged high feed prices could cause a wave of bankruptcies.[88] Farms are compelled to dispose of cattle for low prices or even for free due to oversupply and because slaughterhouses become overloaded. In that case, cadavers must be sent to rendering plants, which in turn can become overloaded. Those cows kept on the farm become less productive.

However, the wave of bankruptcies will be slowed because livestock farmers will see higher prices on the way, which their banks will also take into account. Moreover, cattle farmers who own their own land can remain solvent for a long time. But no one knows how quickly prices will rise, and they will not rise soon enough for all farmers. Transport, meat and dairy companies also risk bankruptcy. The feed trade is extremely wary about price shocks because they can have a devastating effect on agribusiness.[89] However, all of these problems and adaptations will not result in a permanent loss of production, because in most cases the production will be simply taken over by farms and businesses that continue to operate.

In the border regions, the high prices make it attractive to smuggle meat and dairy products.[90] This increases the risk of introducing contagious diseases, followed by disease outbreaks, massive culling and transport bans. As a result, in some regions the sector can

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88 The indicative model of Jansen *et al.* does not account for bankruptcies because it is based on a single, large, virtual cattle farm, pig farm or chicken farm which *cannot* go bankrupt.

89 Personal communication H. Stam, Cefetra. Moreover, the dairy industry is wary of price spikes for dairy products because they promote the replacement of dairy products – potentially for the long term – with plant-based substitutes, such as artificial cheese in convenience foods (personal communication R. Laperre, Ministry of Economic Affairs, Agriculture and Innovation).

90 Even today, introduction of diseases from smuggled meat is a serious risk for the EU. According to a recent study, every year more than 63 tonnes of meat and fish are imported illegally through Charles de Gaulle airport alone. This concerns not only meat from livestock, but also that of wild animals (bushmeat). Both types of meat can transmit livestock diseases (*Agrarisch Dagblad* 22 June 2010).

incur additional damage, although livestock farmers in other regions may benefit from higher prices.

But even without the introduction of diseases, the damage to animal health and welfare can be serious. For example, with low market prices, cattle farmers would be less inclined to use veterinary services, and there is a risk that many cattle would become malnourished and neglected.

For that matter, the consequences for the livestock sector in the Netherlands are less severe than for the livestock sectors in most other Member States. After all, the Netherlands is relatively insensitive to drought and the Dutch livestock sector (including cattle farming) uses more imported soya and by-products from the food industry.

Consequences for society

The feed security for cattle is clearly threatened, but does that also apply to food security for people? The price increases calculated with the model are not so extreme that significant numbers of citizens become malnourished. However, the price increases in reality can be higher – temporarily and locally – due to related phenomena such as food nationalism, panic buying, hoarding, theft and speculative management of stocks. Arable farmers, livestock farmers, traders and investors – also parties from outside the sector – can all speculate. On the other hand, in terms of their nutritional needs most consumers can afford to eat much less meat and dairy products,[91] and they can also replace beef with eggs, chicken and pork, which – according to the model calculations – hardly increases in price.[92]

Nevertheless, the affordability of meat and dairy products can be a problem for lower income groups, especially in the least prosperous Member States such as Romania. These groups still spend a relatively high percentage of their income on food, and a large price increase means that they are unable to afford as much meat, dairy products and eggs. The risks of malnutrition are greatest in the cities, because in the countryside people tend to be more self-sufficient. Most adults can easily tolerate a vegan diet (completely free of animal products), but children can soon suffer from deficiencies of iron and vitamin B12.

These risks can be alleviated by means of focused social policy, such as benefits, food stamps or food banks. However, these supplements have the disadvantage of driving prices even higher.[93] Smuggling can lower prices in the border regions somewhat, but smuggling can also introduce livestock diseases; after all, the EU has a stricter veterinary regime than the surrounding countries. That can lead to epidemics, additional scarcity of meat and dairy products – and even higher prices.

Consequences for developing countries

More severe social problems can occur in developing countries, of which a large proportion (especially in Africa) are net food importers.[94] At the European level, the model does not lend itself to illustrating the risks for various groups of consumers and producers in different countries. Several plausible examples will suffice.

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[91] Nutritional experts do not agree on whether eating less meat and dairy products promotes health. In any case, there are advantages in terms of environmental impact, natural habitats, energy consumption and climate.

[92] However, there are limits on the substitution of one product for another. For example, Moslems and Jews do not eat pork.

[93] In comparison, prices are not driven up by another policy option: maintaining larger stocks.

[94] In 2004-2005 – before the crisis of 2007/08 – this concerned 42 of the 58 low-income countries, or 72% if we look only at food production, and 24 of the 58, or 41% if we look at *all* agricultural production (including cash crops such as cacao). For that matter, there are also developing countries with a middle income classification (such as Egypt) with serious food shortages. Of the 47 Sub-Saharan countries, 35 are net food importers. Source: A. Aksoy & F. Ng 2008. *Who Are the Net Food Importing Countries?* World Bank.

Box 5.1 The indicative model used and its limitations

The indicative model developed by Jansen *et al.* (2010) estimates the effects within Europe for various types of calamities. As a result of a calamity, agricultural products can suddenly become scarce. The model estimates the prices of the products in that situation based on the relationships between the demand, supply and price of these products (elasticities). In addition, changes in land use (for arable crops) in Europe in the model are based on the demand, supply and price of the crops. This also applies to the magnitude of livestock-based production in Europe, where the model accounts for biophysical aspects of the livestock sector (such as the growth rate of animals) and the time required to build a herd.

A central aspect of this approach is the emphasis on stocks of products and the rate of change in the stocks with respect to expected or optimal stocks. Stocks increase due to the supply of goods produced within the EU and/or imported from outside the EU, and they decrease due to consumption and/or export. Because the changes in stocks can sometimes occur quickly, for each time step of three months (one quarter) the model calculates changes in the prices and availability of products and adaptations in the production systems (especially for animal-based products). The effects on the food and feed system in the EU are described in terms of the availability and relative price (relative to the initial price) of various products (dairy products, meat and eggs, grains and roughage).

For the sake of clarity, we have added several comments to the results of the model calculations that are presented here:

- The model makes assumptions about measures that farmers take to deal with the calamity. It assumes that farmers respond to price relationships. In reality, other factors will also play a role, certainly in case of severe price shocks.
- In the model, specific price elasticities of production and consumption are used. In the literature, other price elasticities are also used, which would generate somewhat different results.
- The indicative model is a dynamic equilibrium model, where the effects of shocks such as drought or the collapse of imports subside after several years. The model is not based on an entirely open EU market. In most of the calculated scenarios, it is assumed that the market for grain has been entirely liberalised, but the market for animal products has not. In one of the scenarios (not addressed here), grain imports and exports have been halted. This has little additional effect on the prices because the EU is a net grain exporter; even without an export ban, exports would decline due to market forces.
- For grain, the model assumes that the share of the EU in the world market (12%) is too small to have a relevant influence on the price. This assumption is somewhat too optimistic. Moreover, the market share of the EU is expected to increase further during the decade to come. But much more important to the "collapse of soya imports" scenario is the *cause* of the import collapse: if the EU has closed its borders to imports, then the price of soya would fall on the world market and pull grain prices down along with it. Grain prices would then fall in the EU as well. Therefore, the consequences would be less severe than those calculated by the model. However, a more probable cause of the collapse of imports would be crop failures in South America and/or North America, or mega-purchases of soya by China. In that case, the soya price would rise on the world market and also pull grain prices *up*. This effect will be amplified if the EU begins to export less grain and import more. Therefore, in the further analysis we have assumed that there *is* some affect on the world market price, and therefore also on the European market price for grain. This also means that the price shocks for meat, dairy products and eggs would be somewhat stronger than those calculated by the model.
- The model sees the EU as a single market without internal barriers. In practice, however, there can be problems with transport, transportation bans, road blockades, national preferential treatment, etc. This also makes the results of the model possibly too optimistic. In any case, there will be important regional differences in the effects. As a result, local food shortages can occur more quickly than assumed.
- The model does not make any distinction between farm prices, wholesale prices and consumer prices. A frequently heard complaint of farmers, also acknowledged by the European Commission, is that they earn an inadequate share of the value added in the chain. In economic jargon: the price transmission to the farmers is inadequate. It is conceivable that their share will increase during times of scarcity. In that case, the damage to the farmers would be less severe.

As a whole, the model appears to underestimate the consequences of a calamity more than it overestimates them. This aspect aside, it should be made clear that the results are only an *indication* of economic effects. However, the model does indicate the order of magnitude of the effects and provides insight into the differences between scenarios. Obviously, this is why it is called an "indicative model".

As soon as it becomes obvious during the first growing season that crop failures are imminent, and that the prices on the European market are rising above those on the world market, European traders begin exporting less grain and start importing more soya and grain. This can drive up the prices on the world market. This effect could be amplified if the EU should decide to restrict exports and promote imports (which it has done a number of times in the past). Moreover, this could lead to a domino effect, comparable with the effects of export bans by Russia and other countries in recent years.

Higher world market prices for grain are theoretically beneficial for arable farmers (though not for livestock farmers) across the world, including in developing countries. But that only applies to the extent that the price increases are transmitted to farmers – which is not always the case – and even then it applies only to those farmers who are net *sellers* of food.[95] The higher prices actually threaten the many farmers who are net *buyers* of food and poor population groups in the cities.[96] Possible consequences: malnutrition in the countryside and food riots in the cities (as in 2007/08 and 2010, and during the first months of 2011).

The question is, how much will the EU reduce its net grain exports? According to the indicative model, the reduction is 50%. A 100% reduction would drive up the world market price by approximately 25%,[97] so a 50% reduction would have a much smaller effect. The consequences for developing countries could therefore remain limited. But the consequences would be greater if the market is already tight, and even more so if the EU interventions cause domino effects.

Case 2: Severe volcanic eruption

At least one type of calamity could cause even larger scale damage than the previous one: a severe and prolonged volcanic eruption. Europe was given a foretaste of such a calamity during the spring of 2010, when Eyafjallajökull in Iceland was active for three months. A huge ash cloud spread across Europe and beyond. The ash cloud, acid rain and fluorine were harmful for the livestock in Iceland, but had little or no effect on agriculture on the European mainland. However, there was *indirect* damage because air traffic was paralysed for a week. At the high point of the crisis, 29% of global air traffic was brought to a standstill.[98] This damaged the trade in flowers, vegetables and fruit, but did not affect agricultural production itself.

As shown in Box 4.3, the historical record contains much more serious volcanic eruptions: Laki in Iceland in 1783/84, Tambora in Indonesia in 1815 and Krakatoa, also in Indonesia, in 1883.[99] In the more distant past – in 1630 BC – there was the comparable eruption of Thera (Santorini archipelago, Greece). This eruption and the accompanying

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95 The price transmission to farmers is often inadequate and differs between countries as a result of taxes, oligopolies, poor infrastructure or other causes.

96 The public image on this point is distorted. Although images of urban slums often dominate the picture, in Africa three-fourths of the poor still live in the countryside. Of the rural population, more than 50% are net buyers of food. See: A. Kuyvenhoven 2007. *Africa, agriculture, aid.* Valedictory address, Wageningen University.

97 K. Burger in an e-mail, 4 November 2010.

98 IATA, quoted in *NRC Handelsblad* 21 April 2010.

99 The eruption of Krakatoa caused an enormous tsunami that was observed as far away as France. See: Zeilinga de Boer & Sanders 2002. *Volcanoes in human history - The far-reaching effects of major eruptions.* Princeton University Press, Princeton. A large tsunami caused by a volcanic eruption and/or an earthquake in the Atlantic Ocean could threaten the Netherlands and coastal zones in Western Europe. Nevertheless, at the European scale only a small percentage of farmland would be affected. Rapid price increases would not be expected.

earthquakes and tsunamis destroyed the Minoan civilisation on Crete, paving the way for Greek hegemony in the Mediterranean. The volcanic eruptions of Laki, Tambora and Krakatoa slowed agricultural production across much of the world. According to some authors, the food scarcity that followed the eruption of Laki contributed to the social unrest that led to the French Revolution in 1789.[100] The Tambora eruption also affected the Northern Hemisphere. Many crops were lost, food prices rose, poverty increased and in parts of Europe food riots broke out through 1817.[101]

Potentially the most destructive volcanoes are thought to have been the "super volcanoes" of Taupo (New Zealand), Toba (Sumatra, Indonesia) and Yellowstone (USA). The eruption of Toba (which created Lake Toba) occurred long ago – around 74,000 BC – but was gigantic. The eruption and the subsequent volcanic winter might have threatened the very existence of mankind: the population of *Homo sapiens* apparently shrank to an estimated 10,000 individuals, which created an evolutionary bottleneck.[102] The Yellowstone volcano was featured in the news in 2007 due to the swelling of the crater floor.[103] Volcanologists also warn about an impending eruption of Katla in Iceland, which has erupted several times in the past following eruptions of Eyafjallajökull.

Such eruptions can slow agricultural production over large parts of the world, thereby driving up food prices. The consequences will differ from region to region. In the region near the volcano, agriculture will be affected by volcanic debris, acid deposition and fluorine, and will therefore suffer extensive damage. A larger area would be affected by the attenuated solar radiation (both light and heat), causing crop yields to fall.[104] This effect could be amplified by a sulphur mist, which spreads over a large area. The result could be a world-wide decline in agricultural production.

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[100] C.A. Wood 1992. *The climatic effects of the 1783 Laki eruption.* In: C. R. Harrington (Ed.) *The Year Without a Summer?* Canadian Museum of Nature, Ottawa. But according to the Utrecht historian B. van Bavel, the crop failures were "...nothing more than a spark. Agriculture was also affected in many other areas in north-western Europe, but there was much less unrest." (interview in *NRC Handelsblad* 24 April 2010). However, such discussions often take place if someone attributes a multi-causal phenomena to only one of the causes – a form of reductionism. Critics then often make the opposite mistake by asserting that this factor had no significant influence. The revolutions in Tunisia and Egypt in January and February of 2011 were caused by a combination of high food prices and social and political malaise. In such cases, it is perhaps better to say that the high prices were a *catalyst* for smouldering unrest.

[101] Source: http://wetenschap.infonu.nl/natuurverschijnselen/56328-de-uitbarsting-van-de-vulkaan-tambora.html

[102] This estimate is based on DNA analyses. There is still no consensus about the accuracy of such analyses.

[103] http://www.kennislink.nl/publicaties/vulkanen-opbouw-vorm-slash-type-en-locatie. Sources include: Zeilinga de Boer & D.T. Sanders *op. cit.*

[104] A severe volcanic eruption can slow world-wide agricultural production in other ways, not only due to the ash cloud. In the cold, calm and dry stratosphere, sulphur dioxide and the sulphate droplets that are created from this compound can stay suspended for many months, even years. In large quantities, they can sometimes reflect more than 1% of the solar radiation. See: K. Knip 2010. *Vliegtuig of vulkaan.* [Aeroplane or volcano.] *NRC Handelsblad* 24 April. This effect is referred to as *global dimming*. The attenuated solar radiation affects agriculture in two ways: 1) directly: reduced photosynthesis due to less light and therefore less plant production, and 2) indirectly: lower temperatures due to less solar heating, which also leads to lower production. (Daytime temperatures will be lower than normal due to reflection of incoming solar radiation, but night-time temperatures will perhaps be higher due to reflection of outgoing thermal radiation). On the other hand, volcanoes will also emit CO_2. This could lead to accelerated photosynthesis, but that effect is uncertain. More important is that CO_2 enhances the greenhouse effect. This could explain the fact that *higher* temperatures were temporarily measured at some low-lying areas in Europe following the eruption of Laki. The effect on global temperature can last for centuries. In the short term, this could lead to higher global food production, but with the expected additional rise in temperature, it would probably have more of a braking effect.

Nevertheless, it is conceivable that the average arable farmer in the world would be better off on balance due to higher grain prices. However, livestock farms – especially intensive operations that purchase relatively large amounts of feed – will be faced with higher feed costs world-wide, which could cause problems. If these problems result in lost production, the prices of meat and dairy products will rise. The higher food prices can offer livestock farmers some compensation for higher feed costs, but can also cause malnutrition among vulnerable groups of consumers (including farmers) in food-importing developing countries and to a lesser extent in Europe.

The Platform Agriculture, Innovation and Society has not yet commissioned a quantitative analysis of this scenario. However, it is clear that the consequences of an eruption will depend largely on the scale. If production is slowed only in Europe, then the EU will be able to "buy itself out of trouble" on the world market without exorbitant costs. But if production has slowed on a much larger area world-wide, then the prices could also rise sharply on the world market, and the purchases would be much more costly for the EU. In that case, the livestock sector could suffer much greater financial damage, and consumer prices would also rise sharply. The risks of malnutrition would then be proportionally greater.

Case 3: Collapse of soya imports[105]

After the EU became self sufficient in most agricultural products around 1980, it was no longer highly sensitive to external calamities. However, as stated previously, there are still two vulnerabilities: vegetable oil imports and the crucial soya imports. These imports can suddenly collapse due to physical or geopolitical causes. What would be the consequences?

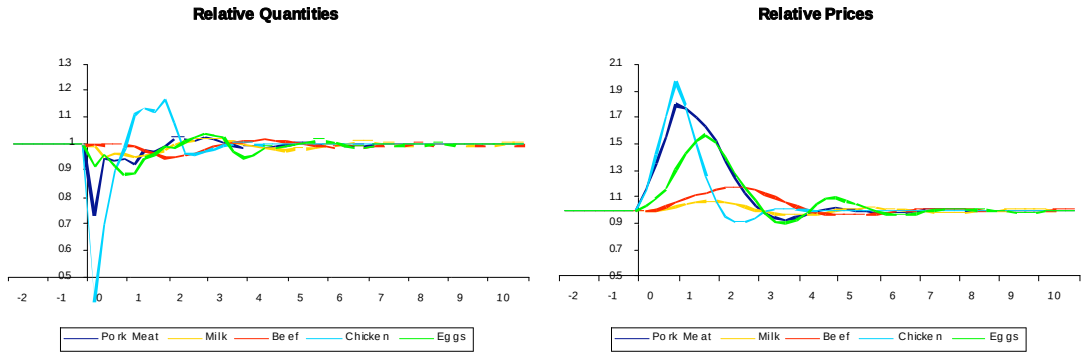

Figure 5.2 Effects of a two-year interruption of soya imports in the EU on production and prices of meat, milk and eggs. Source: Jansen *et al.* 2010.

Calculated effects on production and prices

Jansen *et al.* have used the indicative model to calculate the possible consequences for the EU of a two-year interruption of soya imports. They assumed that the international trade in grains would continue as normal.

[105] This scenario was also studied as part of the *Strategie Nationale Veiligheid* [National Security Strategy], but for the Netherlands only. In this study it was assumed that soy imports would collapse due to the combination of three events: the refusal of the EU to approve a new GM variety grown in South America, a crop failure in South America and subsidised Chinese imports. Ministerie van Veiligheid en Justitie 2010. *Nationale Risicobeoordeling - Bevindingrapportage 2010* [National Risk Assessment – Findings 2010]. The first event would appear to be very unlikely during times of scarcity.

Most important results:

- Almost immediately (in the first quarter) there is an acute shortage of soya. There are stocks, but it appears likely that traders would not immediately sell them; they would do so in stages. As a result, soya almost triples in price and soya consumption declines sharply – by two-thirds.
- Pig farmers and chicken farmers respond with increased culling of animals and bring fewer animals into production. As a result, production of pork falls in the first quarter by 25%, and production of chicken falls by as much as 60%. Egg production declines less and somewhat later; this is because laying hens have a longer lifespan than broiler chickens. The production of dairy products and beef declines only slightly and even later on.
- Due to the shrinking supply, pork and chicken become scarce. Pork prices rise sharply to 180% of their initial level in the third quarter, and chicken prices to 200% in the fourth quarter. The prices for eggs do not rise sharply and peak only in the sixth quarter, and prices for dairy products and beef rise even more slowly and peak only in the seventh and tenth quarters, respectively.
- The high meat prices are an incentive for the remaining pig and chicken farmers to start increasing production as early as the second quarter.
- Chicken farmers start feeding 75% less soya and 65% more grain; production returns to the initial level as early as the fourth quarter. Pig farmers and egg producers reach that level in the eighth quarter.[106]
- Due to increased production, the prices of pork and chicken fall sharply, and stabilise after six years following several fluctuations.
- As a whole, the livestock sector consumes 50% more grain than before the collapse of soya imports.
- Arable farmers respond to the high soya prices during the next growing season by planting more high-protein crops instead of grain; the acreage of grain falls slightly.
- Due to this adaptation, total soya consumption (all sectors together) does not drop further than 28%, measured over the entire two years.
- After two years, soya stocks are even somewhat larger than at the beginning. This is because the soya grown in year 2 must last the entire season until the harvest in year 3, and it is unknown when imports will be resumed.
- Despite the smaller acreage of grain, the grain price does not rise because traders quickly start exporting less grain and importing more. According to the model, this would not have any effect on the grain prices on the world market.

Comparing the graphs with those of a drought which also lasts two years (Figure 5.1), the most important differences are that the chicken and pork sectors are most severely affected, and that the price shocks are more severe but shorter in duration, which is due to the shorter lifespan and faster maturation of pigs and chickens.

Other consequences for the sector

Based on common sense, we can add the following expectations to the model calculations. Due to the drastic declines in production, many chicken and pigs farms are threatened with bankruptcy.[107] These are primarily farms that depend heavily on imported soya. In the feed

[106] Although the price shocks on a quarterly basis are severe, over two years pork production declines only by 7%, whereby farmers are feeding two-thirds less soya to their pigs. This is a much smaller decline in pork production than the 1/3 decline calculated by Bindraban *et al.* (2008).

[107] During the epidemics of classical swine fever (1997) and avian influenza (2003) in the Netherlands, most of the farms that were cleared out (all animals culled) still managed to survive. The LEI concluded that the reimbursement in 1997 was adequate, so that farms continued to exist. But one effect of this policy was a

and meat industries as well, companies risk bankruptcy. But the "survivors" can expect compensation from the higher prices for their products. This makes it less likely that banks will refuse to provide more credit.

In this scenario as well it can be expected that smuggling – in this case of pork and chicken – will increase, which carries the risk of introducing livestock diseases. This could worsen the damage to the sector.

For the Dutch livestock sector, the damage would probably be greater than in most other Member States. This is because Dutch pig and chicken farmers in particular rely more on imports of soya and on exports of livestock and meat.[108] Production declines in chicken farming of more than 60% in the Netherlands are therefore quite possible. Moreover, farms in the Netherlands are financed with relatively more borrowed capital. This weakens their resilience.

Consequences for society

In this scenario as well, side effects can be expected such as hoarding, criminality and speculation. These side effects can amplify the price shocks. As a result, meat could become too expensive for the lowest income classes, and the risk of nutritional deficiencies could increase, especially amongst urban children in the least prosperous Member States.

Consequences for developing countries

The consequences of the collapse of imports for food-importing developing countries depends on the cause of the collapse. If the cause lies in a policy measure of the EU itself, then this puts downward pressure on the world market price. But we have assumed that the collapse is caused by crop failures in South America and/or North America, and/or mega-purchases of soya by China. In that case, the soya price will also rise on the world market and will pull grain prices up with it. This effect will be amplified if the EU discourages grain exports and encourages grain imports. The consequences can then be serious for food importing developing countries, especially for poor urban population groups, and – to the extent that the price increase spreads to domestic markets – for farmers who are net buyers of food. Food riots can lead to political instability, security risks and massive flows of refugees.[109]

Case 4: Drought + collapse of soya imports

What are the consequences of a *double* calamity? For example, what if a two-year drought in the EU coincides with a two-year interruption of soya imports? The probability of such a double calamity is, of course, much lower, but the consequences can be much more severe. The risk (probability multiplied by effect) it is therefore not necessarily smaller or larger.

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continuing oversupply of pork and low prices in 1998/99. This was primarily due to the public/private *Diergezondheidsfonds* [Animal Health Fund], which reimbursed most of the damage. Such funds do not exist for calamities such as a collapse of soya imports.

[108] Imported soya accounts for about 20% all protein in European animal feed (excluding roughage). But the proportion in the total protein fed to Dutch pigs is around 50%. Because soya contains about twice as much protein as other high-protein crops, and because its amino acid composition is ideal for pigs and chickens, it is difficult to replace. C. Rougoor, G. Hemke & F. van der Schans 2009. *Melkvee- en varkenshouderij zonder soja*. [Dairy and pig farming without soya]. CLM en Hemke Nutriconsult, intern rapport.

[109] These consequences are generally similar to those cited in the *Nationale Risicobeoordeling - Bevindingrapportage 2010.* [National risk assessment – Findings 2010], which in addition predicted heated discussions in the Netherlands about the feasibility of the current level of meat production and consumption.

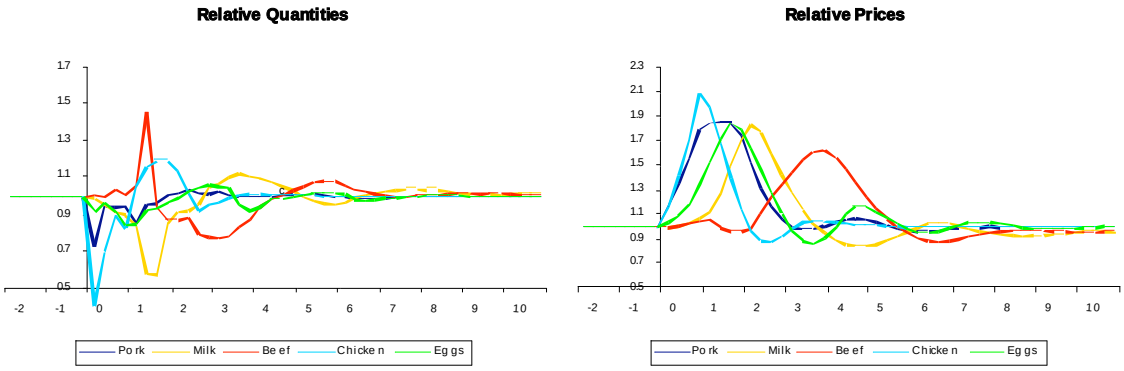

Figure 5.3 Effects of a two-year interruption of soya imports in the EU, combined with a simultaneous drought in Europe, on the production and prices of meat, milk and eggs. Source: Jansen *et al.* 2010.

Calculated effects on production and prices

The indicative model shows that the effects, roughly speaking, are a sum of the effects of the separate calamities, plus an additional effect because some effects amplify each other. In more concrete terms:

- When combined with a drought, soya prices rise somewhat more sharply (up to 323% of the initial price), than they would if there was only an interruption of soya imports (290%); this is because arable production in the EU itself also declines.
- The production losses for chicken (-59%), pork (-27%) and eggs (-17%) take place at about the same rate as with an interruption of soya imports alone.
- The initial production increase for beef (up to +46%) is slightly higher than with a drought alone (+40%). The subsequent drop in production (-23%) is also slightly more than with a drought alone (-20%).
- The drop in production of dairy products (-40%) is the same for a drought alone.
- Compared to drought alone or the collapse of soya imports alone, prices rise as fast or faster:
  - pork +93%, the same as with the collapse of soya imports alone;
  - chicken, +99% to +110%;
  - eggs, +59% to +86%;
  - dairy products, +60% (with drought) to +84%;
  - beef, +46% to +63%;
- Production also stabilises about as quickly as with a single calamity: after 8 to 9 years, in the same sequence of types of livestock.[110]

Other consequences for the sector

It appears likely that the wave of bankruptcies would be approximately equal to the total bankruptcies following the single calamities. But it could be slightly smaller because the price increases (except for pork) are higher, which provides improved prospects for recovery.

In reality, the shock could also be more severe. With a double calamity, it is expected that the crisis atmosphere and the social-psychological impact would be more intense. This could lead

[110] The fact that the price spikes of the various products are not synchronous is partly due to the biological differences between the three livestock species. This is actually an elementary example of how biodiversity can contribute to economic stability.

to more bankruptcies, panic buying, hoarding, speculation and criminality, and thus to amplified price shocks.

The consequences for animal health and welfare could possibly be greater as well, especially in cattle and dairy farming, where the production shocks are most intense. Due to the even higher prices, the probability of smuggling and the accompanying introduction of livestock diseases is also greater than with drought alone or the collapse of soya imports alone.

Consequences for society

It is also likely that the effects on society will be greater than with a single calamity. A double calamity means that not only less chicken, eggs, pork and dairy products come onto the market, but also less beef. As a result, consumers would have fewer possibilities to substitute an expensive product with a less expensive alternative. The total period of higher prices also lasts longer. Although that effect would be alleviated somewhat because the price spikes are not entirely synchronous, the probability of malnutrition amongst vulnerable groups will be greater than with drought alone or with the collapse of soya imports alone.[111]

Consequences for developing countries

The effects on the world market price can be much greater than with drought alone or a collapse of soya imports alone. This is because – according to the indicative model – the EU becomes a net importer of grain in the eighth quarter. This could drive up the grain price on the world market by more than 25%. In reality, this effect would be somewhat less, because the EU begins reducing its grain exports in the fourth quarter of the first drought year; if that drives up prices on the world market, then grain production would be stimulated elsewhere in the world. But the remaining price effect could still be significant.

This can cause malnutrition. In the cities, food shortages could lead to food riots and political instability. Vulnerable regions are North Africa and the Middle East, which are the largest importers of EU grain. Instability there could also lead to security risks and to massive flows of refugees. If the governments in these regions attempt to alleviate price increases with food subsidies, this could strain the national budgets, which can also have a destabilising effect. It should also be noted that the EU depends heavily on Morocco for its phosphate supplies.

Case 5: Large-scale livestock disease epidemics

What would be the consequence of livestock disease epidemics? The indicative model assumes a hypothetical livestock disease (or combination of diseases) that simultaneously affects cattle and dairy farming, pig farming and chicken farming, or three diseases that simultaneously affect the three livestock species. The epidemic lasts two years. Three scenarios have been calculated, with respective mortalities of 1%, 5% and 10% per quarter. This mortality not only concerns the animals that die from the disease, but also animals that must be culled preventively on contaminated (or possibly contaminated) farms and their neighbours within a security zone. Also included are animals that are slaughtered due to animal welfare considerations when barns become overcrowded with live animals due to transport bans.

[111] For the sake of completeness, we will also refer to the probability of malnutrition in the group of *vegans* with low incomes, due to the much higher prices for soya and other plant proteins. But this group is very small. Moreover, some vegans may perhaps decide to start eating eggs or dairy products due to the high prices for soya.

A mortality rate of 10% per quarter is very high, but is certainly possible. In comparison: during the outbreak of classical swine fever in the southern region of the Netherlands, the mortality was 20% per quarter. Of course, this concerned only a relatively small area, but with a coordinated bioterror attack it is conceivable that such percentages could occur over a much larger area for longer periods. Although vaccines are available for most contagious livestock diseases, it is uncertain whether these would be available promptly and in sufficient quantity. Even if they are, it is uncertain that they will be used because market parties – even without rational justification – can reject products from vaccinated animals.[112] Moreover, viruses can mutate, making vaccines ineffective. Finally, there are viruses for which no vaccine yet exists, such as African swine fever.[113]

Calculated effects on production and prices

For livestock diseases, Jansen *et al.* have calculated specific scenarios with the indicative model. They assumed that culled animals would be sent to rendering plants, and therefore not slaughtered for human consumption. Before discussing the model results, a qualification is in order. Several far-reaching simplifications of reality have been applied in the model:

- It is assumed that no vaccine is available during the disease outbreaks, or if it is available it is not used. This is a worst-case situation.
- The consumer responds only to the *price* of meat and dairy products, not to the worsening *image* of these products. The price increases can therefore be overestimated, but the effects on the sector can be underestimated, since a smaller price increase can hamper recovery of production.
- Following a price increase, livestock farmers can freely add to their herds, unrestricted by transport bans and other veterinary limitations. Due to this unrealistic assumption, the effects on the sector and the prices are underestimated.
- The gaps in European production are compensated with imports of meat and dairy products. In reality, some imports can be expected, causing prices to rise less steeply. This is beneficial for the consumer, but not for the producer.
- There is sufficient capacity for culling and rendering. In reality, these capacities can quickly become inadequate in situations with high mortality. This can disrupt the sector.
- The model is based on a single, large, virtual European farm per sector. The farm cannot go bankrupt and responds quickly to new conditions. In reality, there are of course a great many farms, and they do not, or cannot, always respond quickly enough following a calamity. Repopulating empty barns with animals acquired elsewhere is sometimes forbidden. As a result, many farms can fail. On this point, the model underestimates the effects on production and prices.

Therefore, with this model there are additional reasons to not take the results literally, but purely as indicative.

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[112] One of the risks of this situation is that livestock farmers could gamble and choose to not vaccinate their livestock during a disease outbreak.

[113] Since 2010, an epidemic of African swine fever has been raging in southern Russia and Armenia and western Russia. See: S. Moesker 2010. *Afrikaanse varkenspest kan bedreigend zijn voor EU*. [African swine fever could threaten the EU.] *Agrarisch Dagblad* 27 November. And: *Varkenspest Rusland komt mogelijk door swill en leger* [Swine fever in Russia is probably transmitted by swill and the military] *agd* 3 March 2011. The disease can be transmitted via refrigerated meat, contact between animals and by vehicles. It can also be transmitted by a species of tick.

Figures 5.4 and 5.5 show the results of the model calculations:

- In the extreme scenario of 10% mortality per quarter, severe declines in production occur: in the quarter with the greatest decline, production falls by 40% for milk, 10% for chicken, 30% for eggs, 20% for veal and 70% for beef. The severity of the decline in beef production is partly due to reduced production of veal calves from dairy farming.
- Once again, the drops in production are not synchronous: chicken production quickly reaches its lowest point in the second quarter of the outbreak, pork in the second and third quarters, and milk and beef just before the end of the second year, when the epidemic ends. The asynchronous declines are due to differences in the lifespans and reproduction capacities of chickens, pigs and cows. Broiler chickens reach maturity in six weeks, finishing pigs in about four months, while milk cows take more than a year.
- Due to these drops in production, the price of chicken peaks at 150% of the initial level, eggs at 470% (both in the seventh quarter), milk at 300% in the tenth quarter, pork at 340% in the seventh quarter and beef at more than 500% in the third year. These increases not only reduce demand, but also provide strong incentives for the surviving livestock farms to increase production.
- The rate at which the prices stabilise at the old level also differ greatly: chicken prices stabilise after 3 years, pork prices after 6 years, egg prices after 7 years, milk prices after 9 years and beef prices only after more than 12 years.

The shocks in production and prices are extreme, especially those in the beef and pork sectors, but they are also caused by an extremely high assumed mortality combined with a rigid import limitation. In practice, as stated previously, the price spikes could be lower, but could also be even higher, although a spike of 500% or more appears to be unrealistic. Prices are hard to calculate as the consumer response is not known.

Other consequences for the sector

The damage to the sector could be enormous: many farms risk failure, many farmers and other involved parties are expected to suffer psychological damage, and in regions with transport bans all the barns remain empty. As the area affected by livestock disease increases, fewer farmers *outside* the affected areas are able to benefit from higher prices. Shocks to consumer confidence can lead to loss of demand, which can reduce upward pressure on prices. This could aggravate the problems for livestock farmers and make recovery even more difficult. In addition, banks are reluctant to provide credit as long as the epidemic continues.

The consequences for the Dutch livestock sector, all other things being equal, are much more severe than for the livestock sectors in most other Member States. After all, the Netherlands has a high livestock density, which allows diseases to spread more quickly. Moreover, the livestock, meat and dairy sectors in the Netherlands have a relatively strong export orientation, and since many countries will close their borders in case of contagious livestock disease, the Netherlands will be affected even more severely than others.

Consequences for society

The consequences for society could also be severe. The Netherlands experienced these societal consequences during livestock epidemics in 1997, 2001 and 2003. Expected social-psychological consequences are societal commotion about the mass culling of animals (especially cattle and pigs), strong emotions about livestock farmers (ranging from revulsion to empathy) and loss of confidence in the meat industry and the government (the latter was especially the case with BSE in England and Germany). In the case of bioterrorism, fear and panic could be added.

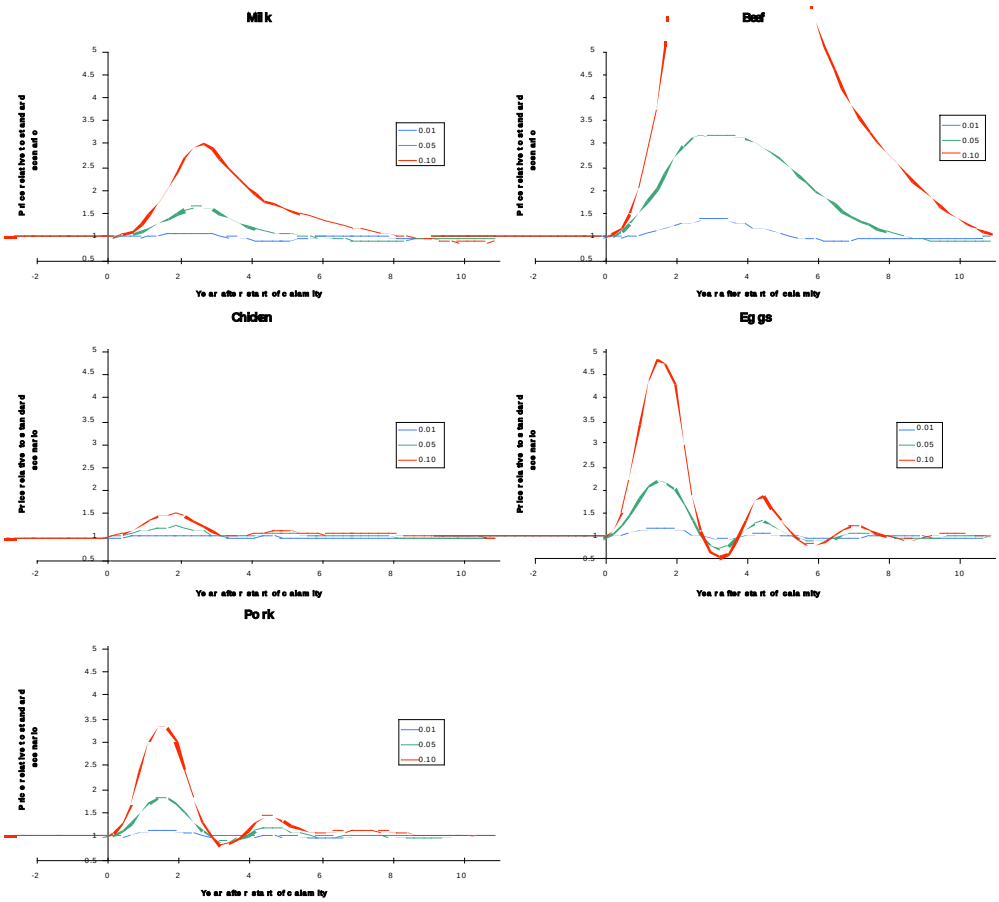

Figure 5.4 Effect of various livestock disease scenarios (mortality percentages as a fraction of living animals per three months) on the prices of milk, beef, chicken, eggs and pork. The price is shown as a fraction of the price in the standard scenario (relative price change). Source: Jansen *et al.* 2010.

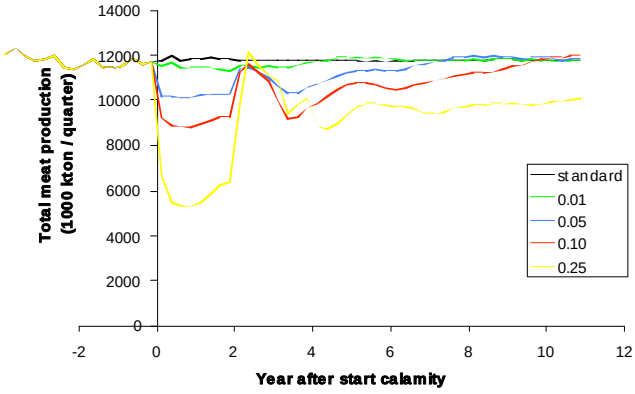

Figure 5.5 Total meat production (beef, pork and chicken) with different mortality percentages as a result of an outbreak of a livestock disease. Source: Jansen *et al.* 2010.

Consumers buy less meat and dairy products due to high prices and reduced confidence in food safety. However, if confidence remains high, and price spikes are consequently also high, then a number of side effects can be expected: panic buying, hoarding, theft, smuggling

and speculative stockpiling. Moreover, due to transport bans, meat and dairy products are no products remain available for all European citizens, even at the highest mortality, compared with the previous scenarios more people – especially children – suffer from malnutrition.[114]

The transport bans can also cause damage outside the livestock chain. Roads and nature reserves will be closed. This can harm other sectors, including transport, recreation and tourism.

The economic damage could be enormous. Table 4.3 shows the figures for large epidemics in the Netherlands from 1997 to 2006, with the total damage ranging between €3.8 billion and €4.6 billion.[115] For the EU as a whole, the damage could be much greater.[116] The damage from the 2001 foot-and-mouth outbreak alone is estimated at €1.6 billion,[117] and that of BSE at more than €2.8 billion *per year*.[118] In scenarios of large-scale coordinated bioterrorism, the damage could be a multiple of these amounts.

Table 5.1 Costs of major epidemics of livestock diseases in the Netherlands 1994-2006. Source: various studies of Wageningen UR summarised by Rougoor *op. cit.*

Disease	Period	Costs in millions of euros
BSE	1994–2004[119]	554-940
Swine fever	1997	1,500-1,900[120]
Foot-and-mouth disease	2001	874
Avian influenza	2003	870-970
Total	1994-2004	3,800-4,600

If prices rise steeply, consumers also bear some of the costs.[121] The EU can cushion excessive price spikes by allowing more imports of meat and dairy products from the world market, but this can actually hamper the recovery of the sector.

It goes without saying that the consequences for animals are disastrous. Millions of animals become sick and are killed prematurely for rendering. As a precaution, healthy

[114] In the indicative model, malnutrition only becomes probable with an even higher livestock mortality: 25% per quarter. But the model also assumes rapid replacement of livestock. During an epidemic, this is often impossible. As a result, malnutrition could occur even with lower mortality.

[115] After 2006, there were outbreaks of blue tongue and Q fever. The costs of these outbreaks have not yet been quantified.

[116] With respect to trans-border risks, the EU compensates part of the damage, especially the damage resulting from the mandatory culling of animals following an outbreak of a highly contagious disease. Between 1997 and 2005 the EU contributed between €24 million and €424 million to emergency measures following outbreaks of avian influenza, classical swine fever, foot-and-mouth disease and several other diseases (in total €989 million). In addition, in 2004 alone the EU contributed €142 million to the elimination of BSE. See: Landeg, F., N. Coulson & M. Mourits 2010. *Animal health policy*. In: Oskam, Meester & Silvis *op. cit*. But most of the damage is the responsibility of the Member States themselves and the sector.

[117] This concerns the costs for the government. The EU contributed €475 million. See: Landeg, F., N. Coulson & M. Mourits *op cit.*

[118] European Association of Animal Production 2003. *After BSE – A future for the European livestock sector*. This concerns the costs of policy: culled animals are worth €55 less because the meat-and-bone meal from the rendering plant no longer has any value. Additional costs include €21 per animal for disposing of the meat-and-bone meal and another €25-€50 per animal to test for BSE.

[119] The first case was diagnosed in 2007, but measures had already been taken and costs had been incurred.

[120] According to Statistics Netherlands, this is equivalent to 0.4-0.6% of the gross national income.

[121] Moreover, consumers also bear the costs as citizens by paying taxes.

animals that are *possibly* infected are culled before they show symptoms. Other healthy animals are culled because barns become overcrowded as a result of transport bans. Moreover, due to the malaise in the sector, it is likely that animals are neglected.

Consequences for developing countries

For developing countries, the consequences in this scenario are actually *less* severe than in the previous ones. After all, the demand for animal feed declines, and the EU begins exporting more grain. If this puts downward pressure on the prices on the world market, then this is beneficial for net *food-importing* developing countries, but harmful for net *food-exporting* ones. It also benefits farmers who are net buyers of food, but not those who are net sellers.

On the other hand, the EU will largely stop exporting meat or dairy products (exports from areas with contagious disease are forbidden), and that can push up the prices of those products on the world market – specifically dairy products for which the EU has a large market share – especially if the market is already tight. That effect could be amplified if the EU opens its doors for meat and dairy products from the world market. This would certainly be an advantage for meat exporting countries such as Brazil, but it could be a problem for meat and dairy importing developing countries, especially for the relatively prosperous urban middle class, which consumes comparatively more meat and dairy products.

But if the market and policy response of the EU leads to price shocks for grain, meat and dairy products, this is harmful for all parties, except perhaps for some speculators.

6. The market mechanism, market failures and reasons for intervention

We now return to the following questions:
- To what extent can the market itself solve problems with its self-regulating capacity?
- Where can the market fail?
- Where is government intervention necessary?

Self-regulating capacity of the market
In the previous chapter, it became clear that the "invisible hand" of the market has a large self-regulating capacity, also when it comes to food scarcity. To summarise:

If *soya imports* in the EU suddenly collapsed, the price mechanism is expected to result in the following adaptations:
- Due to the sudden price spike for soya, feed companies and livestock farms – to the extent this is possible nutritionally and financially – replace soya with grain and other protein-rich products such as field peas.[122]
- Due to the high feed price, the production of pork and chicken falls.
- As a result, pork and chicken prices rise sharply.
- During the first subsequent growing season, arable farmers plant less grain and more protein crops (but that also depends on other prices in the market and the policy on the biofuel blending mandate).[123]
- Consequently, the price of grain rises. As soon as the price of grain rises above the world market price, grain traders begin reducing exports[124] and/or increasing imports, which moderates the price increase (although the world market price can rise somewhat).
- Due to the high prices of pork, chicken and dairy products, consumers (especially less prosperous ones) begin purchasing less. They also start purchasing somewhat more beef.[125]
- The amount of food waste, which is significant in the EU, declines.

In scenarios where grain also becomes scarce, a portion of the feed grain will be used for human consumption. Although feed grain has lower baking quality than has bread grain, this buffer is so large that malnutrition due to a deficiency of carbohydrates is very unlikely. However, iron and vitamin B12 deficiencies, caused by shortages of meat and dairy products, are conceivable – especially among children in the least prosperous Member States.

[122] In the indicative model it is assumed that this replacement can be based on the relative prices of protein in soy and grain, and that the amino acids missing in grain can be supplemented.
[123] In the indicative model, several scenarios were modelled for this situation. For more information, see Jansen *et al.* 2010, Section 6.3 (options 6 and 7).
[124] This correction can often take place quickly because many contracts are made on a yearly basis (personal communication, H. Stam, Cefetra).
[125] The indicative model only models production, not consumption. Therefore the model does not account for this buffer or the following buffer.

If *domestic agricultural production* (including grass) declines due to a prolonged drought or severe volcanic eruption, then the following adaptations via the price mechanism are to be expected:

- Due to high feed prices, cattle farmers dispose of animals.
- As a result, the milk price rises, while the price for beef initially declines, to subsequently rise sharply due to fewer beef cattle and calves.
- Livestock farmers begin harvesting roughage from road verges and – to the extent this is permitted or tolerated – from nature reserves.
- They also replace a portion of their roughage with grain and concentrates (but due to nutritional restrictions, this option is limited; moreover, concentrates are expensive).
- If grain prices rise above the world market price due to these adaptations, then grain traders begin exporting less grain and/or importing more, which moderates the price increase.
- Due to higher prices for dairy products and beef, consumers purchase less of these products, and start purchasing somewhat more pork, chicken and eggs.
- Also in response to high prices, the production of dairy products and beef increases, leading in turn to lower prices.

Comparable adaptations can be expected during a large-scale livestock disease outbreak.[126] The market mechanism therefore provides important feedback mechanisms and shock absorbers, which can cushion the severity of calamities. Some of these adaptations (reduced wastage, grass from road verges) have not been taken into account in the indicative model. The axiom of free-market capitalism, "the best remedy for high prices is high prices", applies to many situations, but not to all – especially when a prompt response is needed.

Limits to the self-regulating capacity of the market

The market can respond inadequately, especially in times of crisis, for at least seven reasons:

1. Inertia: the market response can come too late to prevent serious problems. This applies to most sectors, but especially to agriculture. Inertia is unavoidable in agriculture because it is a *biobased* sector that produces in open systems. The production is linked to seasons, weather and biological lifecycles. For example, a milk cow begins producing milk only after more than a year, and a fruit tree begins producing coffee beans only after a number of years. Some investments – in barns and irrigation systems, for example – may require many years to show a return. This inertia often creates cycles in which periods with low prices and low investment alternate with periods with high prices and high investment. A classic example is the "pork cycle", but the phenomenon also occurs in other sectors and at the global scale.[127] For example, the food crisis of 2007/08 was caused in part by low investment in the preceding years.[128] In this way, overproduction can lead to underproduction and food shortages, and the

[126] But in the case of livestock disease epidemics, the market can become less self-regulating due to unavoidable government interventions, such as transport bans. Moreover, price shocks in the market can result from violations of consumer confidence.

[127] N. Koning *et al*. 2008. *Long–term global availability of food: continued abundance or new scarcity? Netherlands Journal of Agricultural Science* 55: 229-292. See also the interview with Koning in *Resource*,13 January 2011. The Australian government agency Abara expects lower prices for wheat and oil seeds as soon as 2011/12 (*agd* 4 March 2011).

[128] FAO-OECD 2010.

reverse.[129] To prevent such cycles from becoming too extreme, government intervention is frequently required.

2. Bio-risks: the bio-based character of agriculture also leads to risks: pathogens, weeds and parasites can affect production and can spread through physical contact. Some biological mechanisms are even potentially in conflict with the "laws" of the market. For example, in an ideal market, every supplier should be able to contact every buyer, but from a biological perspective that is a risk because it can promote the spread of hazardous organisms. This also applies to international trade.

Many years ago it was acknowledged that the trade in agricultural products requires regulation. The GATT treaty from 1948 included sanitary and phytosanitary regulations for international trade, whereby countries retained the right to ban imports of contaminated products. There are also many national regulations, but these are sometimes "stretched" or poorly enforced. For example, the BSE crisis was a result of deregulation: the British government relaxed the regulations for using slaughterhouse waste in animal feed. After this crisis, the regulations and monitoring in the UK and the EU became much stricter. In case of scarcity, such measures come under pressure, and therefore require additional monitoring.[130]

3. Food safety: when it comes to food safety, it has also been clear for many years that the market can fail disastrously if regulation is lacking. This occurred during situations such as the BSE crisis, various dioxin scandals and, more recently, the scandal with melamine in Chinese dairy products and antibiotic-resistant bacteria in chicken. In the General Food Law, the EU has made producers responsible for food safety. This intervention increases the probability that the market will also be effective in the area of food safety.

Here as well, during times of scarcity and high prices, there is a risk that discipline will weaken and the pressure to commit fraud will increase. For example, pig farmers could again start feeding swill to their animals, which increases the risk of contagious livestock diseases. If slaughterhouses become overburdened, then provisional slaughtering will take place under less hygienic conditions, and if rendering plants become overburdened, cadavers may simply be dumped. Systems of integral chain management and tracking and tracing can collapse, allowing animal shipments to evade inspections, etc. This can lead to the spread of livestock diseases[131] and/or to contamination of food. As a result, consumers can lose confidence in the market.

4. Speculation: speculation on the futures market can help stabilise prices, but speculators from outside the sector – including investment banks, hedge funds and pension funds – can invest in commodities markets if prices rise and if they expect further increases. As a result, they can drive prices even higher (see Box 8.4), causing more people to become malnourished. If these speculators suddenly pull out of commodities, then prices will plummet. These amplified price shocks can disrupt chains and scare away investors.

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[129] Besides economic buffers, there are also social buffers. Social networks such as families and churches can help prevent malnutrition. But these networks can compete with each other, and that can actually have a negative effect on those *not* participating in such a network.

[130] W.J. van der Weijden. *MKZ maakt spanningen tussen markt en biologie zichtbaar.* [Foot-and-mouth disease illuminates the tensions between the market and biology] *De Volkskrant* 26 April 2001. According to this article, biology should not be subject to the discipline of the market, but the reverse.

[131] Serious hazards can result from the unsafe use of swill and other by-products. In the 1980s, this led to an outbreak of African swine fever in the Dutch province of Zeeland. There is no vaccine for this disease.

5. *Inequality:* the market is an efficient distribution mechanism, but for the lowest incomes it does not offer any guarantee of affordable food. Therefore, many countries have food subsidies or food banks. In case of scarcity and high prices, larger-scale facilities are required. At such times, it is often argued that the government should begin distributing food vouchers to the least prosperous citizens. There is a lot to say in favour of this step, but it can drive food prices even higher.

At the global level, the market is even less capable of supplying affordable food for everyone. This is why there is food aid and development aid for agriculture. For that matter, the EU largely owes its current self-sufficiency to government interventions in the past to support agriculture. Due to this policy, a lower intervention level is adequate today.

Box 6.1 Lessons from the financial crisis

After the financial crisis of 2008 (which continues to this day) there was a return to the realisation that markets require regulation. According to the economist Arjen Van Witteloostuijn, "World leaders must return to the drawing board, as they did following the stock market crash in the 1930s, when the architecture of the financial institutions and banks was renewed. At that time, under the leadership of the British economist John Maynard Keynes, many good reforms were implemented, which prevented another global financial firestorm for decades afterwards. But the 'fire lanes' that were built into the financial system have been abolished. If the system catches fire now, the flames will immediately spread around the world. This situation must be changed soon to prevent a new, possibly even more serious crisis". The same applies to a certain extent to agricultural policy, where the fire lanes consisted of features such as stocks, land set-aside measures and intervention prices.

Economic *theory* has also become inadequate, as many economists acknowledged after the credit crisis. In his valedictory address, Professor Arie Oskam summarised the strengths and weaknesses of prevailing economics theory – including agricultural economics. The theory is weak because it fails to account for

- transaction costs of policy measures (for example due to resistance from vested interests);
- mutual interdependencies in the decision process of actors, such as herd behaviour (one reason for the recent emergence of behavioural economics).

An even more fundamental weakness is that many theories have not been empirically validated, which makes their predictive value low.

Sources:

Oskam, A.J. 2009. Policies for agriculture food and rural areas: does science matter? Valedictory lecture Wageningen University.

van Witteloostuijn, A. Interview in NRC Handelsblad 20 January 2011.

In many developing countries, government support for farmers was cut back too soon, and the government is now at most giving support to consumers.

6. *Vulnerability of chains:* food production is increasingly organised in chains, and has become much more concentrated. In case of severe price shocks, this integration comes under pressure because suppliers can go bankrupt or switch to a different buyer. As a result, large gaps can occur in the feed and food supply. In the agricultural sector – as in the financial sector – if "system companies" such as Danish Crown and Vion (in meat) and Nestlé (in dairy products) were to fail, they could take down entire food chains with them. If their

production is not quickly taken over by other companies, then the market will fail and the government will have to intervene in order to ensure the continuity of food production.[132]

7. Lack of transparency: ideally, a market can function properly only when buyers and sellers have access to essentially the same information about products and prices; in other words, there is symmetrical information. This precondition is often disregarded. Companies regularly market products and services with hidden deficiencies. This behaviour is often punished by the market over the long term, but by then it could be too late, and severe damage could already be inflicted. In the financial sector, the problem with hidden deficiencies got entirely out of hand in 2008. Investment banks marketed complex products on a large scale, hiding the risks of the products. This was one of the causes of the credit crisis. In the meantime, this sector has once again realised that no market can be stable without regulation and oversight.

In short, the "invisible hand" of the market can be seriously inadequate, especially following calamities. Bluntly stated: the neo-liberal model is incompatible with food security. There are valid arguments for government intervention, including interventions to prevent and prepare for calamities.

There is also an entirely different argument in support of intervention: the global free market in agricultural products has never really existed, and is unlikely to be coming much closer.

Emergence of state-owned companies

In recent years, partially and fully state-owned companies have emerged on world agricultural markets. This emergence is due in part to the above-mentioned inadequacies of the market, and in part to nationalism and power politics

Partly in response to the food crisis of 2007/08, state-owned companies from China and Russia, along with large private conglomerates from Korea, India and other countries, purchased grain, rice and other products and created large stockpiles. Moreover, many countries, including Arab countries, invested in farmland and agricultural development – also in energy crops – in the Third World. Their primary aims were to ensure food supply and to prevent food inflation, price shocks and social unrest in their homeland. In the case of energy crops, energy security was another aim. State-owned companies also compete for strategic positions.[133]

In contrast, the USA and the EU have sharply reduced their own intervention levels. The EU now intervenes only as a safety net when prices fall below a predetermined, very low level, and then only for wheat, milk and skim milk powder.[134] The EU apparently assumes that possible feed shortages can easily be compensated with trade. However, this strategy could be very costly, for example if China was also faced with shortages and began to spend its enormous dollar reserves to purchase large quantities of soy and grain in South America. Or if state-owned companies have already protected themselves against shortages with long-term contracts. The EU would then still have the option of purchasing grain elsewhere, for example from the Black Sea countries, but if prices are also high in that region, these countries could decide to temporarily halt their exports.

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[132] When it is clear beforehand that the government must intervene, this can tempt companies to engage in risky behaviour. Therefore it may be necessary for the government to make specific agreements with "system-relevant companies".

[133] See footnote 25.

[134] Until recently, sugar producers in the EU were required to maintain strategic stockpiles, but this requirement was abolished during the last reform of sugar policy in 2005 (*agd* 1 February 2011).

Box 6.2 Government interventions in Dutch agriculture and food security during World War I and World War II

In two periods in the 20th century, extreme circumstances occurred in the Netherlands that compelled the government to make drastic interventions.

World War I

When World War I broke out in August 1914, the government decided to intervene directly in the food supply. As long as there were ample stocks, this intervention consisted of regulated distribution and control of hoarding and price manipulation. Concrete measures included the following:

- establishing maximum retail prices;
- expropriation in case of price manipulation;
- expropriation of wheat stocks;
- purchases of rye to benefit controlled distribution.

When stocks continued to decline, in 1916 the *Distributiewet* (Distribution Act) went into force, which instituted rationing, resulting in measures such as bread and flour vouchers. The Act also made it possible to take prohibitory measures "to ensure that the need for sufficient food and feed is not threatened by the production of less desirable crops or by less desirable uses of foodstuffs or commodities".

On 28 July 1917, when potato stocks were entirely gone, it became known that a ship with a cargo of potatoes destined for the Army was moored in the Prinsengracht in Amsterdam. Wives of labourers from the Oostelijke Eilanden and the Czaar Peterbuurt districts plundered the ship in order to feed their families. In early July, the unrest grew, and the labourers themselves went into action. Warehouses and shops were plundered. The police were powerless and the military was called in. On 5 July 1917, a battle took place and soldiers opened fire on the crowd that had gathered at the Haarlemmerplein. The rebellion was defeated. During these "potato riots", 9 people were killed and 114 wounded.

The government also intervened in land use. The pre-war conversion to more intensive forms of livestock farming had made Dutch agriculture dependent on imports of fertiliser and feed, and on export markets for the final products. Moreover, the domestic food supply had become reliant on imported bread grain. This dependency caused problems when imports were temporarily halted due to the war. At the same time, the Netherlands – which remained neutral in WWI – was pressured by the allies to restrict exports to Germany. The government devoted itself to food security and fair food prices. To this end, grain production had to be restored, and to limit the demand for feed grain, the livestock population had to be reduced.

This objective was thwarted by a shortage of fertiliser, which caused yields to gradually decline. To solve this problem, the government decided to make it a legal obligation to plough grasslands and clover pastures and convert them into arable farmland. Despite these measures, there was still a threat of famine. But not long after the first emergency measures were taken, the war ended. Most of the emergency restrictions were lifted by 1919.

The post-war boom created the impression that the era of prosperity had returned. But the relationship between government and agriculture had changed fundamentally; both parties realised how dependent they were on each other.

World War II

When World War II broke out in 1939, the objective of government measures once again shifted to domestic food security. Although the population had grown and dependence on imports and exports had increased, under the leadership of S.L. Louwes the *Rijksbureau voor de Voedselvoorziening in Oorlogstijd* (National Bureau for Food Security in Wartime) showed itself capable of managing and distributing production in such a way that food security – despite forced exports to Germany and the unavoidable black market – remained at a reasonable level until the end of 1944. Then followed the "famine winter" in the region of the Netherlands that had not yet been liberated.

As during World War I, the government attempted to reduce livestock production to benefit arable farming for human consumption. The production of other crops was promoted by means of price incentives.

To promote the shift from livestock to arable crops, the following measures were implemented:

- a premium for ploughing grassland to plant arable crops, which later became mandatory for 60,000 ha;
- feed allocations;
- mandatory livestock deliveries;
- maximum numbers of livestock per farm.

Box 6.2 ***continued***

Altogether, the government intervened even more drastically in farming than it did during World War I. The government also intervened in distribution. That began as early as 11 October 1939, when sugar became the first rationed product. After January 1940, dried peas were also rationed. Many products continued to be rationed until the early 1950s. In 1952, coffee was the final product to be released from rationing.

After World War II
During the oil crisis of 1973, a limited form of controlled distribution was implemented briefly, whereby petroleum products, especially petrol, were rationed.

Since the *Coördinatiewet Uitzonderingstoestanden* [National Emergency Coordination Act] went into force in 1996, the Netherlands has had two types of national emergencies: a limited national emergency and a general national emergency. If the government declares a general national emergency, and this decision is published in the *Staatsblad*, then a broad range of emergency measures can go into force: the Civil Authority Special Powers Act, the Transport under Exceptional Circumstances Act, the Anti-hording Act, the Distribution Act, the Expropriation Act and the Emergency Food Security Act. But the effectiveness of these measures is limited because the Netherlands is part of a common market.

At the European level, there is no legislation on food distribution in times of calamity and scarcity. In the Treaty of Rome (1960), food security was an important aim of Common Agricultural Policy. The development of the EU into a major agricultural producer (and exporter of some products), with a relatively large area of productive land per resident, has made scarcity policy in the EU less urgent. In its recent proposals for the CAP after 2013, the European Commission stated that one of the strategic aims is to achieve "food security for European citizens and to contribute to growing world food demand", and urged the maintenance of production capacity "to address rising concerns regarding both EU and global food security". But most of the attention in the proposals is on the competitive position of the EU in the world and the increasing demand of consumers for quality and diversity.

Sources:

Bakker Th. M. 1985. Eten van eigen bodem - een modelstudie. [Food from our own soil – a model study] Proefschriften uit het LEI no. 1. LEI, Den Haag.

van Meurs, W.C. 1920. Rantsoenering en distributie ten tijde van de Eerste Wereldoorlog - De levensmiddelenpolitiek van de Nederlandse regering. [Rationing and distribution during World War I – the food politics of the Dutch government.] www.forumeerstewereldoorlog.nl

Andrik, J., M. Dénis & J. Sanders 1988. Een eeuw boeren op papier; Over de archieven van de drie landbouwcoöperaties in het zuiden: [A century of farming on paper: on the archives of the three agricultural cooperatives in the south of the Netherlands] Suikerunie Campina, CHV.

Koning, N., H. Löffler & N. Louwaars 2010. A sustainable and fair food system in the European Union. Sustainable Production and Food Security Group, Wageningen University.

European Commission 2010. The CAP towards 2020: meeting the food, natural resource and territorial challenges of the future.

A similar scenario applies to the markets for dairy products and meat. If the prices of these products rise sharply following a calamity, the EU can decide to encourage imports and discourage exports. This measure is effective if the world market is well supplied, but much less effective if it is tight. In that case, state-owned companies from China and elsewhere can hold an advantage over European companies.

In case of acute feed and food shortages, the world market would become so disrupted that it will no longer be a reliable refuge, not even for wealthy countries.[135] What's more, if

[135] Remarkably, the recent book by Oskam, Meester and Silvis on the CAP (also referred to above – otherwise a thorough and multifaceted work) pays little attention to the consequences of the financial crisis and no attention whatsoever to geopolitics. And only a single category of calamity was given attention: epidemics of plant and livestock diseases.

European companies start bidding against financially powerful state-owned companies, that will drive up prices on the world market, and the impact will be felt elsewhere: in food-importing developing countries.

Box 6.3 EU Agricultural Policy

The Common Agricultural Policy (CAP) of the EU has traditionally focused on food security and stable prices. This went hand-in-hand with sizeable interventions in the form of import tariffs, price guarantees, export subsidies and structure policy. This policy was successful: around 1980, the EU became self-sufficient for most agricultural products. But at the same time, the costs of this policy also increased. The EU had to purchase more and more agricultural products for intervention, and then sell them on the world market, thereby incurring higher and higher costs. This depressed the prices on the world market, which caused export subsidies to be raised even higher, thus creating an even heavier burden on the budget. Moreover, there was increasing criticism from trade partners and developing countries about these dumping practices.

Initially, the solution was *not* sought in more free-market mechanisms, but in even more government intervention. For example in 1977 – to relieve the burden on the budget – a co-responsibility levy was imposed on dairy farmers, which essentially amounted to lower prices paid to farmers. At the same time, a premium on non-delivery (output reduction) was implemented. When that had insufficient effect, in 1984 a "super levy" was imposed on production expansion, which become known as the milk quota system. In 1992, a land set-aside scheme was implemented for arable farming.

But in that same year, the EU also took an initial step towards more free-market mechanisms – not by eliminating subsidies, but by decoupling them from the products and replacing them with support per hectare and per animal. In 2003 it decided to further decouple products and subsidies, and the subsidies became farm payments. This decoupling was first implemented for grain, followed by the milk premium (in the Netherlands in 2007) and the slaughter premium in 2010. The final steps in decoupling are planned for 2012. Intervention will not be abolished entirely, but will only be applied in case of extremely low prices – like a safety net. Moreover, in 2007 – in response to high grain prices – the EU reduced the land set-aside scheme to zero, and then abolished it entirely. A decision was also made to abolish the milk quota in 2015 (30 years after its inception). As a result, the free market mechanism has been greatly strengthened.

This policy has various advantages. The burden on the budget has been reduced. Agriculture and agro-industry have been compelled to focus more on demand, also in terms of quality. And tensions with trading partners have been reduced. However, farm supplements still lead indirectly to unfair competition, in the sense that they made it possible – without massive protests from farmers – for the EU to lower prices for agricultural commodities and make them more competitive.

Economists sometimes give the impression that they are still trying to win the previous battle, which primarily involved the global triumph of the free market. A recent report from the Rabobank, *Sustainability and security of the global food supply chain* (2010), does pay attention to instability caused by climate change, water scarcity, etc., but not to geopolitical risks. Nevertheless, it did express concern that: "..current national agricultural policies and the current world trade rules may not be adequate to prevent [..] a crisis in the future." This is followed by a plea for "Improving the international mechanisms for preventing and/or managing sudden extraordinary food price spikes..." Recently, the government has also paid more attention to geopolitics. Based on the *Nationale Risicobeoordeling 2010* [National Risk Assessment 2010], the government wants to "invest more in the issues of cyber-security and international threats to national security, including shifting power relations (economic or otherwise) and the effects of geopolitics on energy security, resource security and food security". And: "Resources for industry and energy originate in part from unstable regions in the world. As a result, mutual economic dependence, besides having economic advantages, also has disadvantages". *Brief van de Minister van Veiligheid en Justitie over Nationale Veiligheid*. [Letter from the Minister of Security and Justice about National Security] *Tweede Kamer, vergaderjaar 2010-2011, 30 821, nr. 12.*

EU Agricultural Policy

Although the market is – and will remain – central to European food security, there are three good reasons for government intervention:

- making the system – especially the livestock, meat and dairy sectors – *less vulnerable* to physical calamities and the whims of geopolitics;
- safeguarding the access of *vulnerable population groups* – especially in the cities – to dairy products and meat;
- preventing European companies from shifting the consequences of calamities *to food-importing developing countries.*

Since 1984, the EU has reformed its agricultural policy in stages, with good reason and with some success (Box 6.3). But the most recent reform has significant disadvantages from the perspective of stability. Two buffers (stocks and set-aside land) have been relinquished, and intervention has been reduced to a safety net. This incurs three risks:

- The European agriculture and food system has become *more vulnerable* for internal and external physical calamities and the whims of geopolitics. Scarcity and price spikes can occur more rapidly. [136]
- *More severe price fluctuations.* It will no longer be possible to dampen price peaks, both for the industry and for consumers.[137]
- In case of scarcity, the trade will increase grain imports and reduce exports more quickly; as a result, the EU will shift the food security problem to *food-importing developing countries*.

In the following chapter, we will provide an overview of the options for the EU to reduce the vulnerability of the market for calamities and the whims of the world market and geopolitics.

[136] Recently, LTO Netherlands [Dutch Farmers Union] chair Albert Jan Maat called for the EU to establish strategic stockpiles of agricultural commodities. According to Maat, Europe is clinging to outmoded policy. "The EU is still working with interventions and quotas, while other countries are building stockpiles." If there is a shortage of a commodity on the market, countries such as China, Russia or India can corner the grain market. Then Europe will be left empty-handed. "The big players can spoil the market." Maat believes that the EU should consider instruments that would make the European market less vulnerable for extreme price fluctuations (*Nieuwe Oogst* 9 February 2011).

[137] Dairy farmers had a foretaste of this situation in 2009.

7. Options for reducing vulnerabilities

The main problem with food scarcity is often not the availability (the volume), but the access to affordable food for everyone (price and distribution).[138] In this chapter we refer to policy options for both aspects. We distinguish options for three phases of the "disaster cycle":

- Prevention (reducing the likelihood and magnitude of the calamity)
- Preparedness and Response
- Recovery.

Preventive options for a collapse of soya imports

The EU has at least seven preventive options to minimise the likelihood of a collapse of soya imports and/or minimise the resulting shortages of animal feed.

Option 1. Conclude trade agreements

The EU can reduce the likelihood of a collapse of soya imports by investing in good and stable trade relations with Argentina and Brazil, including trade agreements.[139] The ongoing negotiations with the Mercosur countries could lead to this objective. Trade agreements can reduce the likelihood that imports will collapse, but they do not offer supply security. This is because:

- They offer trading partners market access to the EU, but no supply security, because trade is still a matter for private companies.
- Chinese state-owned companies are already attempting to conclude long-term contracts.
- In times of crisis, exporters will prefer to do business with the companies that offer the highest price. If China is faced with acute shortages and high domestic prices and fears social unrest, state-owned companies will be prepared to pay extremely high prices for commodities on the world market.
- Argentina and Brazil can be persuaded with compensatory measures. For example, China – unlike the EU – can offer in exchange a vital commodity like phosphate, which Argentina and Brazil will increasingly need for the development of their agriculture.
- If the market becomes extremely tight, Argentina and Brazil could suspend the trade agreement.

This option can even make the EU more vulnerable because it can lead to even more dependence on third countries.

Option 2. Risk diversification in the soya supply

One preventive option with respect to the collapse of soya imports is the diversification of the import risks. This can be done by spreading soya imports more evenly between countries and regions. In more specific terms, this means purchasing less soya from Brazil (good for 46% of

[138] The FAO (2006) uses the following definition: "*Food security exists when all people at all times have physical access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.*"

[139] Trade agreements are a priority area of the Strategic Plan for Commodities, recently published by the European Commission.
Source: http://www.acp-eutrade.org/library/files/EC_EN_020211_EC_Communication%20on%20commodity%20markets%20and%20raw%20materials.pdf

EU imports in 2008) and Argentina (38%), and more from North America (10%).[140] This may require a further relaxation of EU policy towards GMOs, which now only permits the import of soya products that are virtually free of banned GMOs.[141] Moreover, soya from the USA could not immediately replace soya from South America because the growing seasons are six months apart.

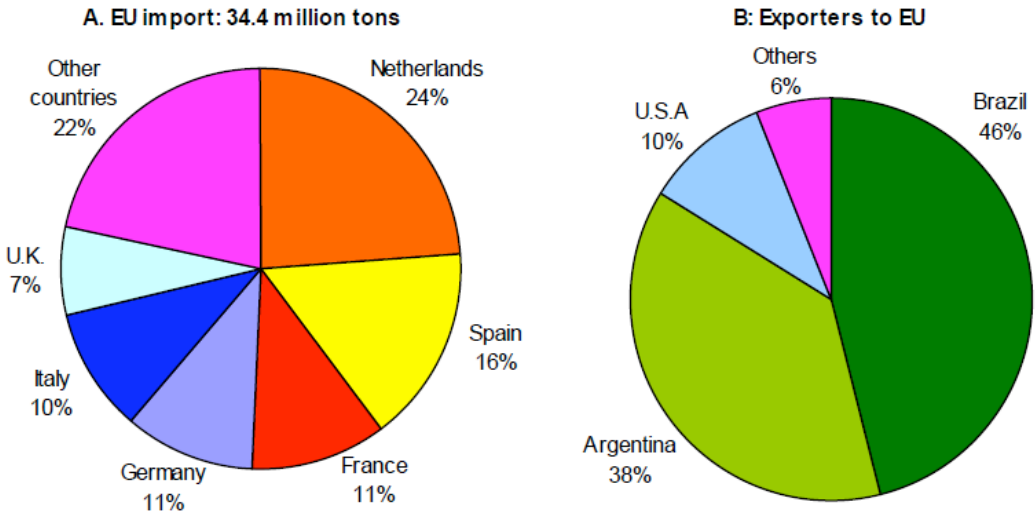

Figure 7.1 Share of EU Member States in imports of soya products in 2008 and shares of exporting countries (soybean meal and soybeans expressed in soybean meal equivalents). Source: Product Board MVO 2009. *Factsheet soy 2009*.

Option 3. Acquisition of farmland overseas

In the Dutch feed trade there are plans to secure supplies from overseas by participating in acquisition (purchase or lease) of farmland overseas, especially in South America and Africa. These acquisitions are often referred to as *international land deals*, but critics prefer to use the term *land grabbing* (Box 7.1).[142] With this strategy, the trade is aiming to stabilise prices.

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[140] Source: http://www.mvo.nl/Portals/0/statistiek/nieuws/2009/MVO_Factsheet_Soy_2009.pdf

[141] In 2008, there was an impending shortage of soya due to crop failures in South America, combined with the restrictive GMO policy. The European Commission responded to this situation by accelerating the admission procedure for Roundup Ready 2 soya. This made it possible to import soya from the USA.
Sources: http://www.gmo-compass.org/eng/news/407.eu_commission_genetically_ modified_soybean _ authorised.html
And : http://www.thecattlesite.com/news/25284/fasttrack-approval-more-effective-than-gm-debate.
The European Commission has proposed to relax the zero-tolerance policy on imports of feeds contaminated with GMOs that are not approved in the EU by raising the threshold from 0.0% to 0.1%. This seems to be a small difference, but it means that soya exporters would run a significantly lower risk that a shipment would be rejected.

[142] In the Netherlands, the Rabogroep established Rabo FARM (Food & Agri Real-assets Management) for investments in overseas agriculture: “to initiate funds for investment into primary agriculture production -- from farmland and water rights to crop and livestock production – around the world. Rabo FARM intends to diversify its investment geographically and among crop and animal production "to take advantage of complementary growing seasons and to spread the inherent risk of adverse weather, seasonality and macroeconomic fluctuations." It will also focus on large-scale production. In April 2009, Rabo FARM bought 70% of Primary Investment Management (PIM), which will now handle Rabo FARM's farmland acquisitions for Europe. PIM operates the €400 million Kamparo European Farmland Fund I, which will now be renamed the Rabo FARM Europe Fund. This fund, which focuses on the acquisition and operation of farms in Europe, is Rabo FARM's first farmland fund.” Source: http://www.grain.org/m/?id=266

This could be more effective than relying on free trade, because the WTO offers few possibilities for price stabilisation via tariffs. Traders also want to safeguard imports and insure against a possible powerplay by state-owned companies.

However, it is questionable whether land grabbing can actually provide such guarantees. In case of scarcity, the feed commodities on the market may still go to the buyer who offers the highest price and the most attractive compensatory measures (such as building roads, oil pipelines or telephone networks, as China is doing) or who can exert the greatest political pressure. Moreover, a number of projects (in Madagascar, Indonesia and elsewhere) have already been cancelled due to mass protests from the local population. In addition, land grabbing would have no benefit if imports were halted due to port blockades.

Option 4. Promote production of other protein crops

A more fundamental preventive option is where the EU becomes less dependent on soya imports by growing more protein-rich crops itself. Good candidates for such crops are field peas (for pigs and chickens) and lupin and field beans (for cattle). Another possibility is offered by oilseeds that yield protein as a by-product, such as rapeseed and sunflower seed. Producing more oilseeds would also help to reduce the dependence of the EU on imports of vegetable oil. Both possibilities would also comply with the continuing social and ecological criticism of soya production in South America (Box 7.1).

To give an impression of the required acreage: assume that the EU replaced 50% of its soya imports with European protein crops; that would require 15 million ha. That is equivalent to 7.5 times the entire agricultural acreage in the Netherlands.

How can the production of protein crops be promoted? An indirect – but effective – strategy is to impose an *import tariff* on plant protein. This would lead to a price increase for plant protein, which in turn would be a powerful stimulus for production and breeding. It is still unclear how high this tariff should be. Estimates range from 20% according to the NAV (Dutch Arable Farming Union)[143] to 80% according to CLM.[144]

Of course, an import tariff would increase the costs of feed, in any case over the short term. On the other hand, it would also reduce risks. Moreover, the costs of European-grown protein crops and oil seeds could fall significantly over the long term.

Another objection to an import tariff – certainly to a high tariff – is that it could lead to trade conflicts. This certainly applies to the "consolidated" agreements about oilseeds, which go back to 1992. As a result of these agreements, the EU would be required to offer exporting countries (especially Argentina, Brazil and the USA) compensation in the form of more market access for other agricultural products, such as sorghum, dairy products and meat.[145] Another consideration is that the market for oilseeds and the agreements that were made about this market in 1992 have already been thwarted by the growing trade flows of proteins that have become available as by-products from the production of biofuels.

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[143] http://www.nav.nl/2009/02/nav-pleit-voor-masterplan-plantaardig-eiwit/

[144] Based on the additional costs of soya-free animal feed referred to in: C. Rougoor, G. Hemke, E. Elferink & F. van der Schans 2009. *Melkvee- en varkenshouderij zonder soja* [Dairy and pig farming without soya.] CLM and Hemke Nutriconsult, internal report.

[145] For sorghum, the EU imposes a variable import tariff that fluctuates depending on the world market price. During the period 1961-2008, imports fluctuated between 0.5 and 4 million tonnes, with a peak in the mid-1970s and 2008. According to FAOSTAT, in 2008, 6.5 Mt sorghum was produced, the majority in the USA (12.0 Mt), and less in Argentina and Brazil (respectively 2.9 and 2.0 Mt). Sorghum is used for food (such as couscous), feed and to produce alcoholic beverages.

Box 7.1 Debate on sustainable soya production in South America

Soya production South America has been criticised for decades due to its ecological and social impacts. The ecological criticism focuses primarily on the destruction of forests and *cerrados* in Argentina and Brazil to create soya plantations for feed and for vegetable oil.

Since 2006, the Round Table on Responsible Soy (RTRS) has worked on a standard for "sustainably grown soya". The members of the RTRS include Latin American soya growers and processors, multinational enterprises (including Bayer, Cargill, Monsanto, BP and Shell), sector organisations (primarily European companies) and NGOs (including the World Wildlife Fund and Solidaridad). The RTRS standard was established in 2010; it stands for better agricultural production, good working conditions, respectful treatment of local communities, environmental protection and conservation of biodiversity.

The tension is intense. For some producers, the standard is so high that they have left the organisation. In contrast, for some NGOs the standard is so *low* that they have also left the organisation and have initiated a boycott. The criticism focuses on the following topics:

- approving the "responsible" label for GMO soya;
- the fear that the expansion of soya monoculture will continue at the cost of small farmers and ecosystems, including forests;
- the large-scale use of herbicides, which could be hazardous to public health and can generate resistant weeds.

Time will show what the effect of the Round Table will be.

Sources:

van Berkum, S. & P. Bindraban 2008. Towards sustainable soy – An assessment of opportunities and risks for soybean production based on a case study in Brazil. LEI Wageningen UR, Den Haag.

van der Bijl, G. [Solidaridad] in an e-mail, 13 April 2011.

Holland, N. [Corporate Europe Observatory] 2011. Nieuw 'verantwoord' soja-label is consumentenbedrog. [New label for "responsible" soya misleads consumers]. agd 10 March 2011.

Response of the State Secretary of Economic Affairs, Agriculture and Innovation, also on behalf of the Ministry of Foreign Affairs, to the Second Chamber of Parliament, regarding the letters objecting to the support of the Dutch government for the RTRS. Kamerbrief | 03-03-2011 | EL&I.

http://www.gmfreeze.org/uploads/13_reasons_rtrs_final.pdf

http://www.vilt.be/RTRS_is_eerste_goede_stap_in_verduurzamen_sojaketen

Of course, it is also possible to grow protein crops without an import tariff, but for the time being this can hardly be competitive. Therefore direct incentives are provided with *production subsidies*. Such subsidies are as old as the CAP itself, and were continued during the reform of 2003. At that time, the subsidies were partly included in the farm payment programme and partly converted into a special support payment of €55.60 per ha. On top of this, the Member States are allowed to provide additional supplements for specific crops, including protein crops. France, Poland, Finland and Spain are currently paying such supplements to their farmers.

Nevertheless, this policy was unable to prevent the decline in total acreage of protein crops, especially field peas, from approximately 1.3 million ha in 2003 to less than 900,000 ha in 2008.[146] The acreage of protein crops in the EU continues to decline steeply every year due to imports of cheap soya and the relatively high prices for grain.[147] This trend has accelerated since Monsanto announced new varieties for the 2009 growing season. The second generation of herbicide resistant GM crops has approximately 10% higher yield than the first

[146] LMC 2009. *Evaluation of measures applied under the Common Agricultural Policy to the protein crop sector. Main report.*

[147] In 2006, Romania had 140,000 ha of soya, but after joining the EU, soya acreage fell to 44,000 ha in 2010 (*agd* 27 January 2011).

generation.[148] The increased production of biofuels, with their cheap, protein-rich by-products, may also have played a role.

However, France has recently achieved a minor success. The announcement of new support measures led in 2010 to a nearly 50% expansion of the acreage, to 305,000 ha.[149] A sharp rise in these subsidies is not compatible with the decoupling policy to which the EU has committed itself in the WTO negotiations.[150] More compatible are *subsidies for innovation* in

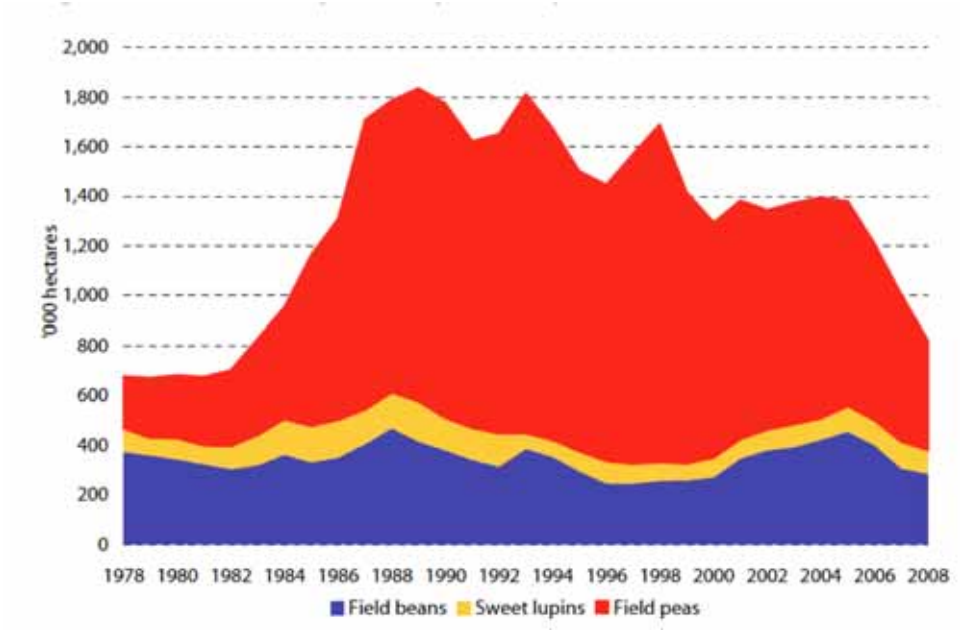

Figure 7.2 The acreage of protein crops (beans, lupin and peas) in countries that are now part of the EU-27.
Source:http://ec.europa.eu/agriculture/eval/reports/protein_crops/fulltext_en.pdf

breeding and selection and production systems. These innovation subsidies are sorely needed because virtually no production and variety research has been conducted on crops like field peas during the last 10 to 15 years. But such subsidies are slow to impact the market.[151]

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[148] *Kiemkracht, concepten en innovatieagenda. Het eerste jaar.* [Kiemkracht foundation, concepts and innovation agenda. The first year] *http://www.productschapakkerbouw.nl/files/CT_31102008_bijlage_6d.pdf*

[149] LMC International 2009. *Evaluatie van maatregelen onder het landbouwbeleid voor de sector eiwithoudende gewassen* [Evaluation of measures in agricultural policy for the protein crops sector]. http://ec.europa.eu/agriculture/eval/reports/protein_crops/syn_sum_nl.pdf

[150] Another remarkable event is the recent policy change in Japan. Of all industrialised countries, Japan has the lowest level of agricultural self-sufficiency (40%). Due to the recent increase in the demand for wheat and maize, from China and elsewhere, the costs of imports have risen. This is why the Japanese government has decided to promote the domestic production of rice, wheat and five other crops with additional subsidies. A. Takada & Y. Song. *Japan to slash stockpiles of U.S. corn as rice production grows. Bloomberg Businessweek* 29 September 2010. http://www.businessweek.com/news/2010-09-29/japan-to-slash-stockpiles-of-u-s-corn-as-rice-production-grows.html. The degree of self-sufficiency in Japan will depend partly on the magnitude of the nuclear disaster of March 2011 and the level of nuclear contamination of soil and crops.

[151] In the agribusiness sector (in the Netherlands this includes the seed companies Limagrain and Agerland) there is interest in the breeding and selection of lupin, field beans and soya. R. van Haren, director of Stichting Kiemkracht, has high expectations for the new crop *tarwi*, also known as Andean lupin. Like soya, this crop contains both oil and protein, but in even higher proportions. However, additional breeding and

Box 7.2 How the EU traded away the production of oil seeds

The fact that the acreage of oilseeds in the EU remained limited in the 1990s can be attributed to the history of trade politics. In 1962, the EU concluded an agreement with the USA as part of the Dillon Round of GATT. In this agreement, the EU retained high protection levels for its internal grain production in exchange for low or zero import tariffs on soya. The American Department of Agriculture looks back on this agreement as follows: "The European Union is self-sufficient in vegetable oil production, but its protein deficit still makes it the world's largest importer of soybean meal and second-largest importer of soybeans. Since the 1960s, EU imports of soybeans swelled because of rapid growth in livestock production and tariff-free concessions signed in trade agreements. In the 1970s and 1980s, soybean consumption slowed as EU agricultural policies subsidized a large expansion in domestically produced rapeseed and sunflowerseed, eroding the market for oilseed imports. The U.S. Government challenged these subsidies and, in 1992, the EU committed to a number of reforms of its Common Agricultural Policy (CAP), including area limits on the planting of oilseeds."

In the GATT negotiations, the USA found the EU oilseed policy with hectarage payments for producers to be unacceptable. At the beginning of the 1990s, the US threatened to impose punitive tariffs on a package of imported food products from the EU worth $1 billion. Under this pressure, the EU and the USA concluded the so-called Blair House Agreement in 1992. Besides provisions about internal support, export support, market access and veterinary and phytosanitary regulations, there was an agreement about oilseeds. In this agreement, the EU limited its support to the production of oilseeds (soybeans, rapeseed and sunflower seed) to a maximum area of 5.13 million ha (including 10% land set-aside) – the average acreage during the period 1989-1991. If this limit is exceeded, a proportional reduction of the payment would be applied. For its part, the USA agreed that the acreage payments for oilseeds, grain and protein crops in the EU would fall into the so-called *blue box* of GATT. This meant that these payments would be excluded for the time being from the obligation to further reduce support.

The Blair House Agreement was never formally dissolved, but since the decoupling of support in 2003, there has essentially been no limitation on production of oil seeds in the EU. In the meantime, however, the EU has implemented a biofuel blending mandate. This has also given the breeding and selection of oilseeds a new impulse. During the next decade the European Commission expects a further increase in production as a result of a moderate increase in productivity and a small growth in the acreage. But this will not necessarily result in an improvement in the usability of the protein by-product as animal feed.

Sources:

European Commission 2010. Prospects for agricultural markets and income in the EU 2010-2020. http://ec.europa.eu/agriculture/publi/caprep/prospects2010/fullrep_en.pdf

van Berkum, S. & P. Bindraban 2008. Towards sustainable soy – An assessment of opportunities and risks for soybean production based on a case study in Brazil. LEI Wageningen UR, Den Haag

http://www.ers.usda.gov/Briefing/SoybeansOilcrops/trade.htm

There have also been arguments in favour of specific *quality and sales incentives.* The CAP offers this possibility.[152] Nevertheless, the question remains whether such incentives are not an unequal battle against increasing imports of cheap soybean meal and the increasing stream of by-products from biofuels – even more so because the suppliers of these products can always decide to lower their prices.[153]

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selection is needed for this to become a competitive crop. See: J. Engwerda. *Alleen nieuw eiwitgewas kan import soja vervangen.* [Only a new protein crop can replace imported soya] *Agrarisch Dagblad* 13 March 2010. The crop is relatively easy to grow and is environmentally benign. It remains unclear whether dairy farmers and/or arable farmers will begin including lupin (and other protein crops) in their crop rotation plans.

[152] According to LMC International (*op. cit.*) Canada – where the growing conditions for protein crops are relatively beneficial – has been successful with sales incentives.

[153] J. Engwerda. *Groei eiwitgewassen komt niet zo maar van de grond.* [Growth in the production of protein crops doesn't come easily] *Agrarisch Dagblad* 4 December 2009.

Domestic production also has a downside. Although it makes the EU less vulnerable for geopolitics and crop failures overseas, the EU becomes more vulnerable for crop failures[154] in Europe. On the other hand, smaller emergency stocks are required with domestic production than with imports. After all, the annual production becomes available during a short period, while the consumption is spread across the entire year. As a result, stocks will be available almost all year.

For the rest, the choice between European production or import is a matter of weighing costs and risks. As we give more weight to geopolitical risks, the choice for European production becomes more attractive.

Option 5. Promoting the production of energy/protein crops

A variant that can be implemented more quickly is promoting the production of energy crops. Besides supplying sugars (for ethanol) or vegetable oil (for biodiesel) these crops also supply protein that is potentially usable as animal feed. The EU is already promoting energy crops by means of the mandatory biofuel blending mandate for road traffic fuels, which will increase to 10% in 2020. This policy can certainly contribute to the protein supply of the EU, to the extent that the biofuels are produced in the EU itself. In 2008 this percentage was about 80% for biodiesel; the rest was imported from the USA. Today, this percentage will be even higher as a result of an import tariff imposed in 2009.[155] One option is mandate a minimum percentage of between 80% at 100% for the European share (of the intended 10% biofuels in 2020).[156] Jansen *et al.* used their indicative model to calculate the following:

- With 10% blending, so much protein would become available as a by-product that nearly all soya imports for animal feed could become unnecessary.
- As a result, feed supplies, animal production and product prices would become virtually insensitive to a collapse of soya imports.
- Of course, there would also be greater susceptibility to crop failures within the EU itself.
- This would be especially problematic in case of a double calamity, with both a crop failure and a collapse of soya imports. After all, in that case imports could not be used as a buffer. As a result, egg prices would skyrocket to 240% in two years. But the prices for pork and chicken would remain lower than in the scenario without biofuels.
- The production and prices of eggs, pork and chicken respond more slowly than in the scenario without biofuels, because if protein crops are produced in the EU, larger stocks will be maintained year round than in the case of imports. This "time buffer" allows the EU more time to take measures against scarcity.

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[154] We use the term "crop failure" in a broad sense, including sharp drops in production on grassland.

[155] There is not yet a mandatory minimum percentage of European raw materials in biofuels. However, since 12 July 2009, the EU has imposed tariffs on biodiesel from the USA because it claims it is unfairly subsidised and dumped on the European market at low prices. This tariff can be as high as €237 per tonne of biodiesel. These measures were to be in effect for five years. Source: *Vlaams Infocentrum voor Land- en Tuinbouw* [Flemish Centre for Agriculture and Horticulture] http://www.vilt.be/EU_onderzoekt_illegale_import_biodiesel_door_VS. The USA is actually subsidising the production of biofuels in three ways: a blending mandate, an import tariff on bio-ethanol and a subsidy for fuel producers. Some US senators have called for abolishing the $6 billion subsidy (*agd* 11 March 2011). This would make it more difficult for the EU to maintain its own import tariff.

[156] This leads to a fundamental issue: if we want to make the EU self-sufficient in protein-rich animal feed, then we can do this with a blending mandate for European biofuels, but also with a blending mandate for European *protein commodities* in feed. The latter measure would have a more immediate effect and would have a lower risk of conflicts with other aims.

Box 7.3 Autarky, integration in the world market or a third way?

When it comes to food security, in broad terms two extreme positions are possible:

1. 100% autarky: self-sufficiency in all basic foodstuffs. This requires protecting the food market by means of prohibitively high import thresholds for food and for the means of production such as fertiliser, feed and energy. If internal food prices are higher than world market prices, then export will only be possible with subsidy. However, this would quickly lead to conflicts with other exporting countries, so exports will remain limited. The Netherlands experienced virtually autarkic conditions during the final years of World War I (see Box 4.6 and Box 6.2).
2. 100% integration in the world market. This will happen by itself if we eliminate all import and export barriers. In that case, the only products that will be produced domestically (and exported) are those with a competitive advantage, for example in terms of price/quality ratio, image or logistics. Everything else will be imported.

Both positions have advantages as well as risks in terms of vulnerability for calamities.

Autarky makes a country (or a bloc of countries such as the EU) relatively invulnerable for geopolitical risks and for natural disasters overseas.[157] The downside is the *greater* vulnerability for *internal* calamities. This requires emergency measures such as stocks and land set-aside. The stocks must be even larger if the infrastructure for foreign trade is lacking. In addition, prices will be relatively high. Another disadvantage is that the country (or the EU) will have little to offer to third countries, and consequently can ask very little in return.

The other extreme, full integration in the world market, results in the mirror image: less vulnerability for internal calamities (which can be compensated by additional import) but *greater* vulnerability for *external* calamities or geopolitical crises. The production system will also be less robust: while a calamity within a regional market can lead to higher prices – which sweeten the medicine for producers and make rapid recovery possible – this remedy is not available on the world market. Therefore, relatively large emergency facilities will be required to prevent mass bankruptcies.

Therefore, neither of the extremes is very attractive, and a middle road appears to be a more viable option. In that case, smaller emergency facilities will be sufficient. In view of the ecological advantages of production in the region and the increasing geopolitical risks, much can be said for a high degree of self-sufficiency for all basic commodities, but this should be combined with limited level of import and export. If nothing else, this would keep the infrastructure viable, along with the buffer. In this case the risks would be smaller and more widely spread, and there would be less dependence on the whims of the world market and geopolitics. This option requires a certain level of market protection, at least for products that cannot compete very well on the world market, such as plant proteins.

An interesting research question is: where is the optimum? At which level of self-sufficiency, import and export are the risks and the costs the lowest?

However, there are still constraints:

- The image of meat, dairy products and eggs could be damaged if livestock are largely fed with a by-product of *non-food* production, in this case energy.
- The quality of the proteins, especially the proteins that are generated as by-products from bio-ethanol production from grain and sugar, is not always adequate for animal feed and is not always constant.
- The fuel blending mandate also permits second generation biofuels to be used. The production of these fuels will yield much less protein as a by-product.
- An extreme demand such as 100% European-grown commodities in biofuels can lead to a conflict in the WTO with exporting countries such as Brazil and the USA.

[157] For that matter, strict autarky over the long term for the EU is an illusion. This is because the EU has few phosphate resources. The impact of this situation will probably be felt only after a few decades, when phosphate becomes scarce and expensive worldwide. However, it is conceivable that the phosphate price will already start rising during the next decade, for example if the biggest phosphate producers Morocco and China formed a cartel.

- In addition, there are environmental advantages and disadvantages. It is not yet possible to make a balanced evaluation (Box 7.4).

Without such research, the desirability of this option is unclear.[158]

Box 7.4 Energy crops and the environment

A frequently voiced objection to energy crops is that they may compete with food production. The first generation of biofuels has two obvious problems. First, most energy crops save little energy on balance and therefore contribute little to energy security. Second, they contribute little to a reduction in greenhouse gases – or perhaps even lead to increased emissions as a result of additional deforestation or conversion of grassland (domestically or elsewhere). This situation will hopefully improve in the future, because the EU has established a 35% emission reduction compared with fossil fuels as a minimum requirement [159], and this minimum will be increased to 50% in 2017.

A more difficult issue is the *indirect* effect of energy crops on land use. For example, if energy crops are grown instead of food crops, then additional deforestation could occur in order to grow more food elsewhere. Or, deforestation takes place in order to grow food, and after several years an energy crop is grown on this land anyway. This indirect land use is not yet accounted for (at least not adequately) in the current private Round Table on Sustainable Biofuels and in the various certification systems. Recently, the European Commission presented a report on indirect effects. The scope is limited to indirect effects on emissions of greenhouse gases; the indirect effects on biodiversity are not included (although there is certainly a relationship in the case of deforestation and draining of peatlands).

There appear to be two dominant opinions on how to deal with indirect effects: businesses urge the creation of additional generic policy to protect relevant nature reserves, while NGOs want to account for the additional emissions in the emission calculations. A definitive proposal, including regulations, will appear in July 2011. ISO[160] in principle already includes social and indirect effects; social effects are addressed fully, but indirect effects are not entirely accounted for. ISO has appointed a task force to investigate how these effects can be included, which will be a long process. According to the *Stichting Natuur en Milieu* [Netherlands Society for Nature and Environment], if indirect land-use in the tropics is taken seriously, it is likely that only ethanol from Brazilian cane sugar will be certified.

But there is yet another issue: if the production also yields substantial quantities of protein-rich animal feed as a by-product, should we evaluate the emissions differently? After all, the crop will then not only replace fossil fuels, but also the production of protein crops, with their corresponding energy use and greenhouse gas emissions. On the other hand, if carbon-rich natural habitats (forest, savannah, grassland) are cleared to produce the energy crop, then additional carbon will be released. In the EU, such clearance will probably be unnecessary; due to the ongoing increase in agricultural productivity and the stagnation of demand, there is more and more "surplus" farmland in the EU.[161] Current production of energy crops in the EU also does not impinge on food production and food security.

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[158] An interesting idea in this context is the statement of the American ecologist David Tilman that natural grassland in the USA can supply more bioenergy and can sequester more carbon than grain (in the form of ethanol) and soya (in the form of biodiesel). See: J. Braakman 2010. *Gevarieerd gras, het gouden gewas.* [Varied grass, the golden crop] *Agrarisch Dagblad* 24 September 2010. The scientific evidence can be found in sources such as: P.R. Adler, M.A. Sanderson, P.J. Weimer & K.P. Vogel 2009. "Plant species composition and biofuel yields of conservation grasslands." *Ecol. Appl.* 19: 2202-09. This proposition would not apply to the Netherlands with its high per hectare productivity, but could apply to some other European regions. The highest potential is held by so-called C4 grasses, which include American switchgrass (*Panicum virgatum*).

[159] See Article 17 of Directive 2009/28/EG.

[160] ISO = International Organization for Standardization.

[161] For biofuels from overseas as well, clearance of natural habitats is not always necessary. The European Commission imposes the following condition "...biofuels should not be made from raw materials from tropical forests or recently deforested areas, drained peatland, wetland or highly biodiverse areas." However, due to displacement effects on the market, clearance of natural habitats can still be promoted indirectly. See: http://www.greencarcongress.com/2010/06/ecsust-20100610.html

Box 7.4 *continued*

The argument remains that the production of biofuels places additional demands on finite natural resources, including phosphate and supplies of freshwater, which are becoming increasingly scarce regionally. Although phosphate can be recovered from residues of fermentation or combustion and can be recycled in fertiliser or animal feed – this takes place, for example, with phosphate from extracted rapeseed meal – during the production of energy crops some phosphate is always lost. Another environmental objection to the combined production of energy and protein is that it can be an obstacle to the widely supported transition from first generation biofuels to the second and third generations. These newer generations make use of organic residues, woody crops and algae. For that matter, with woody crops little or no protein is generated as a by-product. These crops have positive scores regarding energy and climate, but negative scores regarding the yield of protein by-products .

Additional sustainability assessments are required for a balanced evaluation, where comparisons are made between complete *feed and energy chains and systems*, not just comparisons between individual *crops*.

Option 6. Selectively restore the use of meat-and-bone meal in animal feed

An entirely different option for making the EU more self-sufficient in protein is to selectively restore the use of meat-and-bone meal in animal feed. During the BSE crisis in 2000, the EU decided to impose a total ban on the use of this by-product in animal feed. Because it was an important source of protein for the livestock sector, the feed industry had to search for a replacement. This replacement was found in soya from South America. According to FAOSTAT, between 1999 and 2007, soya imports in the EU increased by nearly 50% to approximately 32 million tonnes per year. According to Elferink *et al.* (2007)[162] the total quantity of recycled meat-and-bone meal is equivalent to a soya production area of approximately 10 million ha.[163] Most of this production takes place in South America.

The agriculture sector and the environmental movement have called for the total ban to be replaced with a selective ban. In February 2011, the European Commission proposed to maintain the ban on meat-and-bone meal from cattle in animal feed, but to permit meat-and-bone meal from poultry to be used in pig feed, and meat-and-bone meal from pigs to be used in poultry feed.[164] This appears to be responsible if reliable tests are available and if enforcement is strict. These tests are expected to become available in the near future.[165]

Such a policy would make it possible to reduce soya imports by about 4 to 11% (Box 7.7). This would make the EU less vulnerable for a collapse of soya imports. An additional advantage of this option is that rain forest and *cerrado* in South America would be saved, which would benefit biodiversity and climate. This option does increase the risk of new outbreaks of BSE or other prion diseases, but this is something that the EU itself can control.

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[162] Elferink, E.V., S. Nonhebel & A.J.M. Schoot Uiterkamp 2007. *Does the Amazon suffer from BSE Prevention?* Agriculture, Ecosystems and Environment 120: 467-69.

[163] Based on economic allocation, approximately 1/3 of this total must be attributed to soybean oil. See: H. Blonk, C. Alvarado & A. de Schryver 2007. *Milieuanalyse vleesproducten*. [Environmental analysis of meat products] Pre Consultants and Blonk Milieuadvies.

[164] The proposal was discussed in the Agriculture and Fisheries Council. Agenda item see: http://register.consilium.europa.eu/pdf/en/11/st06/st06619.en11.pdf. Provisional report: Council of the European Union (21 February 2011) *Press Release 3070th Council meeting. Agriculture and Fisheries.* Provisional version. Presse 30. PR CO 7. Brussels. http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/agricult/119436.pdf

[165] *Versoepeling Europees totaalverbod diermeel.* [Relaxation of total European ban on meat-and-bone meal] *Agrarisch Dagblad* 15 June 2010. See also: http://www.kennislink.nl/publicaties/test-maakt-hergebruik-diermeel-mogelijk

Box 7.5 Wheat yeast concentrate and DDGS as new protein sources

During the fermentation of grain to produce ethanol, protein-rich yeast is produced as a by-product. This yeast concentrate is used for animal feed. To improve the quality, it is also processed and enriched to become DDGS (Dry Distilled Grain and Solubles). This enrichment consists, among other things, of adding the amino acid lysine in order to produce high quality animal feed. DDGS it is not yet suitable for human consumption.
In the USA, large amounts of DDGS are already being produced, with less in the EU (between 6 and 19 million tonnes). But the volume in the EU is growing, and additional growth is expected, especially due to the blending mandate for biofuels, which will increase to 10% in 2020 in the EU (already 15% in the USA).[166]
DDGS can become a serious competitor for soybean meal from overseas and for European products and by-products:

- residues from the food industry
- extracted rapeseed meal (a by-product of biodiesel production)
- protein crops (for which the production acreage has fallen dramatically in recent decades).

No guidelines are yet available for substituting imported soya and protein crops. The acreage of protein crops (especially field peas) has certainly declined, but that appears to be primarily the result of competition from imported soybean meal.

The Spanish company Abengoa Bioenergia is now building an ethanol factory near the port of Rotterdam. The factory is expected to operate largely on imported wheat and maize from overseas. The current ethanol factories in Europe – primarily located in Hungary, France, the UK, Germany and Spain – operate largely on European energy crops (wheat, maize and barley). Imports of DDGS based on maize from the USA declined temporarily in 2005-07 because the GM variant DAS-59122 was not yet approved in the EU.

DDGS from European energy crops offers several potential advantages:

- It improves the energy and climate benefits of biofuels (which are still low).
- To the extent it replaces soya imports, it can reduce dependence on imports.
- It can help reduce deforestation, with the corresponding loss of biodiversity and increased emissions of greenhouse gases in South America.

There are also disadvantages:

- DDGS can displace the European protein crops, and consequently lead to additional dependence on imports.[167]
- If there is rapid growth in grain production, the crop rotation plans in the EU will become more one-sided, with less grain and fewer oilseeds and protein crops, resulting in increased pressure from soil-borne diseases.

Regarding DDGS from grain produced overseas: by definition this creates a new dependence on imports in the areas of bioenergy and protein, besides the possible displacement of natural habitats and food crops. However, it can spread the risks of imports. For example, if the soya originates from South America and the energy crops (such as grain or oilseeds) originate elsewhere, then DDGS would reduce the risk of a crop failure in South America. The same applies to the scenario where China buys up all the soya on the market. However, it is certainly possible that both the soya and grain would originate from South America, and then the risk spreading would be much less.

[166] The biofuel blending mandate in Brazil is now 25%, and some cars in that country can even operate on 100% ethanol. A. Dijkhuizen. *Wageningen werkt met Brazilië aan verbetering biobrandstof.* [Wageningen is working with Brazil on improved biofuel] *Agrarisch Dagblad* 13 March 2010. A remarkable recent development is that Brazil is now importing bio-ethanol from the USA so it can benefit more from the higher sugar prices (*agd* 4 March 2011). This means even higher transport and energy costs for American ethanol, which already has marginal energy and climate benefits.

[167] The NAV [Dutch Arable Farming Union] has warned about this risk. K. Hoekstra. *Biobrandstofbeleid moet veranderen* [Biofuel policy must change] *Agrarisch Dagblad* 11 April 2010.

Box 7.5 *continued*

Sources:
http://www.allaboutfeed.net/article-database/ethanol-production-and-its-co-products-in-europe-id1251.html
http://ec.europa.eu/agriculture/envir/gmo/economic_impactGMOs_en.pdf
S. Moesker. Bijproducten alcoholwinning ook interessant voor rund. [By-products from alcohol production are also interesting for cattle] *Agrarisch Dagblad* 6 May 2010.

Box 7.6 Flexible blending mandate for biofuels

LTO Nederland (Dutch Farmers Union) has launched a plan to use the biofuel blending mandate for road traffic fuels as a stabiliser for European grain prices. With low grain prices, it would be an obligatory to use more European grain and less imported bio-ethanol. This would support the European grain price. In the opposite situation, with high prices, the percentage of European grain would be reduced. This plan has been analysed by the Dutch Agricultural Economics Research Institute.[168,169]

The basic idea is interesting, but there are severe pitfalls in terms of trade politics. The proportion European grain in biofuels can be controlled by means of a mandatory minimum percentage or by means of a temporary import tariff on bio-ethanol. Both measures can be contested in the WTO by exporters of bio-ethanol, such as Brazil and the USA. And if the EU wants to maintain a high internal grain price with low world market prices by means of the blending mandate, then it must impose a temporary import tariff on grain. This measure could also be contested in the WTO by grain exporting trade partners. In that case, exporters would have to be offered compensation.

In the light of calamities, there are also pitfalls. During the production of bio-ethanol, protein is generated as a by-product. If that percentage varies, then the protein price could actually become *less* stable, and that would not help the EU to become more self-sufficient in plant protein.

The flexible blending mandate would therefore benefit the resilience of the EU with respect to drought, but not with respect to a collapse of soya imports.

Trading partners would not quickly object to this measure, but they could use it (or misuse it) to exclude European beef from their market, which the USA still continues to do anyway. This explains the caution with which the European Commission has approached any changes to this policy.

Option 7. Discourage meat consumption

From the demand side it is also possible to make the EU less vulnerable for a collapse of soya imports. This can be done by reducing meat consumption. The vulnerability of the EU for calamities is not a sufficient reason, but there are various other justifications to promote a diet with less meat. Broadly speaking, when compared with plant production, meat production results in less efficient use of materials and energy, requires a larger amount of land, creates more environmental pressure and causes greater emissions of greenhouse gases and more loss

[168] J.F.M. Helming, A. Pronk & G. Woltjer 2010. *Stabilisatie van graanmarkten door flexibel gebruik van graan voor bio-ethanol.* [Stabilisation of grain markets through flexible use of grain for bio-ethanol] LEI-DLO, Den Haag.

[169] Former member of Dutch parliament Harm-Evert Waalkens has called for the system to be used as a supplement to – not as a replacement for – the emergency grain stocks intended for periods of true scarcity (where the grain price is, for example, 3 times higher than the intervention price). The blending mandate would then help to prevent the EU from dumping subsidised surpluses on the world market. Intervention should first be used to purchase fresh stocks, and thereafter to prevent dumping. H.E. Waalkens 2010. *Eerst ijzeren voorraad dan bijmengplicht.* [First emergency stocks, then the blending mandate] *Agrarisch Dagblad* 11 May.

of biodiversity. There are also health justifications for reducing the current consumption of meat – especially beef – but not all nutritional experts agree.[170]

While per capita meat consumption elsewhere in the world has been rising sharply along with prosperity, in the EU it has risen only slightly in recent decades.[171] During the next decade, the European Commission expects another slight increase – especially of chicken consumption – of 0.3% per year, to 4% above the level in 2009,[172] but a reduction could still be possible. First of all, it is not inconceivable that the continuing debate about animal welfare and the recent emergence of resistant MRSA and ESBL bacteria will lead to slower growth, or even a decline, in the consumption of pork and chicken. Secondly, plant-based meat substitutes have been on the market for decades,[173] and attempts at further innovation are being made at many locations.[174] Even Vion, the largest meat packer in the EU, has been marketing products where animal proteins have been partly replaced with plant proteins.[175]

The EU and national governments could discourage meat consumption with various policy instruments, including regulation of advertising, public education campaigns, taxes on meat and subsidies for meat substitutes. The government could also have an impact through its own purchasing policy.

The problem is that it is virtually impossible for the government to control the eating behaviour of consumers. There is resistance against patronising by the government and against additional taxes on food. The most promising approach appears to be a voluntary or mandatory limitation of meat advertising – primarily advertising aimed at children. But achieving more than a gradual decrease does not appear to be feasible. Assuming that consumption could be successfully reduced by 1% per year, then in 10 years meat consumption would decline by 9.6%. According to the indicative model, this would be equivalent to a decline in soya imports of the same percentage. This difference would make the EU slightly less vulnerable for a collapse of soya imports.

Preventive options regarding crop failures in the EU

As we have seen above, the EU has at least 7 preventive options to make itself less vulnerable for a collapse of soya imports. However, there are fewer options to reduce vulnerability to a sudden decline in *internal* agricultural production. Nothing can be done to reduce the probability of extreme weather or a volcanic eruption, but it is possible to take measures against the introduction of plant diseases.
In general terms, there are only two preventive options:

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[170] See Health Council of the Netherlands 2006. *Advies Richtlijnen Gezonde Voeding 2006* [Advisory guidelines for healthy nutrition 2006].

[171] FAO 2009. *The state of feed and agriculture. Livestock in the balance.*

[172] European Commission 2010. *Prospects for agricultural markets and income in the EU 2010-2020.* http://ec.europa.eu/agriculture/publi/caprep/prospects2010/fullrep_en.pdf

[173] Many meat and dairy substitutes are based on soya. During a collapse of soya imports, these substitutes could also become costlier and scarcer. Consequently, they do not make the EU less vulnerable for a collapse of soya imports. For that matter, there is growing interest in meat substitutes made from European protein crops such as lupin.

[174] Notable research is being conducted by Remko Boom, Professor of Food Process Engineering at Wageningen University. His research is being co-financed by the Peas Foundation based on *crowd funding* (collecting funds from the general public). It focuses on proteins from soya, lupin, tarwi, wheat and yellow peas.

[175] *De Volkskrant* 23 June 2008.

Box 7.7 What percentage of soya imports can be replaced by meat-and-bone meal?

During the BSE crisis, the EU imposed a ban on processing slaughter waste into animal feed. As a compensation, the feed industry sharply increased soya imports, which took place at the cost of natural habitats in South America. The European Commission wants to relax that policy by the autumn of 2011: processing slaughter waste from cattle will continue to be banned, but slaughter waste from poultry can be used in pig feed, and the reverse. What percentage of the imported soya could then be replaced? Here is a rough estimate.

In 2009 the EU imported 23 million tonnes of soybean meal (from approximately 29 million tonnes of soybeans) + 13 million tonnes of soybeans, a total of approximately 42 million tonnes of soybean equivalent.

In the EU, 7.8 million tonnes of beef are produced annually, in addition to 21.5 million tonnes of pork and 7.5 million tonnes of chicken. Assuming that this proportion also applies to meat-and-bone meal, then 7.8/29 = 21% of the meal cannot be used by definition because it originates from cattle. Of the meal that could legally be used, 74% would then originate from pigs. This must be eaten by chickens. In principle, this appears to be possible because chickens require a great deal of protein and are usually given feed with the highest percentage of soya. The 25% of the meat-and-bone meal from poultry could easily be processed into pig feed. But for logistical, nutritional and financial reasons, the entire 80% will probably not be used. We estimate the percentage as a minimum of 25% and a maximum of 75%.

Assuming that 25% can be used; per year that is nearly 1 million tonnes of meat-and-bone meal. This is equal to 1,5 million tonnes of soybean equivalent, or 4% of the soya demand and EU imports. Assuming that 75% can be used, then 11% of the soya demand could be replaced. This amount would be higher if the EU also permitted meat-and-bone meal from cattle to be used in pig and chicken feed. But it wouldn't be that much higher, because this concerns only 20% of the total quantity of meal, and the protein requirements in pig and chicken feed will largely be filled by the other sources.

For that matter, there is also a disadvantage: the meat-and-bone meal used in feed can no longer be used as a biofuel. The blending mandate would then compel users to look for substitute biofuels. If these biofuels originate from overseas, then this again entails the risk that the production would be at the cost of natural habitats, and would generate additional CO_2 emissions. That risk is smaller if the biofuels originate from the EU, because the EU has more and more "surplus" farmland due to productivity improvements.[176] Moreover, in this case additional protein would become available as a by-product, and that could further reduce dependence on soya.

Option 1. Further integration in the world market

A liberal preventive option regarding the risk of crop failures in the EU is to continue in the direction of a free market: use the world market as a buffer, abolish all import barriers and allow a structurally greater percentage of animal feed to be imported from outside the EU.

[176] In South America, the acreage of soya is still expanding at the cost of natural habitats. According to the Round Table on Responsible Soy, no expansion is allowed in *native forest*, but this is permitted in other natural habitats. Wetlands and savannas in the *cerrado*, which have a very high intrinsic biodiversity, therefore continue to be vulnerable. However, an exception can be made for *priority areas for conservation*. According to *The Economist*, innovations in the *cerrado* have also made a sharp rise in productivity possible (http://www.economist.com/node/16886442). But it is still unclear if that will lead to less expansion into the *cerrado*. Brazilian agronomists argue that the productivity of both agriculture and cattle farming can be greatly improved, which will allow more rainforest to be saved. But there is not yet any national strategy in this regard. The rate of deforestation has declined sharply in recent years, but the agricultural lobby and the banks are still focusing on expanding the acreage. See: J. Tollefson 2010. The global farm. *Nature* 466: 554-557.

However, this strategy will be largely ineffective:

- Importing *roughage* is very expensive due to the relatively high transport costs; it is therefore unlikely to happen.
- Increasing the imports of *plant proteins* is risky because the EU already relies heavily on imports – of soya – in that segment.
- More imports of *grain* will not be needed anytime soon. The EU has been a net exporter of grain since 1980 (with a few exceptions such as 2007) and is expected to export even more. During the years to come, the European Commission expects a level of self-sufficiency in grain between 105% and 115%[177] This provides a buffer to reduce exports in case of crop failures in the EU, which will happen automatically due to market forces as soon as the internal price rises above the price on the world market.
- Additional imports also carry the risk of introducing plant diseases.
- All additional imports make the EU even more vulnerable for external calamities and the whims of the world market and geopolitics. If internal scarcity coincides with scarcity on the world market – as a result of a severe volcanic eruption or a sharp rise in the demand for biofuels – then the EU could no longer count on the continued import of commodities for feed.

But imports also allow the risks to be spread. It is therefore sensible to maintain a basic level of imports and keep the corresponding infrastructure intact.

Option 2. Intensify the policy to prevent the introduction of plant diseases

The EU has preventive policy against the introduction of contagious plant diseases, pests and weeds from outside its borders. That policy has certainly been helpful, but pests and diseases still periodically slip past the controls (for example, the corn rootworm was introduced in Europe in the 1990s) or are able to break resistance (for example stem rust in wheat in Africa). It is therefore worth considering where the gaps in the defences are located and how they can be closed.

Because there are so few preventive options against crop failures in the EU, it is even more important to pay attention to preparedness and response. There are many more options in these areas.

Preparedness and response to feed scarcity

Even if preventive measures are taken, shocks can continue to occur, so "shock absorbers" remain necessary. This applies especially to the first and second years of feed scarcity. The probability that a calamity (import collapse, drought or volcanic eruption) would last longer than two years is very low. If this does happen, then the impact will be less severe because the food chain, the consumer and the government will have adapted in the meantime. Due to the ongoing trend towards increased productivity in European agriculture, the scarcity would be somewhat less every year, even if no other measures were taken (Box 6.4).

Precautionary measures for the *first* year of scarcity

During the first year of feed scarcity, it is important that agriculture and the livestock sector are resilient and that the EU has access to substitute animal feed. We refer below to 9 options to achieve these aims.

[177] EC 2009. *Prospects for Agricultural markets and income 2008 – 2015. http://ec.europa.eu/agriculture/publi/caprep/prospects2008/index_en.htm*

Option 1. Improve resilience of agronomic production

It is possible to make agricultural production (including grass) more resilient to extreme weather conditions and diseases. There is great interest internationally in this topic, also in relation to climate change. This concerns biological, technological and economic resilience. Possibilities for improving *biological and technological* resilience include:

- greater diversity of crops and varieties;
- develop varieties that are more resistant to variable weather conditions, heat, cold, drought and diseases;[178]
- make production systems more resilient. This can be done, among other ways, by increasing the organic matter content in the soil.[179]

Box 7.8 How quickly could the "autonomous" productivity increase in agriculture replace soya imports?

Wageningen University professor Rudy Rabbinge has repeatedly – and justifiably – pointed out that a possible collapse of soya imports can be compensated by the "autonomous" production increase in arable farming. But how many years would this process require? Here is a simplified calculation.

Rabbinge (verbal communication) uses the rule of thumb that the current "autonomous" productivity increase in European wheat production is 100 kg per ha per year, and estimates that this increase could compensate for a possible collapse of soya imports in the EU *within 3 years*. This appears to be somewhat too optimistic. Our calculations follow below.

The total agricultural acreage in the EU-27 is approximately 200 million ha, of which Bindraban *et al.* (2008) estimate that 122 million ha is arable farmland. For the sake of simplicity, we will assume that "grain equivalents" will be grown on this land. The annual productivity increase would then provide 122 million ha x 100 kg grain equivalents = 12.2 million tonnes of grain equivalents.

If the demand for grain remains constant, then acreage needed for growing protein crops would become available equal to that needed for growing 12.2 million tonnes of grain. Assuming a production level of 6.6 tonnes of grain per ha, every year 1.8 million ha of additional land would become available for growing protein crops. In the second year, 3.6 million ha of additional land would become available, etc. On 1.8 million ha – assuming a high production level of peas (equivalent to that realised in the Netherlands) of 5.5 tonnes per ha and a IDP value (Intestinal Digestible Protein) of 101 g per kg – about 1 million tonnes of IDP will be produced.

Assume that the entire imported quantity of 56 million tonnes of soya per year is no longer available. Soya contains approximately 200 g PDI/kg, in total 11 million tonnes of PDI. It would therefore take *about 11 years* to replace all soya imports.

In these calculations we have assumed that the production of field peas throughout Europe can be increased over 10 years to the current level in the Netherlands (5.5 tonnes/ha). That is optimistic: in France (where approximately half of the European pea production takes place) the productivity is 4.5 tonnes/ha and in Spain and Germany it is even lower. If this rapid production increase is not attained, then it will take even *longer than 11 years* to replace all soya imports. It will also take longer if the productivity of wheat increases by less than 100 kg/ha/year.

For that matter, the productivity of wheat will not continue to increase indefinitely. Recent research in Wageningen[180] has shown that the "yield gap" – the difference between the actual and potential production per hectare – is no longer very large; in much of Europe it is now less than 2 tonnes/ha. In the Middle East and Eastern Europe, the gap (and the growth potential) is greater. Therefore, a continuing increase of 100 kg/ha *on average* during the next 10 years – the time horizon of this report – still appears to be possible.

[178] Cold periods during the growing season can be the result of a volcanic eruption. Not all crops and varieties are equally susceptible to cold periods.

[179] S. Verzandvoort & P. Kuikman 2009. *Klimaatverandering, klimaatadaptatie en bodem: maakbaarheid, planvorming en realiteitsdenken.* [Climate change, climate adaptation and soil: feasibility of social change, planning and realistic thinking] Alterra Wageningen UR. Increasing the organic matter content not only helps crops adapt to climate change, but can also mitigate climate change itself by sequestering carbon.

[180] K. Neumann 2010. *Explaining agricultural intensity at the European and global scale.* Wageningen UR.

Possibilities for increasing *economic and social* resilience include:
- adequate knowledge dissemination, also via the Internet and social media;
- spreading of risks through diversity of crops, farming types and farming styles.

The EU and the Netherlands could promote this by means of subsidies and financial incentives for innovation and extension. They are already helping to pay for weather insurance (see page 88, Option 8).

In any case, it would *not* be helpful for the EU to make growers' rights subsidiary to patent rights, which primarily benefit large seed companies. That would slowly but surely erode genetic biodiversity, opportunities for innovation and the resilience of agriculture. The increasing commercialisation and protection of public knowledge is also unhelpful. The EU and the Dutch government must continue to ensure a strong public knowledge base and encourage knowledge dissemination.

Option 2. Improve the resilience of animal production

The livestock sector can also be made more shock resistant, especially with respect to livestock diseases, variable/extreme weather conditions and a shortage of protein-rich feed (in this case soya). For livestock diseases, see page 93 ff.

Possibilities for strengthening the *biological and technological* resilience to variable/extreme weather conditions and a shortage of protein-rich feed include:
- Focus the breeding and selection of cattle on animals that can also "perform" adequately under drought conditions.
- Focus the breeding and selection of pigs and chickens on animals that can also "perform" adequately without a protein-rich diet.
- Use more diversity in livestock breeds.
- Develop more robust livestock farming systems.

Possibilities for increasing *economic and social* resilience include:
- Greater diversity of farming types and styles;
- Risk management in the form of insurance, futures contracts, etc. (see Option 8 on page 88);[181]
- More financial buffers on livestock farms. Avoid excessive dependence on borrowed capital, so that the farm does not continuously have to operate on the verge of bankruptcy. The importance of this strategy in dairy farming was shown when milk prices fell in 2009; at that time farms that were heavily in debt experienced more problems.[182] In pig farming, it appears that farms in southern Europe have lower, but more stable, incomes compared to farms in north-western Europe;[183]

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[181] In 2009, the European Commission published a *White paper - Adapting to climate change.* A supplementary document is entitled *Adapting to climate change:* the challenge for European agriculture and rural areas (ec.europa.eu/agriculture/climate.../workdoc2009_nl.pdf). It provides an overview of effects, adaptation requirements and possibilities for action. It is expected that these aspects will be included in the impending reform of the CAP.

[182] LEI 2009. *Kredietcrisis en agrosector, situatie begin maart 2009.* [The credit crisis and the agricultural sector, the situation in early March 2009.] *Policy memorandum commissioned by Minister Verburg.* www.lei.wur.nl/NR/rdonlyres/2A3C9F9F.../090317Kredietcrisis1.pdf

[183] This concerns a study into the vulnerability of livestock farms in southern and north-western Europe for price fluctuations. The study showed that farms in north-western Europe enjoy higher incomes, but are more susceptible to price shocks. The lower resilience of farms in north-western Europe is primarily due to their narrower profit margins, their more limited capital base and the resulting dependence on borrowed capital, as

- Make the livestock sector structurally less dependent on soya imports and more connected to European feed production, the food industry and possibly biofuel refineries. Pigs are highly suited for processing waste streams from the food industry. Their diet can be supplemented, more than is now the case, with feed crops grown in Europe and with waste streams from the European food industry. This does not mean a complete decoupling between intensive animal husbandry and harbours, because food companies (such as Unilever) that produce valuable by-products are often located near harbours. But a more even distribution of pig farming across Europe will make the sector less vulnerable for a collapse of soya imports;
- Limit the market share and market power of food industries and supermarket chains. Competitive trading law already focuses on this problem;
- A special regime for "system-relevant companies" to prevent them from collapsing during a calamity, causing major gaps in the food supply. Special agreements with these companies are necessary.

Here as well, the EU and the Dutch government must ensure an adequate public knowledge base and promote knowledge development and knowledge dissemination.

Box 7.9 Proposals of the European Commission for EU agricultural policy reform

The Common Agricultural Policy (CAP) of the EU is on the threshold of reform. In November 2010 the Commission presented a Communication with the title *The CAP towards 2020: Meeting the food, natural resources and territorial challenges of the future.*

The document refers to **three challenges** for European agriculture:
- Food security: Europe must maintain its production capacity in an environment of liberalised markets that lead to greater uncertainty and increased volatility. Moreover, agricultural incomes, which are already significantly lower than in the rest of the economy, fell even further in 2009 as a result of the economic crisis.
- Environment and climate change: agriculture plays a key role in producing public goods, such as landscapes, biodiversity, climate stability and greater resilience to natural disasters such as flooding, drought and fire. At the same time, many farms put pressure on the environment, leading to soil depletion, water shortages and pollution, and loss of wildlife habitats and biodiversity. It is important to further unlock the agricultural sector's potential – based on innovation – to adapt to and mitigate climate change through greenhouse gas emission reduction, production efficiency, including improvements in energy efficiency, biomass and renewable energy production, carbon sequestration and protection of carbon in soils.
- Territorial balance: the vitality and potential of many rural areas – also in the new Member States – remain closely linked to the presence of a competitive and dynamic farming sector.

The Commission then lists **seven reasons for reform**, including:
- to address rising concerns about food security;
- to retain and enhance competitiveness in a world characterised by increasing globalisation and rising price volatility, while maintaining agricultural production across the whole European Union;
- to achieve sustainable growth by maintaining the food and feed production base and promoting renewable energy, among other aims.

The document then lists the **three main objectives** for the future CAP:
1. *Viable food production*
- contribute to farm incomes and limit farm income variability;

well as the stronger market response to calamities. For example, following the epidemic of swine fever, pork prices rose temporarily, and farms quickly increased production, but were then confronted with sudden price declines. The contribution of non-farm income and capital also plays an important role. See: H.C.J. Vrolijk, C.J.A.M. de Bont, H.B. van der Veen, J.H. Wisman & K.J. Poppe 2009. *Volatility of farm incomes, prices and yields in the European Union.* www.groupedebruges.eu/pdf/volatility_farm_incomes_EU_LEI.pdf

Box 7.9 *continued*

- improve the competitiveness of the agricultural sector and enhance its value share in the food chain;
- compensate for production difficulties in regions with specific natural constraints.

2. *Sustainable management of natural resources and climate action*
- guarantee sustainable production practices and secure the enhanced provision of environmental public goods that are not remunerated through the market;
- foster green growth through innovation, notably in the context of the emerging bioeconomy;
- mitigation of and adaptation to climate change (such as extreme weather fluctuations). These two aspects are compatible.

3. *Balanced territorial development*
- support rural employment;
- improve the rural economy and promote diversification;
- allow for structural diversity in farming systems, improve the conditions for small farms and develop local markets.

As possible **instruments for price stabilisation**, the document lists the following:
- intervention during longer periods
- "disturbance" clauses[184]
- private storage.

Intervention should be used only as a safety net in case of significant price declines and possible market disturbance. In addition, the Commission wants to provide Member States with a *risk management toolkit*, ranging from a new WTO green box compatible income stabilisation tool, to strengthened support of insurance instruments and mutual funds.

In this entire document, the Commission appears to be referring primarily to extremely *low* prices caused by overproduction, not the extremely *high* prices that can be expected following calamities. Consequently, this is more along the lines of policy for producers than consumer policy. Food security is indeed cited, but as one of the challenges and reasons for reform, not one of the objectives of reform. The objectives appear to primarily concern income security for farmers (basic income support) and improved territorial balance. This is remarkable because on page 1 it is stated that in the discussions leading up to this document, the overwhelming majority concurred with the strategic aim: "...to guarantee long-term food security for European citizens and to contribute to growing world food demand". Moreover, food security is sought through more production in Europe, not in developing countries.

The document has at least four major gaps:
- price spikes
- food production in developing countries
- physical calamity and geopolitical crises
- the impending scarcity of phosphate and other minerals in the world, and especially in the EU.

However, the first two gaps appear to have been filled in recently. See the following text box.

[184] "Disturbance clauses" are not defined, but this probably refers to clauses in the *Agreement on Agriculture* from the Uruguay Round of the WTO. With these clauses, countries can temporarily protect their farmers with import restrictions against serious disturbances of their markets. During the ongoing Doha Round, India and China (with the support of other developing countries) have called for a broad application of that *Special Safeguard Mechanism*. They demanded that the mechanism should be initiated as soon as imports increase by more than 10%. In accordance with the proposal of chairman Lamy, the USA demanded a higher threshold of 40% See: http://www.europarl.europa.eu/ftu/pdf/en//FTU_4.2.8.pdf. One of India's arguments was that the monitoring capacity of the country is still so weak, that once the 40% trigger had been reached, this would take so long to prove that "the Indian farmers concerned would have already committed suicide". The EU took an intermediate position. See: http://www.brookings.edu/~/media/Files/rc/articles/2008/1205_trade_blustein/1205_trade_blustein.pdf

Option 3. Restrict grain exports and/or promote imports
Today, the EU is a net grain exporter. The self-sufficiency is now 103%, and is expected to increase further. In case of a sudden scarcity of soya, livestock farmers will partially substitute grain for soya. That will drive up the price of grain, and when it has risen above the world market price, grain traders will start exporting less grain and importing more, as soon as their contracts allow. If the EU determines that this market effect is inadequate – for example if the price is simultaneously high on the world market – then it can do the following:

- restrict grain exports by means of an export ban, export quota or export tariff;
- promote grain imports by suspending the import tariff or subsidising imports.

The WTO leaves room for export restrictions because it focuses more on eliminating *import* barriers. But an export ban is a very rigorous measure and can elicit criticism from trade partners. An export quota would not be as controversial. An export tariff would also not be as difficult and would provide income for the EU budget. The EU took such a measure previously in 1973 and 1995, when grain prices in the EU were high.[185]

Box 7.10 Intentions of the European Commission regarding price rises and price volatility

During the meeting of the Agriculture/Fisheries Council on 24 January 2011, Commissioner Dacian Ciolos announced an initiative regarding the international agricultural markets. We quote from the Dutch report on the Council meeting:

"Commission Ciolos provided information about the current situation on the important international agricultural markets. The activities in the context of the G20 in the areas of agricultural commodities, price volatility and market transparency and in the context of the WTO/Doha negotiations were central. According to Commissioner Ciolos there has been a rapid rise in prices on international agricultural markets. According to the Commission the current price volatility is not caused by low stocks, which was the case in 2008. The control of the price fluctuations will be discussed in the context of the G20. The Commission announced the Communication *Tackling the challenges in commodity markets and on raw materials*, which appeared on 2 February of this year. In this document the Commission addressed transparency through improving the quality of data, specifically regarding stockpiling.

In addition, Commissioner Ciolos stated his intention to establish an international forum of the most important participants (importers and exporters) in these markets, which would allow better prediction of crisis. He also indicated that he wants to work on:

- the availability and transparency of information about public and private storage, production and consumption;
- the availability in emergency situations of stocks for countries that are structurally dependent on food imports;
- food security mechanisms for countries that are confronted with tensions in food security;
- the role of the Commission in the area of food aid, both internationally and at the EU level;
- instruments for international governance in this terrain, for example through mechanisms for institutional dialogue between key countries.

(..) the French delegation summarised the activities of the French chairmanship of the G20 related to price volatility. The French announced a meeting on 22 and 23 July 2011. France intends to prepare an action plan, with topics such as an early warning system and transparency. In addition France referred to regulation of the trade in commodities. The action plan must be approved during a meeting of heads of state and government leaders of the G20 at the end of 2011."

These are certainly not minor aspirations. In addition to the classical instrument of food aid, France and the Commission are also placing transparency, stocks, food security of developing countries and global governance on the international agenda. The support for these proposals in the G20 will become apparent later this year.

Source: www.rijksoverheid.nl/.../verslag.../verslag-landbouw-en-visserijraad-d-d-24- januari-2011.pdf

[185] Source: http://www.fao.org/docrep/003/w1358e/w1358e14.htm.

Suspending the import tariff and introducing import subsidies is expensive for the EU. Nevertheless, during the price spike in 2007/08 the EU suspended the 10% import tariff on grain for several months. It did this again in February 2011. In both cases the motive was the high domestic grain price.[186]

Regardless of the variant chosen, upward pressure can be exerted on the grain price on the world market. This is especially disadvantageous for food-importing developing countries.[187] But family often has preference over friends.

A more preventive option would be to regulate the grain trade, such as an obligation to conclude at least 50% (by volume) of the contracts on an annual basis, so that traders can quickly switch to trading within the EU in case of relatively high prices. But that would not help very much if there are few long-term contracts, which appears to be the case. Traders attach great importance to flexibility.[188]

Option 4. Promote imports of dairy products and meat

With high domestic prices for dairy products and meat, imports of these products will increase. The EU has limited these imports by means of tariffs and by means of so-called "tariff quotas": quotas on reduced-tariff imports.[189] But if the price difference between the European market and world market becomes very large, the tariffs will no longer restrict imports, and that will attenuate the price spikes. To enhance this market response, the EU could reduce or suspend tariffs, or expand the tariff quotas. For consumers, this would be beneficial – at least in the short term – but for the economy and the resilience of the European food system it has disadvantages:

- It results in additional problems for the meat and dairy sectors, and will slow their recovery and make it more difficult. For example, banks would be even more reluctant to provide credit.
- In the power game of trade politics, it is difficult to restore tariffs once they have been lifted. As a result, the sector could be permanently disadvantaged and would probably have to shrink. In that case, the EU would become *more* self-sufficient in protein-rich feed, but *less* self-sufficient in dairy products and meat. In 2004-2006, the average self-sufficiency for butter was 112%, for cheese 107% and for meat 104%.[190] Especially where meat is concerned, the EU could therefore quickly become a net importer.[191] The European Commission expects that the EU, even without calamities, will be exporting less pork by 2020 and will have become a net importer of chicken. This would primarily be the result of increased consumption of chicken and a high exchange rate for the euro.

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186 In addition, the EC considered expanding the tariff quota for Canada (*agd* 11 March 2011).

187 The FAO on the export tariff in 1996 and the suspension of the import tariff in 2007/08: "...they seem to have exacerbated the increase in world prices and put a significant burden on food importing countries. In brief, in these two cases, the EU policy generated a significant externality by stabilising its own domestic prices at the expense of net food importing countries." (ftp://ftp.fao.org/docrep/fao/012/i1098e/i1098e10.pdf)

188 H. Stam, Cefetra (in an e-mail).

189 For example, for pork there are quotas for about 100,000 tonnes, mostly for third countries, with a tariff reduction of 50-100%. For lamb, the tariff-free quotas amount to nearly 300,000 tonnes, largely for New Zealand, Argentina and Australia. For beef there are quotas for more than 200,000 tonnes, with 80-100% tariff reduction, largely for all third countries and for specialty beef (Hilton beef) from Mercosur, the USA, Canada and Australia. Finally, for chicken, primarily salted and cooked, there are quotas for more than 600,000 tonnes with 85% or more tariff reduction, almost exclusively for products from Brazil and Thailand. Source: Productschap PVE, data from 2008. During the negotiations with Mercosur it is likely that the quotas will be expanded and/or the tariffs will be reduced.

190 Calculated from figures obtained from www.indexmundi.com

191 European Commission 2010. *Prospects for agricultural markets and income in the EU.* (http://ec.europa.eu/agriculture/publi/caprep/prospects2010/fullrep_en.pdf)

(For that matter, no one can predict the exchange rate of this currency). This will create new vulnerabilities for the whims of the world market and geopolitics.

This measure therefore entails significant risks for the EU, even though it is not required to attenuate price spikes because the market mechanism will largely take care of this. It is more appropriate to reserve this option in case the market mechanism does not attenuate the price spikes sufficiently. By promoting imports the EU can possibly also deter undesired forms of speculation. In any case, it appears to be advisable to maintain a certain level of import as buffering, thereby keeping the corresponding infrastructure intact.

Box 7.11 Is meat production in Brazil less sustainable than in the EU?

Many in the European livestock and meat sectors hope that high European standards (public and/or private) for sustainability, including animal welfare, will prevent imports of cheaper meat from South America. The European Parliament has insisted that the Commission take account of these differences in standards and their consequences during negotiations with the Mercosur countries. A lot can be said for this strategy, but there is no reason to assume that South American producers are incapable of complying with European standards.

However, there are indications that today Brazilian beef has a relatively low sustainability score. According to a Swedish study, 6% of the beef production in Brazil is related to deforestation. This part of the production could generate 25 times more CO_2 emissions than production elsewhere in the country. The average carbon footprint of Brazilian beef production could be twice as high as the European average.

One controversial aspect is that farmers in parts of the Amazon may be allowed to burn down forests and use the land to pasture their cattle for free. In the 1970s, the government encouraged people to move to the Amazon region, promising that they would receive title to the land at a later time. As a result, farms and individuals have become established for decades without official registration. Only 4% of the land is legally owned by private parties, 31% is held by private parties without formal title, and the other 65% is owned publicly, but there is extensive illegal land occupation. Land ownership is uncertain in roughly half of the *Legale Amazone*.

In recent years, the government has been working on legalising existing land use. In 2009 it was agreed that owners/users of farms up to 100 ha in size would be given ownership by the government for free, and that holdings larger than 100 ha (up to 1500 ha) would have to pay a reduced price for the land. According to critics, "That proposal maintains the perverse subsidies that can encourage new deforestations, since the offer of free land makes it more profitable to invade and deforest new areas than to invest in increasing the productivity in lands already cleared."

Moreover, this practice can be seen as a form of state support, comparable to the payments the EU gives to its farmers. From this perspective, Brazil and the EU are quits with each other. But it will be difficult to challenge the Brazilian practice in the WTO as long as there are no international treaties that forbid such policy. It is more conceivable that – analogous to soya and palm oil – a *Round Table for Responsible Meat* would be established that would prevent such practices. Such roundtables can certainly slow the imports of cheaper meat, but they cannot block it entirely; if the discussion were to move in that direction, the South American discussion partners would quickly abandon the roundtable. Therefore, even with higher standards for sustainability, the EU will probably see more Brazilian meat on its market.

For that matter, part of the deforestation can be attributed to meat that is produced in the EU.

Sources:

Brenda B. and P. Barreto 2009. The risks and the principles for landholding regularization in the Amazon. Imazon, Belém, Brasil.

Brazil beef - greater impact on the environment than we realize. *http://www.physorg.com/news/2011-03-brazilian-beef-greater-impact.html*

Ontwerpresolutie van het Europees Parlement over de EU-landbouw en internationale handel. [Draft resolution of the European Parliament about EU agriculture and international trade.] *2010/2110(ini)).8.2.2011* *http://www.wrm.org.uy/bulletin/144/Brazil.html*

Option 5. Permit mowing or grazing in nature reserves

At present, the EU has a certain overproduction of roughage. This provides a buffer in case of feed scarcity, which was already taken into account in the indicative model. In addition, the EU has a large area of nature reserves, including a large proportion of grassland. On some of this grassland, mowing for forage or grazing by livestock is not permitted. It is therefore an option to allow grazing or mowing in case of roughage scarcity.

But this offers little consolation. First of all, during droughts or following a volcanic eruption, grass will not grow very well, also on most of the nature reserves.[192] Second, this concerns only a small part of the total acreage of grassland reserves. After all, most of the grassland is already being grazed, otherwise it would turn into forest. "Wild" grazers also populate the grasslands. They would face competition from domestic livestock or mowing machinery. This would certainly lead to protests from nature conservationists.

Nature provides yet another buffer, albeit a small one. During times of high meat prices, more animal products will also be "harvested" from nature. For example, there will be increased interest in hunting for geese, ducks, pigeons, deer and wild boar, both legally and illegally. In the Netherlands today, many wild geese that are shot as part of wildlife management practices are sent to the rendering plant. With high meat prices, this practice would quickly change. During times of scarcity, it is an option to temporarily relax the rules for hunting. But the additional contribution to the meat supply would be modest, even more so because there is already a lot of hunting for consumption purposes.

Option 6. Create emergency stocks of feed and meat[193]

Another option is to create emergency stocks of feed, especially protein-rich feed. Stockpiling of grain is urged by organisations such as the OECD and FAO.[194] Stocks are especially important during the last quarter before the harvest season, when reserves usually fall to their lowest level. With their indicative model, Jansen *et al.* have calculated that during a two-year absence of soya imports, stocks of 20 million tonnes – equivalent to 2/3 of the annual usage – could reduce the peak price by about 20%.[195]

The EU can create stocks in at least three ways:

- purchase stocks directly and store them at private companies;
- oblige companies to maintain emergency stocks (which was until recently the case with sugar manufacturers);
- purchase *tickets* (options) on the stocks of large companies.

The third way is the easiest for the EU, but also the least secure; it is questionable whether private stocks will be available at the critical juncture, and if so, what the tickets will be worth in times of crisis. The first two options provide more security.

Stocks of meat and dairy products can also have an attenuating effect on price spikes. For dairy products, this won't be needed as quickly. This is because the EU, based on the

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[192] In case of drought, *wetlands* are a possible exception. If they become dry, they can even produce more grass.

[193] The EU should not implement this and the following precautionary measures in a top-down fashion, but in consultation with key players in the business community, and if necessary with NGOs.

[194] Two quotations from the summary of the OECD-FAO *Agricultural Outlook 2010*: “National and local stockholding of key food security commodities for food emergencies (...) may increase confidence in access to food in times of crisis and help stabilise local markets”. And: “While experience with international efforts to manage stocks has not been positive, options to reduce the unpredictability of food import bills [legislation] should be explored”.

[195] A larger stock of 60 million tonnes – equivalent to approximately 200% of annual consumption – could reduce the peak price by about 65%. But such large stocks are very costly and actually unnecessary, because in the first and subsequent growing season, more soya substitutes can be grown.

figures for 2005-2007, has an average self-sufficiency of 112% for butter and 107% for cheese. As soon as the internal prices are higher than the prices on the world market, traders will quickly reduce exports. For meat, the EU is only 102% self-sufficient, so emergency stocks will be needed sooner.

This option is in direct conflict with current policy. The EU has greatly reduced its interventions in the context of liberalisation. In the future, the EU intends to take only 3 million tonnes of wheat out of the market for a predetermined price, plus more if necessary at a lower price, but then via a tender.[196] For milk and skim milk powder, similar facilities have been implemented, but not for meat. With moderately high prices, stocks can be sold in their entirety. Stocks are therefore useful safety nets in case of extremely *low* prices, but are not strong buffers in case of calamities and extremely *high* prices.[197] Along with the bathwater of excessive protectionism, the EU has thrown out the baby of the stocks. In the meantime, state-owned companies in China, India, Russia and Ukraine have stockpiled large quantities of grain.[198]

The fact that the EU has a common agricultural policy has made it relatively easy to coordinate the policy on stocks. Without the CAP, there would be the risk that Member States would conclude all kinds of bilateral agreements. For example, this happened with oil: due to the lack of a common energy policy, Member States concluded no fewer than 60 bilateral agreements for oil to ensure access to emergency stocks in case of sudden scarcity.[199] It is also helpful that no pipelines have to be built to transport agricultural products. As a result, it is almost always possible to transport commodities from surplus regions to scarcity regions.

The aim of stocks must be to prevent scarcity, attenuate price shocks and discourage undesired forms of speculation. However, there is a risk that they will be misused for other objectives, especially:

- if the EU itself begins speculating in order to reduce the budget burden. Risk: price shocks are amplified, not attenuated, and there are inadequate guarantees that the stocks will still be sufficient in case of a calamity;
- if the EU returns to the controversial income policy for farmers, unrelated to calamities, where increased stockpiling only serves to support farm income. This results in distorted price incentives. More and more farmers will begin producing strictly for intervention. And the stocks will have to be sold on the world market with subsidy.

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196 *Health check CAP, November 2008: Council political agreement.*

197 However, NATO has a Food and Agriculture Planning Committee, which maintains the national emergency plans for food and agriculture. We have been unable to acquire much information about these plans. NATO appears to be primarily interested in terrorist attacks on food safety. In April 2010, NATO held a high-level research workshop, *Advances in Food Security and Safety against Terrorist Threats and Natural Disasters*, in Cairo, Egypt. The workshop addressed how deliberate contamination of food with microbiological or biological substances could be prevented and/or minimised, as well as how the health and economic risks for the food chain as result of a terrorist attack or a non-deliberate calamity could be limited. See: http://www.nato.int/cps/en/natolive/news_62559.htm. Such risks are highly relevant, but are outside the scope of this report.

198 For Russia, the large stocks appeared to be a problem, but they became extremely useful following the crop failure that resulted from the severe drought and heat wave in the summer of 2010. China decided in 2007 – when the prices for pork and chicken were high due to the high maize price and the swine fever epidemic – to create emergency stocks of pork (*NRC Handelsblad* 29 May 2007). China has also stockpiled enough wheat for nearly a year. These stocks also became a useful buffer during the recent high grain prices (*agd* 8 March 2011).

199 W. Heck. *Brussel vertrouwt opslag crisisolie niet meer na gasconflict.* [Brussels no longer trusts storage of crisis oil stocks following gas conflict] *NRC Handelsblad* 5 February 2009. Many countries, including the Netherlands, have replaced some of their stocks with tickets (options) at oil companies. But there is discussion about what such options will be worth during a crisis.

There are essentially two temptations. First, to build up excessively large stocks or to engage in lucrative speculation. Second, there is the temptation, if prices are not extremely high, to sell all the stocks and in this way to sacrifice the buffer.[200,201] The OECD and FAO are urging research into best practices of stock management. Perhaps the stocks should be managed by a semi-autonomous, non-profit government agency – comparable to an agency like the Central Bank.

This does not mean, however, that stocks always involve losing money nor that there will be no beneficial effect on farm income.[202] On the contrary: stocks will often be purchased at low prices, and will be sold during the calamity that causes scarcity and thus high prices.

Moreover, buffer stocks are not only in the interest of the EU itself. They also help to prevent European traders from turning to the world market during times of high feed and meat prices, thus driving world market prices even higher, to the detriment of food-importing developing countries. Theoretically, it is even possible to use the stocks in part for emergency help to developing countries. However, feed commodities are often not suitable for human consumption, and it is better if the emergency stocks for developing countries are established in the corresponding region.

Option 7. Make the private sector co-responsible

Another strategy for creating emergency stocks is to make the private sector co-responsible for the preparedness regarding potential shortages of feed, meat and dairy products. This would be compatible with the trend towards corporate social responsibility. Moreover, the recent literature on risk management has urged the government to cooperate with the private sector and other parties as part of its risk policy.[203] According to the OECD, such "management-based regulation" is a superior strategy.

Then following question arises: what is the likelihood that companies will voluntarily commit themselves to creating emergency stocks? This is not very likely, because the management of many companies focuses on cost reduction by keeping minimum inventories and providing just-in-time delivery. And in a competitive market, there is always the fear that the competitor will gain a cost advantage. Besides, emergency stocks can offer financial and image benefits only in case of a calamity, and the probability of the calamities referred to in

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[200] France has recently decided to conduct research into European grain intervention practices. The French want to know whether the EU with its current policy can maintain sufficient grain stocks (*agd.media* 16 December 2010).

[201] Another aspect that is relevant to this report is that the proceeds from the sale of the stocks are partly earmarked for the "food aid for the most deprived persons" programme of the EU (*Agrarisch Dagblad* 18 September 2010). The original intention of this programme (1987) was to use agricultural surpluses to provide food aid to deprived persons. In the mid-1990s, the scheme was changed; under certain conditions, agricultural surpluses can be supplemented with purchases on the market. In 2006 more than 13 million EU citizens benefited from this support scheme. See: http://ec.europa.eu/agriculture/markets/freefood/index_en.htm

[202] For that matter, stockpiling always has an effect on prices. When stocks of feed are *purchased*, the prices for arable farmers rise. During *storage* the stocks keep prices somewhat lower. And when stocks are *sold* during a price spike, the spike is attenuated – which is exactly the idea. For livestock farmers, the first phase is detrimental, but the second and third phases are beneficial. For society, stability is an advantage, but there is still no free lunch: creating and maintaining stocks can end up costing money. First, there are the unavoidable transaction costs. Second, stocks must be periodically sold and replaced because they are perishable. As a result, maintaining stocks can be costly. These costs can then be viewed as an insurance premium against price spikes.

[203] See Warner *et al. op. cit* and OECD 2010. *Risk and Regulatory Policy: Improving the Governance of Risk.* OECD Reviews of Regulatory Reform.

this report is perhaps only 1/100 years. At most, companies would want to insure themselves against such calamities. But insurance does not add anything to the actual stocks.

Nevertheless, the survey conducted by Meuwissen *et al.* points out that many Dutch food companies have a business continuity plan which takes account of one or more calamities (Box 4.1). However, these companies also envision a role for government agencies and public bodies, especially for the EU. Consequently, it would be worthwhile for the European Commission and the Dutch government to enter into discussions on this topic with industry and the retail sector. If these discussions do not lead to any firm concessions, then an obligatory stocks scheme can still be imposed. This brings us back to the previous option. In the related area of food *safety*, for example, the EU also made food producers legally responsible by means of the General Food Law.[204]

Option 8. Contribute to private financial buffers

Although financial buffers do not increase actual stocks, they can help prevent scarcities of feed, meat and dairy products from becoming even more severe by preventing bankruptcies of companies in the livestock, meat and dairy sectors. Such bankruptcies occur more frequently when banks stop providing credit. And the likelihood of this happening will increase further if the EU suspends tariffs on meat. Possible financial buffers include emergency funds, insurances and futures contracts.

Many Member States already have *emergency funds* for extreme weather and livestock diseases, but not for plant diseases and price risks. During outbreaks of highly contagious livestock diseases (with mandatory reporting and control), which must be held in check with livestock transport bans and culling, the immediate losses for the sector are generally reimbursed by the Member State concerned, with co-financing from the "Veterinary Fund" of the EU. The subsequent costs (primarily the costs and risks of replacing culled livestock) are usually paid by the livestock farmer alone. The allocation of costs and responsibilities between the government, the sector and the individual livestock farmer differs per Member State. In the Netherlands, the Animal Health Fund is co-financed by the government and the livestock sector. The EU wants to gradually harmonise the policy in this area to create a level playing field and to control costs.[205] In the Netherlands, plans are also being made to establish a Plant Disease Fund.[206]

Regarding price risks, in recent years there has been interest in private forms of risk management, especially insurance and futures contracts. This interest is partly the result of the partial liberalisation of the CAP and the expected increase in price volatility.[207] The European Commission also referred to similar options in its recent proposals for CAP reform (Box 7.9).

One problem with *insurance* is that insurers are not eager to insure the risks of large-scale calamities (so-called system risks) such as severe drought, because these risks could quickly exceed their capacity. The premiums will then be high, which depresses demand. Of course, insurers can limit their risk through re-insurance, but this also raises the premiums.

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[204] The EU would do justice to the name General Food Law if it expanded this legislation to include regulations for food *security*.

[205] Landeg, F, N. Coulson & M. Mourits *op. cit.*

[206] Based on the *Steunregeling voor ondernemingen in moeilijkheden als gevolg van maatregelen ter bestrijding van dierziekten en schadelijke organismen bij planten* [Support Scheme for farmers having problems as a result of measures to control livestock diseases and organisms that are harmful for plants.] Kamerstuk 32 123 XIV.

[207] See: J. Pennings, P. Garcia & A. Oskam. *Private market and price stabilisation*. In: Oskam, Meester & Silvis *op. cit.*

This is why the EU and the Member States partly subsidise insurance premiums.[208] For example, since 2010 there has been a broad weather insurance scheme in the Netherlands that covers extraordinary damage from rain, drought, frost, snow damage to structures, freezing rain, storms, hail, erosion caused by flooding and fire caused by lightning. The government reimburses 60% of the premium, where 75% of this subsidy originates from the EU. For 2011, €10.6 million of such funding has been made available.[209] A politically relevant aspect is that such subsidies are allocated to the so-called Green Box in the WTO: forms of agricultural support that do not distort the market and therefore do not have to be reduced.

Futures contracts are traded on the exchange, while *forward contracts* are traded directly, outside the exchange. One constraint is that farmers are often insufficiently capable of evaluating such contracts. Collective contracts, such as those concluded in cooperatives, can be a solution. The Dutch cooperative Agrifirm is already offering its members (wheat growers) such contracts.[210] However, it is questionable whether such contracts would offer a solution for large-scale calamities at the European scale, such as a collapse of soya imports or a large-scale drought. In this area as well, there is a case for a support task for national governments and the EU. The European Commission has provided an opening for this role of government (Box 7.9).

It appears to be a worthwhile to conduct stress tests to determine the extent to which the European livestock industry and meat and dairy industries are resilient to large-scale calamities and a collapse of soya imports, the extent to which insurance and futures/forward contracts could limit these risks, and where supplementary policy from the government is required.

As part of the stress tests, special attention should be paid to so-called system companies that are "too big to fail". If the government provides these companies with a safety net, it is entirely reasonable to require something in return, such as the obligation to maintain emergency stocks.

Another possibility is to split up such companies (analogous to proposals for system-relevant banks) to spread the risk of collapse. In some cases these companies could be split up on the basis of competition policy. Some researchers claim an additional argument for splitting up these huge companies: smaller companies would also have advantages in terms of diversity and innovation.[211] However, there are also disadvantages to smaller scale operations, plus the fact that smaller companies become easy prey for takeovers. It is still unclear what the best strategy would be.

Option 9. Rationing feed and food

Precautionary measures to safeguard the availability of feed, meat and dairy products will not always be sufficient to ensure their accessibility and affordability for everyone. For example, in case of sudden price increases, there is a strong likelihood that those livestock farmers having a high level of debt would no longer have access to affordable feed, and that consumers with low incomes would no longer have access to affordable meat and dairy products. Prices can be driven even higher by the “herd behaviour” of hoarding consumers,

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[208] In the EU, the total premiums paid for agriculture insurance amount to €1.5 billion. The annual subsidies for agricultural insurance total approximately €500 million. The average amount of *ad hoc* assistance in the EU is approximately €900 million. Every year, €1.1 billion of damage reimbursements are paid on average (Burger, Warner & Derix *op. cit.*).

[209] M. Vermaas. *Weersverzekering: kwestie van wikken en wegen.* [Weather insurance: a question of careful consideration] *agd* 4 March 2011.

[210] http://www.agripress.nl/start/artikel/297638/nl

[211] K. Burger *op. cit.*

speculating farmers and small investors. On futures markets, big speculators can add to the problem. Moreover, market manipulation by big investors and cartels cannot be excluded. Finally, an increase in food criminality can be expected, such as theft and smuggling.[212] At the same time, the pressure to avoid compliance with regulations for plant and animal health as well as food safety will increase, with the corresponding risks.[213]

In such crisis situations, the market is inadequate and government intervention is essential (see Box 6.2). At the very least, measures are required to assure access to affordable food for everyone. Member States are already required to impose fines on cartels. Moreover, the EU could obligate all Member States – especially the less prosperous Member States such as Romania – to prepare emergency plans for distribution, including controls on hoarding. The Netherlands already has legal facilities for this purpose, and the Ministry of Economic Affairs, Agriculture and Innovation has a policy strategy: *Crisisbeheersing Voedselvoorziening* [Food Supply Crisis Management] (see Box 6.2).[214] This strategy is currently being adapted for the scenario involving a collapse of soya imports.[215] If necessary, the EU itself should be able to intervene if the European market is distorted by food nationalism.

In addition, the EU should begin regulating speculation on the markets (including futures markets) for grain, seed, dairy products and meat.[216] The USA has made more progress in this area. For that matter, the use of emergency facilities can be limited if relevant players conclude voluntary special-purpose agreements (*convenanten*) with adequate codes of conduct for emergency situations. To this end, multi-stakeholder committees could be

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[212] Criminality is often strongly related to high prices, to price differences between commodities and their substitutes, and to price differences between countries (due to taxes and regulation). This has been shown to be structurally the case with drugs, but it also takes place with commodities such as copper. To illustrate this problem: when copper prices were high in 2006-08, many thefts were reported in the Netherlands of copper roofing, lightning deflectors, valves from gas meters, rain pipes, sundials, cables along railroads, wiring from streetlights and bronze statues, including Rodin's "The Thinker" from the Singer Museum in Laren (*nrc.next* 12 June 2008). Note: bronze is an alloy of copper and tin. When a new price peak was reached in 2010, thefts of copper wiring along railroads were again reported. In addition, there were thefts of copper vases, letters and ornaments from cemeteries, garden statues, church bells, lightning deflectors, retaining pins from a sheet pile and the water system from a swimming pool. ProRail, which manages the rail infrastructure in the Netherlands, was compelled to take additional security measures (*NRC Handelsblad* 14 January 2010). By the same token, with high food prices food theft will increase greatly.

[213] In this context, the "ecothriller" *Graan* [Grain] by Ruben van Dijk (Bruna 2010) is interesting. In this book, a plant virus affects grain production worldwide. The following effects occur: food becomes scarce and expensive worldwide, hunger increases rapidly, also in Europe, China purchases all the soya in Argentina, in the Netherlands starving pigs begin to cannibalise each other, food depots and food transports are raided, speculators make exorbitant profits, urban residents start eating pigeons and other birds and catch all the fish in canals, begin eating nettles, other wild plants and earthworms, and start growing their own vegetables. This is all within the realm of possibility. However, it is highly improbable that pigs would be given the opportunity to cannibalise each other during times of food scarcity.

[214] The last time the strategy was used was in 1986 following the nuclear disaster in Chernobyl.

[215] *Nationale Risicobeoordeling - Bevindingenrapportage 2010* [National Risk Assessment – Findings 2010].

[216] The EU does not yet have any competence to sanction harmful forms of speculation with feed, dairy products and meat, but the *Financial Times* of 20 September 2010 reported: "Reforming commodities markets to curb speculation activity will be a key aim for Brussels officials as they overhaul the rules for trading in Europe during the coming months. EU internal market commissioner Michel Barnier said he planned to use the review of the Markets in the Financial Instruments directive and the Market Abuse directive to tackle what officials view as dangerous price volatility.
The proposal is likely to face strong resistance from London, home to Europe's top commodities exchanges and banks dealing in raw materials. France, supported by several other countries, is pressing to reform commodities trading. The move comes amid growing concerns in Brussels about the recent volatility of prices, notably in some of the agricultural markets, such as wheat."

established at the national and European levels (in the spirit of the Hyogo Framework for Action that was drawn up after the tsunami of 2004). However, compulsory legislation should be available in case key players refuse to cooperate voluntarily.

Emergency plans must also include security capacity for transports of animal feed, meat and dairy products and for emergency stocks to be maintained by industries, supermarkets, distribution centres and if necessary even farms (such as milk tanks). Such capacity can be needed if there are sudden price spikes.

Precautionary measures for the *second* year of feed scarcity

Building stocks for two years is very expensive, and it is actually unnecessary; during the first subsequent growing season, additional feed crops can be grown in the EU. Therefore, during the *second* year of feed scarcity, different policy is required. There are at least four options:

Option 1. Land set-aside

Set-aside farmland is a type of reserve production capacity. This capacity can be used for three purposes:

- a strategic reserve for times of scarcity;
- a price stabiliser during times of overproduction;
- a strategy for conserving natural habitats, the environment and landscapes.

The EU has experience with land set-aside for the latter two purposes. During the 1980s, the EU was faced with increasing grain surpluses. As a result, a mandatory land set-aside scheme was implemented in 1992. All arable farms were required to set aside 15% of the acreage for subsidised crops, which meant this land could not be cultivated, but should be kept suitable for cultivation. Since then, the scheme has been modified several times. In 2000, the percentage of set-aside was reduced to 10%, in 2005 to 8% and in 2007 – when grain prices were high worldwide – to 0%. When prices once again fell sharply, the scheme was *not* reactivated, and was subsequently abolished. As a result, in addition to stocks, the EU has relinquished a second important buffer/stabiliser.[217] The EU still has a voluntary set-aside scheme with environmental and nature targets, for which farmers can receive reimbursement. But Member States are not required to include such a measure in their agri-environment programmes. For example, this scheme is currently being phased out in the Netherlands. In the new scheme set-aside for natural habitats is limited to field margins.

One precautionary measure for calamities would be to re-establish a strong incentive scheme for set-aside. This could take place in three ways:

- mandatory set-aside for x% of the cultivated acreage;
- a minimum of x% set-aside as a precondition for farm payments (cross compliance);
- obligate Member States to offer the option of set-aside for natural habitats in return for payments to farmers.

Note that this does *not* involve the restoration of the previous policy, which was primarily concerned with preventing extremely *low* agricultural prices and farm incomes. In any case, the previous policy would be less effective due to the current low import tariffs for grain. Instead, this should concern a strategic land reserve for calamities and periods of

[217] This buffer would have been very useful today, now that the prices have again risen. The European Commission expects that at the end of the growing season in 2011, grain stocks in the EU will have declined to only 6 weeks of consumption. The Productschap Akkerbouw [Product board for arable farming] expects that the stocks at that point will even be lower than those in mid-2008. See: *agd.media* 11 December 2010.

exceptionally *high* prices. The third variant also has significant potential benefits for natural habitats, the environment and landscapes.

Option 2. Extensification
Extensification is a less stringent variant of land set-aside. In this variant, a portion of the farmland is cultivated extensively (i.e. without fertilisation). This can involve entire parcels of farmland or broad margins of such parcels. In case of feed scarcity, the ban on fertilisation can be temporarily lifted. This can apply to both arable farmland and grassland.
Again, there are three possible variants: mandatory, semi-mandatory via cross compliance and voluntary in return for payment. Here as well, an additional advantage is the potentially significant benefits for biodiversity and the environment. A potential constraint is that this measure is more difficult to monitor than regular land set-aside, but perhaps there are ways to solve this problem.

Option 3. Variable levy on fertiliser
Another option is for the EU to impose a high generic levy on fertiliser (nitrogen and phosphate), which can then be reduced during times of calamity and high feed prices in order to stimulate production. Such a levy would slightly reduce the production of crops and forage on the total acreage of agricultural land. But it also has important environmental advantages: lower emissions of nitrogen, ammonia and nitrous oxide (a greenhouse gas), fewer pests[218] and less use of pesticides. It can also benefit biodiversity. Of course, these advantages would decline temporarily if the levy was reduced.

However, the effectiveness of this measure is constrained; if the feed shortage is caused by drought or lower temperatures, additional nitrogen or phosphate will have little effect on the yield.[219] One social-economic disadvantage is that the incomes of farmers would become less stable: they would have a cost advantage when prices are already relatively high, and a cost disadvantage when prices are low.[220]

A positive side effect is that more farmers would begin to substitute artificial nitrogen with biologically fixed nitrogen from clovers and other leguminous crops. Organic agriculture – where this is the standard practice – would be given a boost. However, the market for organic agriculture could be disturbed if the tariff is again lowered.

In summary, the advantages for food stability and environment are therefore counteracted by instabilities in environment protection, farm income and the market for organic agriculture. This option requires further study.

Option 4. Establish emergency stocks for the means of production
Besides land (Options 1 and 2), it can also be worthwhile to keep other means of production in reserve. For example, one precautionary measure against drought can be to establish emergency reserves of irrigation water in dams or ponds, especially in highly productive

[218] For example, aphid infestations often result from high applications of nitrogen fertiliser (R. Rabbinge, verbal communication).
[219] However, fertilisation can help the crop to survive during drought. For example, see: http://publications.tamu.edu/publications/Animal_Wastes/SCS%202007%2011%20Preparing%20for%20the%20Next%20Drough.pdf
[220] Although farm production would then be lower, due to the relatively inelastic demand this would often be more than compensated by higher prices.

regions where water shortage is a significant risk. This would have little effect if applied on individual farms only, hence it should preferably take place collectively. The EU could obligate or encourage Member States to establish such water reserves in regions that occasionally face water shortages. Sometimes this can be combined with benefits for natural habitats, for example in the form of wetlands.

If more acreage must be sown following a serious drought, stocks of seed can also be a constraint. The market will be unlikely to create emergency stocks for calamities that have a low probability. Consequently, this is a task for the government. This should involve the seeds of crops and varieties that are drought resistant.

Various possibilities are available for the EU. It can:

- create the stocks itself;
- obligate Member States or seed companies to maintain emergency stocks;
- offer seed companies payment for maintaining emergency stocks.

Recovery

During the third year following the calamity, feed scarcity will already be sharply reduced due to market forces, policy measures and the autonomous productivity increase in agriculture. The probability is very low that the calamity will last longer than two years. The sector can then recover, emergency measures can be phased out and preparedness can be restored in phases. Depending on the policy options that were chosen, the following measures can be taken:

- replenish the emergency stocks of feed;
- reactivate the land set-aside scheme;
- reactivate the extensification scheme;
- replenish reserves of water and seeds;
- restore the increased blending mandate for biofuels;
- remove restrictions on grain exports;
- stop grain import incentives and restore the import tariff or tariff quota on dairy products and meat to the previous level;
- replenish the funds for emergency credit.

In this way, after three or four years the EU will have largely recovered and will be prepared for a possible subsequent calamity in the feed supply. Such a calamity could occur much later, but it might occur quickly. Taking account of the American saying "never waste a good crisis", it is advisable to use the crisis period to take unpopular but essential measures. For example, during a crisis the private sector could be obligated to create and maintain its own physical and financial buffers. Or protein production in the EU could be promoted more strongly, if necessary by negotiating with trading partners for reduced market access for soya in exchange for increased market access for other products. Or speculation by financial players on the futures markets could be regulated.

Precautions regarding livestock diseases

The above options focus on shocks in the production and import of feed, which indirectly affect livestock and dairy production. But *direct* calamities in the livestock sector are also possible, especially large-scale outbreaks of highly contagious livestock diseases. What measures are conceivable in this context? We refer below to 8 options.

Prevention

Option 1. Expanding veterinary policy with policy to counter bioterrorism
In terms of prevention, there are certainly the measures that have already become standard, such as strict veterinary inspections at the borders, hygiene rules on livestock farms and during livestock transport, and where possible the elimination of highly contagious diseases. Private sector quality assurance systems in the chain context also promote hygiene on livestock farms. But there is still an Achilles heel: intentional dispersion of pathogens, otherwise known as bioterrorism.

The probability of bioterrorism attacks can be reduced by a wide range of measures, including intelligence work, strict security at laboratories, screening of personnel and education of livestock farmers. There is already a coordinated anti-terrorism prevention policy at the European level, which focuses on radical political, religious and animal rights activism. In addition, some organised crime networks could benefit from damage to the livestock sector. In view of experiences during the past decade (see footnote 81, page 31), anti-terrorism policy should not only take account of groups, but also individuals ("lone wolfs).

We cannot assess whether *bio*terrorism is already sufficiently taken into account in security policy. In any case, security policy can reduce the risk of terrorist attacks, but certainly not eliminate this risk. Therefore, preparedness remains essential.

Option 2. Regulate the density of livestock clusters
Some contagious viruses and bacteria can be transmitted through the air. For example, this applies to the viruses that cause classical swine fever and avian influenza and to the *Coxiella burnetii* bacterium, which causes Q fever in goats and sheep. The likelihood of such pathogens spreading depends in part on the distances between farms. In some areas, the farms are clustered so densely that an outbreak cannot be controlled. In the Netherlands, this applies for example to the poultry farms in the Gelderse Vallei.[221] With Q fever, a zoonotic disease, a small distance between farms and residential areas is also viewed as a risk.

A related risky development in the Netherlands is the implementation of so-called Agricultural Development Areas (known by the Dutch abbreviation LOGs). These are new locations for clusters of livestock farms that are being moved out of ecologically vulnerable areas. This alleviates the burden on nature reserves and also creates possibilities for efficient "industrial ecology". But the biological risks are probably greater. Although clustering can limit transport volumes and reduce the associated risk of introducing pathogens, the probability that farms will infect each other with airborne pathogens is greatly increased. In this regard, the government should actually discourage clustering. The relationships are not yet entirely clear, but one option for the EU could be a directive to regulate the formation of new clusters and promote the "thinning" of existing, excessively dense clusters, if necessary with financial incentives.

Option 3. Reduce long-distance animal transports
A similar problem occurs at a higher level of scale. In the EU, animals are moved around on a large scale. In this respect, the Netherlands functions as a hub. For example, calves are imported from England and other countries, piglets are exported from the Netherlands to

[221] L. den Hartog, F. Leenstra, I. Enting, T. Hermans, M. Meuwissen & Remco Schrijver 2003. *Pluimveehouderij en besmettelijke dierziekten. Inventarisatie van kennis en dilemma's.* [Poultry farming and contagious livestock diseases. A survey of the current knowledge and dilemmas] Wageningen UR. (http://www.impact-kenniscentrum.nl/doc/kennisbank/1000010864-1.pdf)

Germany and Italy, and day-old chickens are exported across the globe. Since the formation of the common market, border inspections within the EU have been abolished. Although the veterinary and hygiene regulations in the new Member States have become more stringent, contagious livestock diseases can now spread faster and across larger distances in the EU.

This is a powerful justification for reducing long-distance animal transports (a policy which is also urged by supporters of animal welfare). Reduction could take place, for example, by implementing maximum transport distances.[222] Animals would then grow up and be slaughtered in the same region in which they are born (after which, of course, the products can be traded throughout the EU). The consequences for the Netherlands would be that the "nursery function" for pigs and chickens would be reduced, and that the veal sector would shrink.

Option 4. Enhance the specific and general resistance of livestock to infection

The science of immunology distinguishes between two systems of resistance of animals against infection:

- the general, natural (or innate) resistance. This is a broad-spectrum system against infections, which is actually not entirely innate, but can also be influenced by infections at a young age, stress, nutrition and other factors.
- the specific, adaptive (or acquired) resistance of the animal. The system is activated by infections and vaccinations and has a "memory".[223]

Both systems can be enhanced.

Regarding the *specific immune system*: preventive vaccination is possible for many livestock diseases, but is often deliberately avoided. This is partly due to the costs and side effects of vaccination, and partly because vaccination can create problems with marketing. EU Member States and third countries can reject imports of meat and dairy products because most standard tests do not distinguish between products from infected animals and those from vaccinated ones. And if the countries themselves to not reject the products at the border, the food trade or the consumers can still refuse to buy them. The marketing of products from vaccinated animals in the EU is still not sufficiently regulated. This could cause serious problems during a subsequent outbreak – of foot-and-mouth disease for example.

Certainly with attention to the risk of bioterrorism, it appears to be advisable to vaccinate *large numbers* of animals as a standard policy against a range of highly contagious diseases. Therefore, a great deal can be said for developing tests that can distinguish between infected animals and those that have been vaccinated with a marker vaccine. Importing countries could then be obligated to use these tests. A European policy could then be implemented that prohibits dissolving of supply contracts – or drastically reducing the price – for meat, dairy products and eggs *only* because the products originate from vaccinated animals.[224] However, the end-user – the consumer – would still retain every right to boycott

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[222] Thanks to GPS, transports can now be monitored much more closely. This has also been shown with manure transport in the Netherlands.

[223] It is this system which is affected by AIDS = Acquired Immune Deficiency Syndrome..

[224] Progress has been made on the price problem in recent years, at least in the Netherlands. In June 2010, the government and the Product Boards concluded the third voluntary special-purpose agreement (*convenant*) on the *Diergezondheidsfonds* [Animal Health Fund]. In this context, the Huirne Commission prepared a plan for "damage reimbursement from collective sector funds to farmers who vaccinate their animals regarding a previously defined set of damage components." LTO Nederland [Dutch Farmers Union] wants the government to pay damages above a specific ceiling, but the current Dutch cabinet wants to arrange that through the European CAP (*Agrarisch Dagblad* 14 May 2010 and *agd* 18 March 2011).

the products. The likelihood of such a boycott increases as public emotions become more intense.

Another constraint on preventive vaccination is that new varieties of pathogens can always emerge, against which the vaccine is ineffective. There are also livestock diseases such as African swine fever for which no vaccines yet exist.[225] Consequently, preventive vaccination can certainly reduce the risk of outbreaks, but not eliminate the risk entirely.

Box 7.12 Effects of calamities on sustainability

Historically, environmental and energy disasters have often contributed to improving awareness about ecological sustainability. For example, consider the oil boycott in 1973, the chemical disaster in Bhopal in 1984, the nuclear disaster in Chernobyl in 1986, and the oil disaster in the Gulf of Mexico in 2010.

On the other hand, different types of calamities can actually draw attention away from sustainability. For example, during food shortages there will be less attention for the environment, climate, natural habitats, working conditions, the Third World and animal welfare. Moreover, calamities can frustrate sustainable development. In this way, a calamity usually leads to inefficient use of the means of production. For example, an epidemic of a livestock disease goes hand-in-hand with loss of meat, dairy products, animal feed, fertilisers and energy. The BSE crisis in the EU even resulted in the destruction of large areas of nature in South America. From the opposite perspective, preventing calamities is theoretically beneficial for sustainability.

This does not mean that *every* concrete measure to prevent or fend off a food crisis is beneficial for sustainability. There can be positive as well as negative effects.
Examples of measures with a *negative* sustainability effect:

- Expanding the area of farmland to benefit food security often has a negative effect on biodiversity and climate change.
- The alternative – intensification of agriculture – can also be harmful for the environment and biodiversity.

Examples of measures with a potentially *positive* sustainability effect (synergy):

- In general terms, measures that stabilise prices, such as creating stocks, can contribute to efficient use of natural resources and more considerate use of animals and natural habitats.
- A land set-aside scheme can not only attenuate price shocks, but can also benefit flora and fauna in years that the set-aside land is not cultivated. The same applies to an extensification scheme.
- A mandatory buffer capacity on livestock farms – with a view to a possible transport ban following an outbreak of contagious livestock disease – can also benefit animal welfare, even in years that the buffer does not have to be used.
- Production of protein-rich feed crops in the EU not only increases the resilience of the EU to the whims of geopolitics, but also entails less risk for nature reserves when compared with the production of such feed crops in South America.
- Selective relaxation of the ban on meat-and-bone meal, as proposed by the European Commission, can replace imported soya. This can benefit natural habitats and food production overseas, as well as benefiting the climate and saving transport fuels.
- Reducing long-distance animal transport not only lowers the risk of spreading contagious diseases, but can also contribute to energy savings and animal welfare.
- Planting trees in between crops (agroforestry) can offer protection from severe precipitation, harsh sunlight and drought, particularly in the tropics. At the same time, trees sequester carbon aboveground as well as underground, which helps to mitigate climate change.

The *general immune system* has been a focus of interest in recent years for immunologists. A strong general (natural) resistance reduces the risk of a wide range of infections. Although the

[225] In recent months outbreaks of African swine fever have been reported in the Caucasus and near St. Petersburg, thus not far from the EU. http://www.pve.nl/pve?waxtrapp=cgotGsHsuOpbPREcBlBKHG en http://web.oie.int/wahis/public.php?page=single_report&pop=1&reportid=10234

general system is not sufficiently effective against the dreaded, highly contagious livestock diseases, it can somewhat mitigate infection, providing precious time for control measures. Moreover, it can improve the effectiveness of vaccinations.[226]

Livestock farmers can strengthen natural resistance through breeding, husbandry practices and livestock nutrition. The EU could promote this process with innovation incentives.

Preparedness and response

In the realm of preparedness, there is also a wide range of standard measures, such as transport bans, culling and vaccination. At least 4 measures can be added.

Option 1. Emergency stocks of vaccines and basic capacity for culling

An important precautionary measure is to create emergency stocks of vaccines against a range of highly contagious livestock diseases. Of course, this is only necessary for diseases against which the livestock herd is not preventively vaccinated. Some Member States have already established such emergency stocks, but because this can involve large quantities, and because it is impossible to predict *where and when* disease outbreaks will occur, it is more effective and less costly to coordinate this at the European level.

The same applies to culling capacity. In case of simultaneous outbreaks in multiple regions of a disease for which a vaccine is available, "ring vaccinations" around the infection hotspots may be sufficient – assuming prompt detection and sufficient stocks of vaccine. But if there is an outbreak of a disease for which no vaccine exists, then the regional culling capacity will quickly become inadequate. Therefore it is advisable to make agreements in the European context about basic preparedness and mutual assistance.

Option 2. Prescribed buffer capacity on livestock farms and at slaughterhouses and rendering plants

Due to transport bans following a disease outbreak, livestock farms can quickly become overcrowded. Moreover, consumers can lose confidence in the safety of meat and/or dairy products. This is especially likely in case of a zoonotic disease.[227] In that case, prices collapse and livestock farmers can no longer sell their livestock for slaughter – or at least not for a reasonable price. The only alternative is then to send the animals to the rendering plant, but its capacity can also be exceeded. In that case there would be a likelihood that animals would be neglected, farms would become overcrowded or cadavers would be illegally dumped, entailing risks of spreading the disease even further.

These risks can be limited to some extent by maintaining a buffer capacity on livestock farms, especially pig and chicken farms.[228] Buffer capacity is also needed at

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[226] G. Benedictus, H. Savelkoul, C. de Vries & J. de Wilt 2006. *Weerbaar Vee*. [Resilient livestock] Innovatienetwerk Agrocluster en Groene Ruimte.

[227] In this respect, BSE was a clear example: consumer confidence collapsed completely when it turned out that it was a zoonotic disease.

[228] Additional buffer capacity is especially worthwhile on pig and chicken farms. Broiler chickens are ready for slaughter after about 6 weeks. In the Netherlands, sows give birth to 25 piglets per year on average, which are ready for slaughter after about 4 months. On such farms, a transport ban would quickly lead to overcrowding. In comparison, milk cows only give birth to a single calf per year, which then takes more than a year to start producing milk. However, in case of transport bans, the capacity of the milk tank on the farm would become a constraint almost immediately. This is because cows cannot quickly stop giving milk, and milk is highly

slaughterhouses and rendering plants. During the crisis, at the very least this buffer capacity would provide additional time to take measures. On a competitive market, few entrepreneurs would do this voluntarily, so the market would fail and this would be a task for the government.

The Netherlands is leading the way in this regard in the sense that the minimum space for piglets and finishing pigs is larger here than elsewhere in the EU. This is primarily to benefit animal welfare, but it also provides a buffer in case of a disease outbreak. The *RDA* [Animal Affairs Council], the *RLG* [Rural Council][229] and the *KNMvD* [Royal Netherlands Society for Veterinary Medicine][230] have all called for such buffers. In the animal welfare requirements that will apply to pig farming beginning in 2013, the minimum pen space per animal has been expanded.[231]

One option for the EU is to promote buffer capacity throughout the EU,[232] by either making this compulsory or semi-compulsory – by linking it to farm payments (cross-compliance).

Option 3. Establish emergency stocks of meat

Emergency stocks of meat and dairy products can be established to attenuate severe price fluctuations, up or down. For more information on this topic, refer to Option 6 on page 85. However, such emergency stocks would provide few benefits if demand collapsed in addition to production.

Option 4. Allow more imports of meat and dairy products

If meat becomes scarce following a livestock disease outbreak, and if prices rise sharply, then the EU can lower the thresholds to imports of meat and dairy products. This has advantages and disadvantages as well as risks. For more information, refer to Option 4 on page 83.

Recovery

To promote the recovery of livestock farming following a crisis, national governments or the EU could provide emergency credit, or encourage banks to do this, for example by sharing the risk. But farms and businesses must also take more responsibility themselves, for example with insurance. The government can encourage this development by subsidising part of the premium or assuming part of the risk. Of course, it is important to restore all buffers to their initial levels: emergency stocks of meat and the buffer capacity on farms and at

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perishable. There is no satisfactory solution for this constraint (E.J. Aalpoel in an e-mail, 15 February 2011). In practice, dairy farmers will simply discard the milk into the manure storage or directly onto the land.

[229] RDA and RLG 2003. *Dierziektebeleid met draagvlak. Advies over de bestrijding van zeer besmettelijke dierziekten.* [Livestock disease policy with a support base. Recommendations on controlling highly contagious livestock diseases] See: http://www.rlg.nl/adviezen/038/038_1/038a.html

[230] KNMvD 2007. *KNMvD-standpunt: massaal doden en destrueren van gezonde dieren in het kader van dierziektebestrijding?* [KNMvD standpoint: is massive culling and disposal of healthy animals necessary to control livestock disease?] http://www.isis-veganisme.nl/bio-industrie/regels.knmvd.pdf

[231] For finishing pigs from 85 to 110 kg, the minimum space per animal will be expanded from 0.8 to 1.0 m^2. Source: http://www.dgbenergie.nl/content/files/Files/IKB_Nederland/Reglement/LB77_bijlage_31_schema_welzijnseisen_varkens_2005.pdf

[232] Mandatory buffers also exist in the financial world. According to the Basel III guidelines, banks are required to maintain a capital buffer of at least 7%. And for pension funds in the Netherlands, there is a minimum coverage level for financial obligations.

slaughterhouses and rendering plants. The most important requirements will differ between epidemics and between regions.

Are the means and aims in proportion?

Following this long series of options, the reader might ask, isn't this entirely out of proportion? Are all these measures really necessary to prevent or to deal with calamities? In fact, not all of these measures are necessary. Firstly, not all of the above options are desirable, as shown in the descriptions. Secondly, not all of the options that have been assessed as beneficial will be needed. In fact, it would be a bad idea to implement them all in practice. A smart selection of options will be sufficient. Moreover, as more effective preventive measures are taken, less reactive measures for preparedness and response are required.

But then another question arises: should we really take so many measures to maintain such a luxurious level of production and consumption of meat and dairy products? After all, meat and dairy products can be largely replaced by plant proteins, which require much less land, energy and minerals to produce and generate much lower emissions. Livestock farming is obviously not an efficient source of protein because it uses so much land, energy and raw materials, places a heavy burden on nature and the environment and can also cause problems for public health. Finally, animal welfare must also be taken into account.

The above propositions can be counteracted with a number of arguments. First of all, the options are not intended as *structural* support for production and consumption, but for preventing and responding to *calamities*. Secondly, calamities in the livestock sector are of a different order of magnitude than calamities in sectors such as the automobile industry. They are not only harmful for the economy and society, but also for animals, natural habitats, the environment, climate and animal welfare. Moreover, the emotional and societal impact can be enormous. Even the fiercest critics of the livestock sector would not be happy with a sudden crisis in the sector.

This does not take away from the fact that there are legitimate arguments for a structural reduction in the consumption of meat and dairy products (Option 7, page 74). But even if something like this happened, it would probably happen slowly, and therefore would only provide a limited contribution during the next decade to a reduced vulnerability for crop failures and a collapse of soya imports.

It is therefore of great social importance to build stabilisers into the production system. And there is yet another argument: it would be in the interest of food-importing developing countries.

8. Shifting the burden to developing countries, and options to limit this tendency

In the previous chapter we outlined how the European market would respond to a scarcity of animal feed caused by crop failures or a collapse of soya imports and to large-scale livestock epidemics. We also discussed how the EU and national governments could respond to prevent severe damage to their food production and supply systems. Some of these responses have consequences for the world market and for the food security of food-importing developing countries.

The situation in those countries is still worrisome. Between 1996 and 2009, the number of hungry people in the world increased greatly (Fig. 8.1). Recently, the number began to fall as a result of lower food prices and improved welfare in developing countries, but it is unlikely that this trend will continue now that grain prices have again risen to very high levels. It also comes as no surprise that the number of food riots rises (and falls) along with the food prices. See Figure 8.2, which does not include the food riots in 2010 and early 2011.

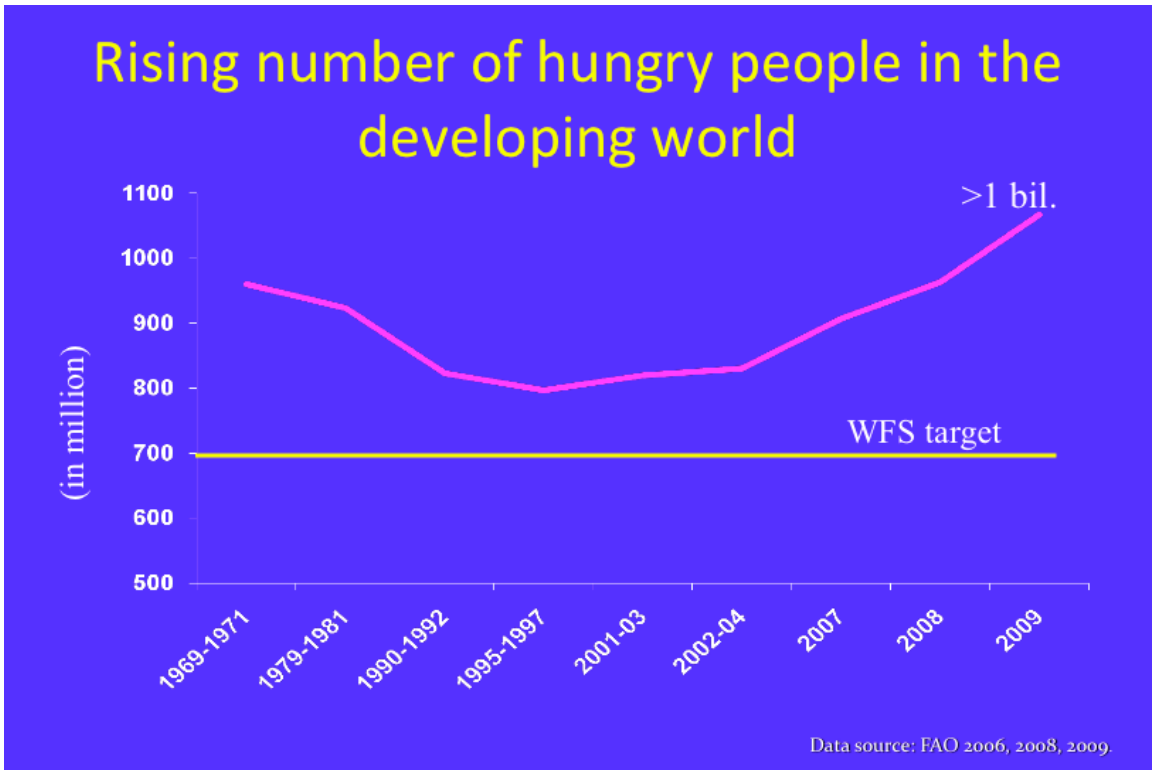

Figure 8.1 The number of hungry people since 1969. Source: Joachim von Braun.

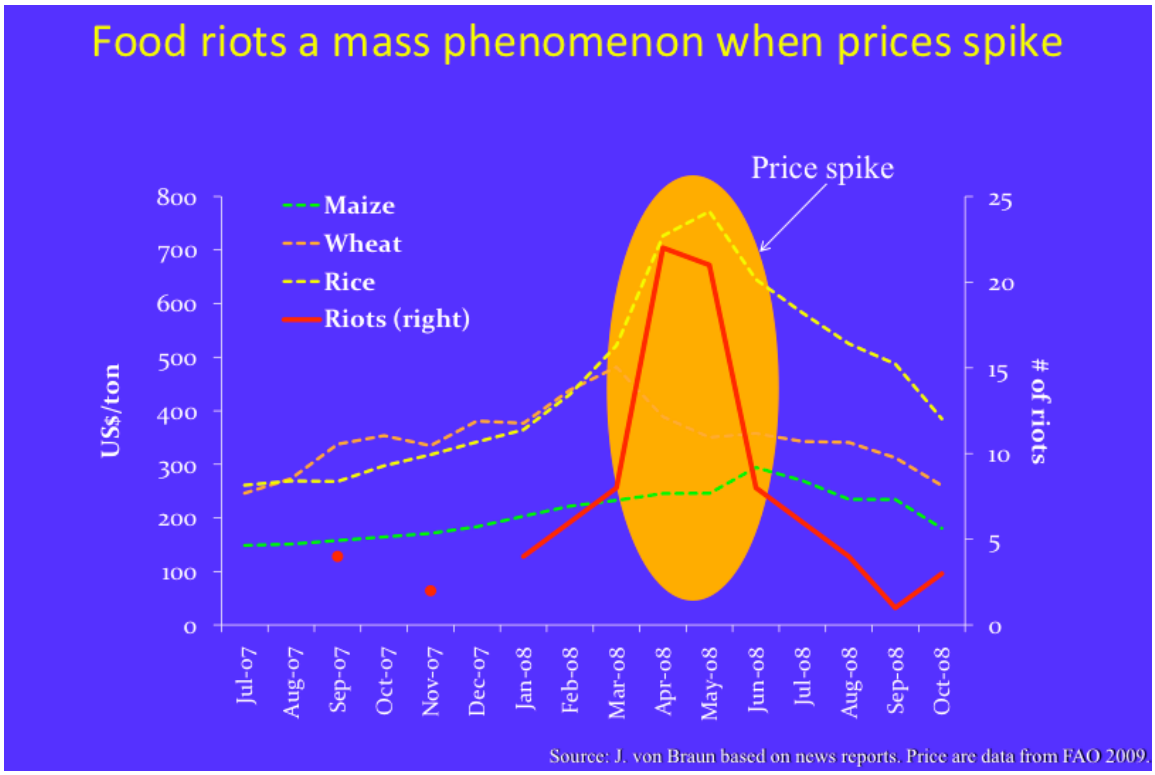

Figure 8.2 The number of food riots as a function of price developments for wheat, rice and maize.

Of the policy options for the EU referred to in the previous chapter, those that can lead to more severe price shocks on the world market are particularly disadvantageous for developing countries. The most disadvantageous of these policies are:

- discouraging exports of grain;
- encouraging imports of grain, meat and dairy products;
- implementing a flexible biofuel blending mandate in such a way that the EU actually "exports" price instability (as it previously did, and still does with export subsidies – albeit to a lesser extent).

Also disadvantageous are long-term contracts with exporters. These limit the room on the market for food-importing developing countries. This often applies as well to land grabbing in Africa, Asia or South America, unless this practice is combined with investments in food production for the local market (Box 8.1).

Measures that are neutral or even beneficial for developing countries are those that have a stabilising effect on food prices in the EU and on the world market. The most stabilising of these measures are:

- creating emergency stocks to sell or distribute during calamity and price spikes;
- implementing land set-aside or extensification – which can then be activated/intensified in case of high prices;
- implementing a flexible biofuel blending mandate in such a way that less biofuel (regardless of origin) has to be blended in case of high grain prices;
- creating emergency stocks of potentially scarce means of production, such as water and seed;
- establishing emergency credit facilities and co-financing insurance in order to maintain production capacity during calamities.

Yet it is clear that the EU – due to its enormous purchasing power – can significantly harm or even destabilise food-importing developing countries during periods of scarcity of feed, meat and dairy products. This concerns, among others, most of the countries in sub-Saharan Africa. Therefore it is crucial to determine how the EU and the Netherlands can help developing countries make their own food systems more shock resistant. It is no exaggeration to state that such policy would also serve national security interests: hunger creates a breeding ground for food riots, instability, war and extremism.[233] In hotbeds like the Middle East and nuclear-armed Pakistan, the security risks are even greater.[234]

On a preliminary note, the global governance on food security is still poorly developed. There are programmes and flows of funds, but few obligations and sanctions. This stands in stark contrast to the governance on food *safety*, livestock diseases and plant diseases. This is much less permissive and has strict rules with respect to standards and trade, including sanctions and arbitration. The rights and obligations of importers and exporters are reasonably well defined. As previously stated, the General Food Law of the EU also has strict regulations for food safety, but none at all for food security. So there are many reasons for the lagging governance of food security to catch up, both in the EU and worldwide.

To make developing countries less vulnerable for food crises, two steps must be taken:
- regarding prevention: continue agricultural development;
- regarding preparedness and response: make agriculture and food security more resilient for calamities.

Prevention

In the area of prevention, the following options should be considered:

Option 1. Investments in agriculture

Between 1980 and 2005, the priority of agriculture fell sharply on the agendas for government investment[235] and development cooperation worldwide. The share of agriculture in the budget for development cooperation fell from 17% to a meagre 3.8%.[236] Following the food crisis of 2007/08, the priority of agriculture has once again risen on the development agendas of the World Bank, the EU, the Netherlands[237] and other countries. This is sorely needed because the prevailing economic theory – which states that developing countries have a competitive advantage due to their low costs for labour and land, and should therefore reap great benefits from liberalisation – has turned out to be dangerously simplistic.

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[233] In Tunisia and Egypt the recent unrest – caused in part by high food prices – has helped to move dictatorships in a democratic direction. But from these events it cannot be inferred that high food prices are beneficial for democracy; the opposite can also happen.

[234] Warner *et al*. (op. cit.) pointed out that linking a problem with security is often an effective way to get the problem higher on the political agenda.

[235] www.eerstekamer.nl/eu/behandeling/20101126/...=/viktjmexkpg2.pdf

[236] High Level Expert Forum – How to Feed the World in 2050. *Investment.* Paper, 2009.

[237] *Landbouw, rurale bedrijvigheid en voedselzekerheid*. [Agriculture, rural commerce and food security] *Nota van de ministers Verburg en Koenders* May 2008. During its round of budget cutbacks, the new Dutch government spared the budget item "private sector and food security", and for 2011 actually budgeted an additional €40 million. See the *Beleidsbrief Ontwikkelingssamenwerking* [Policy Letter on Development Cooperation] of Minister Knapen, 26 November 2010.

Box 8.1 Land grabbing: risks and opportunities

In recent years, public and private investors from wealthy countries have increasingly invested in buying or leasing farmland in developing countries. The most important motive for this increased investment is the damaged confidence in the world market as a source of food and biofuels. This was the result of the food crisis of 2007/08, the export restrictions imposed by several countries and failed attempts thereafter to conclude long-term contracts. Profit expectations are also playing a role.

Between 2006 and 2009, countries such as China, South Korea, India, Saudi Arabia, the UK, Sweden, Denmark and Germany invested in farmland in at least 24 developing countries, especially in Africa, Asia and South America. Most investments were made in thinly populated regions with poorly developed land ownership rights, such as the Guinea savannas in Africa, forested regions in Southeast Asia and the Congo, and the *cerrados* of Brazil. More than 70% of the investment took place in sub-Saharan Africa (especially Ethiopia, Sudan, Mozambique and the Congo) where the conditions for land purchase by foreign investors are the most beneficial. Enormous areas are sometimes involved, such as 450,000 ha for biofuels in Madagascar, 150,000 ha for livestock farming in Sudan and 100,000 ha for irrigated agriculture in Mali. China has its eye on even larger areas: 2.8 million ha in the Congo, 2 million ha in Zambia and 1.24 million ha in the Philippines. The latter plan was halted by the Philippine government, but in 25% of the cases the land is actually being farmed.

Critics refer to this practice as "land grabbing". The criticism focuses especially on the risks for the local population and wildlife habitats. But in principle there are also opportunities for developing countries.

Opportunities	*Risks*
Investment in agriculture	Loss of land ownership
Development of exports	Corruption
New commerce including biofuels	Land speculation
Employment	Social and environmental damage
Technology-transfer	Exhaustion of farmland
Improved land ownership rights	Food uncertainty

Whether the opportunities for the local population improve or actually become worse depends entirely on the content of and compliance with the contracts. Until now, there have been more negative examples than positive ones. The contracts are often poorly put together.

One example of a tragic failure is a project of the Dutch company Bioshape in Tanzania. It involved a plantation of the energy crop *Jatropha curcas*. A great deal went wrong. The farmers were not bought out according to the rules, much of the money was kept back by the local authorities, timber was illegally cut and sold, and the environmental impact assessment was defective. When the Dutch government stopped providing subsidy and a financier withdrew, the project failed. The experimental plantation fell into ruin and the farmers were left destitute.

A more positive example – also in Tanzania – appeared to be a project of the Swedish company SEKAB, one of the largest producers of bio-ethanol in Europe. Until 2009, the company worked on a pilot project with a sugarcane plantation and a processing plant. The conditions under which the company operated – especially regarding employment and respect for the ownership structure – were evaluated by external observers as relatively beneficial. But the company terminated the project in 2009 for various reasons, including a shortage of new land.

There are bizarre situations as well. Sudan and Ethiopia leased out large areas of farmland for producing export crops, while at the same time receiving food aid for millions of people from the World Food Program. And to help persuade investors, Pakistan offered a huge security force – 100,000 strong – in addition to land.

Due to the bad experiences with land grabbing, a code of conduct is often called for. The IFPRI argues that the following aspects should be part of a code of conduct:

- transparency in negotiations
- respect for existing land ownership rights
- a reasonable share in the profits for the local population
- minimum environmental damage
- a positive contribution to local food security.

In addition, the IFPRI calls for effective government, legal sanctions for investors who break the rules and greater involvement of local farmers in the project.

Box 8.1 *continued*

The World Bank, the FAO, UNCTAD and the International Fund for Agricultural Investment have prepared a set of recommended principles, which can be used as the basis for a code of conduct. However, during a meeting of the FAO Committee on Food Security in October 2010, these recommended principles were tentatively rejected by civic organisations due to the lack of participation and involvement of local parties. Oxfam also pointed out that the preparation of a code would require at least 10 years, while rapid developments are taking place in the meantime.

Considering the widely divergent interests of the parties involved and the increasing international demand for land reserves, it will not become any easier in the future to arrive at a broadly supported code of conduct.

Meanwhile, land grabbing continues. The Chinese state-owned company Beidahuang is negotiating with Argentina about investing $1.45 billion in irrigation and production on an area of 320,000 ha. The company is aiming for a 20-year contract to benefit food security in China. Critics refer to a bargain sale of land for industrial soya production. Brazil wants to restrict the purchase of agricultural land by speculators, foreign governments and state-owned companies.

Sources:

von Braun, J. 2010. Mansholt lecture, Wageningen University.
Brown, Lester R. 2010. The Emerging Politics of Food Scarcity. Earth Policy Institute. blog.sustainablog.org/food-security-global-politics/
Cotula, L. S. Vermeulen, R. Leonard & J. Keeley. 2009. Land grab or development opportunity? Agricultural investment and international land deals in Africa. FAO, IIED & IFAD.
Allen, M. 2009 "Land Grabbing" by Foreign Investors in Developing Countries. Risks and Opportunities. IFPRI www.ifpri.org/.../land-grabbing-foreign-investors-developing-countries
Lindijer, K. 2010. Nieuwe kolonisatie moet Afrika juist ontwikkelen. [The new colonialisation should benefit development in Africa] NRC Handelsblad 14 December.
Oakland Institute 2009. The great land grab: rush for the world's farmland threatens food security for the poor. www.oaklandinstitute.org
Valentino, S. 2010. Bioshape trekt spoor van vernieling. [Bioshape leaves disaster in its wake] NRC Handelsblad 21 September.
World Bank 2010. Rising global interest in farmland. Can it yield sustainable and equitable benefits? siteresources.worldbank.org/INTARD/.../ESW_Sept7_final_final.pdf
Zwart, G. & D. Pruett 2010. Comments on World Bank report. Oxfam. http://ediscussion.donorplatform.org/wp-content/uploads/2010/09/Oxfam-comments-on-WB-report.pdf
Tanzania: *http://www.dailynews.co.tz/feature/?n=14722&cat=feature*
Tanzania, SEKAB*: http://www.compete-bioafrica.net/bestpractice/COMPETE-032448-GoodPractice-CaseStudy4-Bagamoyo.pdf*
Argentina: *http://www.grain.org/front/*
Brazil: *Brazilië legt grondaankoop aan banden. [Brazil restricts land purchases] agd 8 maart 2011.*

Especially needed are coordinated investments in *institutions,* such as market infrastructure, property rights, credit provision and government information services.[238] The Green Revolution in Asia also came about through such coordinated investment, but this lesson has long been forgotten. Moreover, investments in agriculture can be a motor for the larger economy. In the poorest countries, each 1% growth in agriculture can generate 2.5% total economic growth; 1% growth in other sectors has a much smaller multiplying effect.[239]

A specific subsidiary aim of such investments should be to strengthen the resilience of the food system for calamities. Since 2008, the World Bank has been active in developing

[238] A. Kuyvenhoven & H. Stolwijk. 2010. *Developing countries and EU agricultural and food policy: opportunities and threats*. In: A. Oskam, H. Meester & H. Silvis. *EU Policy for agriculture, food and rural areas*. Wageningen Academic Publishers.
[239] World Development Report 2008. *Agriculture for development.*

countries, especially in Africa and Asia, to provide assistance against the threats of extremely high food prices. For this purpose, it created the Global Food Crisis Response Programme (GFCRP). Worldwide, approximately 5.9 million agricultural households have benefited from this programme. Short-term production has been improved with fertiliser, seeds, tools and restoration of small-scale infrastructure. The GFCRP has also helped with school meals, nutritional supplements for mothers and children, and money and employment for people affected by extremely high food prices. Several countries have also been given financial assistance to reduce food taxes and import tariffs.[240]

Box 8.2 Agricultural neglect in Africa

During recent decades in Africa, agriculture has been neglected not only by the donors, but also by the African governments themselves. They allowed this to happen because they could import cheap food as a result of food aid and food dumping by wealthy countries. They began to focus instead on the urban elite (which often controls imports), the military and the big producers of cash crops. Another factor is that poor urban citizens tend to revolt sooner than poor farmers.

In the context of liberalisation, important institutions were also abolished or privatised. As a result, farmers were scarcely able to improve productivity per hectare and began to focus more on expanding their acreage. The production was unable to keep pace with population growth. Even though Africa was self-sufficient in food shortly after decolonisation, and enjoyed twice as much per capita income as Asia, today it has become a net food importer and the per capita income is much lower than that in Asia. Partly as a result of the Green Revolution and the stimulus it provided to the economy, incomes have risen in Asia.

In the EU as well, agriculture could develop rapidly after World War II thanks to government interventions in the form of market protection, subsidies and investments in institutions.

Sources:

De Schutter, O. 2011. "Voedselhandel is verworden tot casinospel". [The food trade has become a casino game] Interview in NRC Handelsblad 23 February 2011.

Kuyvenhoven, A. 2007. *Africa, agriculture, aid. Valedictory lecture, Wageningen University.*

Development cooperation policy in the Netherlands also focuses on food security, primarily with a view to an increasingly unstable climate. In this context, the Netherlands took an important step in November 2010 by holding a global conference on agriculture, food security and climate change.[241] There will be a sequel to this conference. To prepare for this second conference, interesting papers have been written by the World Bank and the FAO with many examples about how improvements in agricultural production can go hand-in-hand with improved resilience to extreme weather and climate change.[242,243] Adaptation to climate change can go hand-in-hand with mitigation (tempering the emissions of greenhouse gases). For example, this is the case with agroforestry and biogas. This linkage between the agendas for agriculture and climate is very promising.

[240] http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:22739612~pagePK:64257043~piPK:437376~theSitePK:4607,00.html

[241] The Hague conference on agriculture, food security and climate change 2010. *Chair's Summary.* www.rijksoverheid.nl/.../2010/.../the-hague-conference-on-agriculture-food- security-and-climate-change-chair-s-summary.html

[242] World Bank 2010. *The Hague conference on agriculture, food security and climate change. Opportunities and challenges for a converging agenda: country examples.*

[243] FAO 2010. *The Hague conference on agriculture, food security and climate change. "Climate-Smart" Agriculture – Policies, Practices and Financing for Food Security, Adaptation and Mitigation.*

Option 2. The right to protect agriculture against rapid growth of imports
If all barriers to imports are eliminated, the agricultural sector in many countries, including developing countries, risks being put out of business by competition. Under WTO rules, developing countries have the right to protect a substantial basic level of their own food production with tariffs and/or import quotas against cheaper imports. Based on the so-called Enabling Clause from the GATT Accord (1979), they are exempted from the non-discrimination principle, which requires each country to treat all its trading partners equally.[244] The Special Safeguard Mechanism, which went into effect later, gives countries the right to protect their domestic producers against cheap imports. During the Doha Round, India and other developing countries claimed the right to make use of this mechanism when imports increase more than 10%, or prices fall sharply. The USA, the world's largest agricultural exporter, wanted a much higher threshold of 40% growth in imports.[245] This reflects the high priority given in the USA to market access to the growing middle class in the emerging economies. The EU took an intermediate position. To safeguard food security in developing countries, it is crucial that the threshold for intervention remains low.[246] The Netherlands also supports that standpoint.

Moreover, the credit conditions of the IMF and World Bank are much stricter than the current WTO rules and offer little room for import restrictions to protect domestic food production. For example, Ghana was not allowed to impose a regulatory tariff on imports of cheap chicken wings from the EU, which forced local poultry farmers out of business. These rigid conditions are based on the unrealistic economics theory referred to previously. It was assumed that the institutions needed for agricultural development would emerge automatically from the market after liberalisation, but in most cases this has not happened. In fact, important institutions have been abolished. It is often forgotten that it took decades of protection and active support, also for institutions, before the agricultural sector in the EU became competitive. The same applies to the green revolutions in China, India and Indonesia, which relied on market protection, activist governments and participation of small farmers. The rigid regimes of the IMF and the World Bank are disastrous for such developments (Box 7.2).

Moreover, food aid has also damaged the agricultural sectors in many developing countries more than it has helped. Although this aid was often effective during the food crisis itself, it became counterproductive if it was continued after the crisis. As a result, local farmers were forced out of the market, and the countries became increasingly dependent on food aid. The most disastrous type of aid was the "in kind" food aid from the USA; according to critics, it often did more to serve the interests of American agribusiness and the US transport sector than the distressed country for which it was intended. Food aid was often a

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[244] For example, China has set a target of at least 95% self-sufficiency in grain. To this end, grain prices are supported and inputs are subsidised (OECD-FAO 2010). The disadvantage of input subsidies is that they can lead to inefficiency, waste and pollution. Agreements can probably be made on this aspect in the context of the FAO or WTO.

[245] For that matter, the WTO has acknowledged that right for all countries regarding products that are being dumped on the world market, where dumping is defined as selling the product at below the price on the domestic market. But according to Smaller & Murphy (note 5), the domestic price of commodities in the USA is often below the cost of production for the farmer. This applies to commodities such as maize, soya, rice and cotton. As a result, farmers in developing countries are confronted with imports at artificially low prices, against which they are unable to compete. Moreover, the objection procedures at the WTO are costly and time-consuming

[246] The Dutch development cooperation organisations ICCO, Cordaid and OxfamNovib have called for the EU and the WTO to support the claim of developing countries for flexibility regarding special products and special safeguard mechanisms. Also, developing countries should not be forced to take rapid and far-reaching steps towards liberalisation. See: *Brief 1 september 2008 aan de vaste Kamercommissies voor Buitenlandse Zaken, LNV en Financiën*.

way to dispose of surpluses; it decreased during periods of high prices, and increased when prices rose – exactly the opposite of what developing countries needed. In the 1990s, the EU stopped giving this type of aid. The OESO has pointed out that it is much more efficient to replace mandatory in-kind food aid with cash transfers, which enable countries to purchase food in their own region.[247]

In this context, the Netherlands could seek to help developing countries in two ways:

- Use its good relations with the USA to motivate this country to be more flexible in the WTO negotiations on the special safeguards. But it remains to be seen if that will make much impression in view of the large commercial interests at stake.
- Directly and through the EU, exert pressure on the IMF and World Bank to temper their credit conditions. In that case, it is essential that the pressure also comes from the Ministry of Finance.

In recent years, NGOs (Box 8.3), developing countries and the UN[248] have frequently cited the *Right to Food.* Moreover this is sometimes used as a review framework for policy.[249]

Option 3. Code of conduct for biofuels

The growing popularity of energy crops is not without risk for food security. In 2007, approximately 5% of world grain production and 9% of vegetable oil production was used for biofuels.[250] Particularly during periods of tight grain supplies, this can drive up prices on the world market, which is especially a problem for food-importing developing countries. Locally, the production of crops for biofuels competes directly with food production.

The latter problem can be solved with codes of conduct. The basic principle must be: no farmland should be used for energy purposes until the food needs of the country have been met. The EU should also make this is a firm condition in its policy.

Option 4. Code of conduct for land grabbing

Land grabbing can also undermine food security. Here as well, adequate codes of conduct are sorely needed (Box 8.1). One of the preconditions must be that the food security of the local population should not be eroded by such land acquisition, but should actually be improved. However, there is not yet any consensus about the effectiveness of codes of conduct.

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247 See: Food and Nutrition Coalition 2005. *Dumping Food Aid: Trade or Aid?* ICCO/Wemos. www.wto.org/english/.../posp47 dumping_food_aid_e.pdf

248 O. De Schutter 2010. *Countries tackling hunger with a right to food approach.* Briefing note 01 by the special Rapporteur on the Right to Food.

249 A clear argument in favour of integrating the Right to Food in the world trading system can be found in: C. Smaller & S. Murphy 2008 *op. cit.* Other proposals can be found in: W. Sachs & T. Santarius 2007. *Slow Trade – Sound Farming. A multilateral framework for sustainable markets in agriculture.* Heinrich Böll Foundation, Misereor & Wuppertal Institute. This report was based in part on a North-South dialogue. A juridicial approach can be found in: O. De Schutter 2008. *A human rights approach to trade and investment policies.* www.tradeobservatory.org/library.cfm?refID=104504

250 OECD-FAO 2008. *World Food Outlook 2008.*

Box 8.3 Effects of the credit conditions of the IMF and World Bank on rice production and food security in Ghana, Honduras and Indonesia

High agricultural prices benefit farmers who produce partly or entirely for the market. But they do not benefit the urban population and farmers who are net buyers of food. The other way around, low prices benefit the urban population, but are disastrous for market-oriented farmers. Poor farmers in developing countries risk food shortages especially during the period just before harvest. This risk increases as the prices for their products fall and their purchasing power erodes.

Liberalisation brings domestic agricultural prices closer to the world market prices, which are usually lower. Consequently, liberalisation usually works to the advantage of the urban population, but to the disadvantage of domestic farmers. This can be illustrated with three case studies on the rice markets in Ghana, Honduras and Indonesia between 1990 and 2005.

In the early 1990s, Ghana and Honduras liberalised their rice markets under pressure from the IMF; Indonesia followed in 1997. The markets were promptly flooded with cheap rice from Vietnam and Thailand (in Ghana and Indonesia) and the USA (in Ghana and Honduras). Domestic rice farmers were forced out of the market and confronted with rapidly falling prices.

This was too much for the governments, so they took a step back. Ghana raised it's import tariff on rice from 20% to 25%. However, only a few days later it was forced to roll back the measure under pressure from the IMF. Indonesia refused to yield, but remained under great pressure.

Additional handicaps for rice farmers concerned the privatisation of facilities such as stock management, credit facilities and extension services, and the elimination of subsidies on inputs such as seed, fertiliser, machinery and marketing facilities. Moreover, the government no longer purchased their rice. These facilities and subsidies were abolished as part of programmes, which the IMF and World Bank demanded as conditions for structural adjustment loans.

The rice farmers (often women) lost much of their market and income, fell into debt and had less money for healthcare, education and food. In some areas, farmers even went hungry. And they became even more vulnerable for crop failures. Some of them returned to subsistence farming.

Remarkably, the cheap rice involved dumping practices: Vietnam and Thailand gave their farmers import and export subsidies, and the USA provided export subsidies and gave excessive food aid to Ghana and Honduras. However, these dumping practices were not questioned by the IMF. The liberalisation was therefore asymmetrical. Despite the dumping practices, consumer prices did not fall that much, especially due to the oligopolistic structure of the trade. In Indonesia, consumer prices actually *rose*. The oligopolistic trade structure was also left alone by the lenders.

The policies of the IMF and World Bank can therefore have a negative impact on domestic agriculture, food security and the resilience of the farming population, and sometimes even on the urban consumer. This is partly due to trade liberalisation itself, and partly due to its asymmetrical character.

Honduras made additional concessions to the USA. As part of the *Free Trade Agreement between the US and Central American Countries plus the Dominican Republic (DR-CAFTA, 2006)* the country committed itself to a gradual reduction of its import tariff from 45% to 0% in 2024. At the same time, the USA refused to discuss its own export subsidies. In this unequal battle, Honduran rice farmers appear to have lost out.

Source: A. Paasch, F. Garners & T. Hirsch 2007. Trade Policies and Hunger – The impact of trade liberalisation on the right to food of rice farming communities in Ghana, Honduras and Indonesia. Ecumenical Advocacy Alliance, Geneva.

Preparedness and response[251]

In areas where prevention is inadequate, precautions are necessary. Options:

Option 1. Trade regulations that are more resilient to scarcity

The WTO regulations for agriculture were developed during an era of overproduction; their primarily objective was to get countries to open up their markets for *imports*. In times of scarcity, these regulations lose much of their relevance, and it is more important to ensure that food-exporting countries do less to restrict their *exports*. Under WTO regulations, export

[251] Several countries, including Russia, Morocco, Vietnam and Malaysia, began bartering for commodities such as palm oil, rice and fertiliser.

restrictions are permitted. Exporting countries are indeed required to take the food security of importing countries into account, but this obligation does not apply to developing countries.

This is a thorn in the side of many economists. They believe that export restrictions distort the market, discourage domestic producers and damage the interests of importing countries.[252] They urge the WTO to ban such restrictions. But in political terms, certainly in a democracy, it is logical that, during times of scarcity, a government gives priority to its own population. On the other hand, scarcity should not lead to "everyone for themselves" and to anarchy in trade policy, with domino effects that can cause shockwaves. It would therefore be better to regulate such interventions in the WTO, rather than ban them entirely.

For that matter, in 2007/08 many countries took other types of measures to benefit their own populations and farmers: tax reductions, import tariff reductions, sales of public stocks, incentives for domestic production (such as subsidies on fertiliser), consumer price controls, subsidies for poorer consumers, relaxation of biofuels policy and direct income transfers. All these measures have not yet been rolled back; India in 2010 was particularly slow.[253] Here as well, it is better to regulate such practices than to ban them entirely.

Option 2. Coordination of emergency stocks

Stockpiling is a classical precautionary measure for food scarcity. The USA stopped doing this in 1996, followed by the EU several years ago. As a result, both regions contributed to the enormous price spikes in 2008. Many developing countries have also reduced stocks, often as part of structural adjustment programmes that had been agreed to with the World Bank and IMF.

Since that crisis, there have been calls for the worldwide coordination of emergency grain stocks, not only from developing countries, but also from France, UN rapporteur De Schutter, the International Food Policy Research Institute (IFPRI) and even the G8[254] and the World Bank.[255] The authoritative liberal weekly *The Economist*[256] has also called for more stocks. In October 2010, the ASEAN countries agreed to establish emergency stocks of rice. France has placed global stocks policy on the agenda for the first ever meeting of the agricultural ministers of the G20 in July 2011.[257]

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[252] Although export restrictions can give the wrong signal to domestic agriculture, farmers in other countries can actually receive a positive stimulus. But this stimulus is often weakened by import cartels. Moreover, governments in developing countries sometimes respond to high food prices with consumer food subsidies, which are detrimental to their farmers.

[253] OECD-FAO 2010.

[254] G8 Experts Group on Global Food Security 2008. *G8 Efforts towards Global Food Security*. http://www.g8italia2009.it/static/G8_Allegato/G8_Report_Global_Food_Security,2.pdf

[255] B. Wright 2008. *International Grain Reserves And Other Instruments to Address Volatility in Grain Markets*. World Bank. siteresources.worldbank.org/INTARD/Resources/102609_wright.pdf

[256] *Don't starve thy neighbour - How to rebuild confidence in food markets after this summer's spike in wheat prices*. *The Economist* 9 September 2010 (http://www.economist.com/node/16992151?story_id=16992151)

[257] In May 2010, a group of 65 NGOs – headed by the Institute for Agriculture and Trade Policy in Minneapolis – sent an open letter to governments, the UN and international financial institutions, expressing their concern about the lack of a coordinated policy on food security reserves. They proposed the following measures:
1. Increase foreign and domestic investment to achieve culturally appropriate local and regional food security reserves. As donor governments seek to mobilize investment to strengthen national food security plans, food reserves should be a central plank of their foreign assistance and domestic agricultural policy agenda, taking special care that food reserve mechanisms do not undermine local food production systems.
2. Lead efforts to establish an international commission on reserves, such as one coordinated by the FAO Committee on Food Security, to make recommendations on the establishment of a coordinated global food reserve system.

It is often argued that the stocks/reserves should be established in the regions where they are needed. In addition to grain, there can also be stocks of water, fertiliser, seed and pesticides for emergency aid to poor farmers. To prevent stocks from being misused for speculation and corruption, they should be managed independently. The IFPRI has called for management by the World Food Programme, and Ukraine has seen a role for the World Bank.[258] OECD and FAO have called for research into best practices of stock management.[259]
The IFPRI has proposed that the formation of "regular" stocks should be coordinated globally. Following the food crisis of 2007/08, many countries lost their confidence in the world market, and there is a risk that everyone will try to become self-sufficient in grain and will create their own emergency stocks. This would lead to an inefficient global production system, an unnecessarily large and costly global reserve and a very thin and erratic global grain market. International agreements on reserves could help prevent this from happening.

Option 3. Emergency financing
After the food crisis of 2007/08, the World Bank established an emergency facility, the Global Food Crisis Response Programme, which enables countries to continue to import food during times of high prices.

Option 4. Make the private sector co-responsible
There is a lot to be said for making the private sector co-responsible for world food security, for example by maintaining stocks or by imposing supply obligations in case of scarcity. This would be compatible with the trend towards corporate social responsibility. The recent literature on risk management (see Warner *et al.* 2010 and OECD) has also called for governments to implement their risk policy in cooperation with the private sector and other involved parties According to the OECD, such "management-based regulation" is a superior strategy.[260]
But in a competitive market, profit margins are narrow. For example, it is questionable whether companies are willing to take measures to prepare themselves physically for calamities with a probability on the order of 1/100 years. They would prefer to do this by means of insurance. But insurance does not add anything to the scarce stocks.

Option 5. Anti-cartel policy
Due to the worldwide concentration in the grain markets, the risk of global cartels has increased. If this indeed happens, coordinated global anti-cartel policy will be needed. A global competition authority appears to be an unrealistic option. However, it is conceivable that the WTO would be given authority in this area. After all, cartel formation is an obstacle to free world trade.

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3. Support multilateral, regional and bilateral agricultural trade rules that allow developing countries to invest in the production and infrastructure necessary to support food reserves.
4. Renegotiate the Food Aid Convention, ensuring that contributions *towards food security reserves are counted as eligible to meet commitments in the Convention.*

[258] *agd* 1 February 2011.
[259] OECD-FAO 2010.
[260] OECD 2010. Risk and Regulatory Policy: Improving the Governance of Risk. *OECD Reviews of Regulatory Reform.*

Box 8.4 Speculation: curse, blessing or both?

Since the food crisis of 2007/08, a debate has raged about the role of speculation in the severe price fluctuations. Was speculation an important factor? Economists do not agree on this question.

To understand this issue, it is important to make a distinction between two types of speculation:

- classical, commercial speculation: hedging or protecting oneself against unforeseen price movements, in this case on the agricultural futures markets;
- purely financial speculation in agricultural and other commodities. This speculation generally does not involve the purchase of physical stocks. The FAO estimates that only 2% of agricultural transactions lead to physical transactions.

Traditional commercial speculation

Futures markets have traditionally been part of the agriculture and food sectors. Producers and traders use these markets to cover much of their price risks. This often has a stabilising effect on prices. For example, most traders buy when prices are low, thereby preventing a further drop in prices. The other way around, they sell when prices are high, thus moderating the price spike.

Recently, in 2010, we observed this happening. Due to disappointing harvests (especially in Russia) and competition for grain from biofuel production, there was impending scarcity, and several governments intervened. In August, Russia imposed an export ban. In this situation, grain traders and processors try to safeguard their positions and become more active on the agricultural futures markets. Moreover, some speculators anticipate the expected scarcity. As a result, they encourage producers to increase production, which can also moderate the price spike.

According to Pennings, the futures markets – at least in Europe – are relatively transparent and well regulated. Regulators have a reasonable oversight of who is actually operating on the markets, and if necessary they can intervene. The importance of such private market regulation will only increase due to the elimination of public market regulation in EU agricultural policy, especially after 2013. Futures markets can provide more stability, also for farmers in Europe and in developing countries, and can limit the influence of short-term speculators – such as financial speculators. Hedging can also have another advantage: it announces impending scarcity or abundance (price discovery). Producers, governments and regulators can then anticipate these events.

Financial speculation

The debate has focused primarily on the second type of speculation: purely financial speculation by *external* parties to gain short-term profits. This type of speculation has taken place on a large scale since 2006 (although it goes back in history all the way to the legendary "tulip mania", a speculative bubble on the Amsterdam exchange that exploded in 1638.) Today, this largely concerns the commodity index funds: bundles of futures contracts for a wide range of commodities such as oil, minerals and agricultural products. The trading itself is often automated, i.e. done by computers. These index funds were introduced by Goldman Sachs and other investment banks as an attractive investment vehicle during times when commodity prices are rising. Other important players in index funds were the Bank of America, the American Insurance Group, Citibank, Deutsche Bank, HSBC, Morgan Stanley and J.P. Morgan Chase. In the Netherlands as well, banks such as ABN AMRO and ING – which, according to SOMO (multinational enterprises research foundation), normally have little interest in agriculture – suddenly began marketing financial products with which investors could benefit from the rising or falling prices for agricultural commodities.

Various organisations and authors see this trade as an important cause of the price shocks in 2007 and 2008:

- American economists referred to “market players who had no interest in the underlying physical commodities being traded”.
- According to the World Bank, “Apart from the hedgers (e.g., producers and consumers) with interest in the physical transaction of commodities, two other actors have been operating in the market during the last two or so decades with purely financial incentives and no transactions in the physical markets. They are hedge funds and commodity trading advisors (CTAs).
  During the past few years, investment funds (mostly pension funds and sovereign wealth funds) also entered the financial markets. It has been argued that these groups (mostly the latter) may have affected commodity prices.”
- In an analysis of the rising grain prices in 2007/08, staff of the World Bank and the European Commission referred to “three key factors whose role has been somewhat controversial: speculation, the growth of demand for food commodities by emerging economies and the role of biofuels.
  We conjecture that index fund activity (one type of “speculative” activity among the many that the literature

Box 8.4 *continued*

refers to) played a key role during the 2008 price spike. Biofuels played some role too, but much less than initially thought. And we find no evidence that alleged stronger demand by emerging economies had any effect on world prices".

- In September 2010, UN rapporteur Olivier de Schutter stated that "a significant portion of the increases in price and volatility of essential food commodities can only be explained by the emergence of a speculative bubble. In particular, there is a reason to believe that a significant role is played by the entry into markets for derivatives based on food commodities of large, powerful institutional investors such as hedge funds, pension funds and investment banks, all of which are generally unconcerned with agricultural market fundamentals".
- In 2008, *NRC Handelsblad* published an interview with a Dutch food speculator/commodity trader. To quote from this article, "In the statistics on commodity prices (...) there has been a rising trend for years, with a sudden spike in February 2008. That was exactly the time when many hedge funds and investors turned their backs on Wall Street and began to buy commodities like maniacs."

According to the Institute for Agriculture and Trade Policy in Minneapolis, the financial speculation in the USA could have been stimulated by deregulation of the financial markets; the investment banks had been actively lobbying for this deregulation. As a result, the banks were exempted from the obligation to maintain financial reserves. The limits on the number of positions on the futures market were also abolished. Regulations that were implemented following the crisis in the 1930s were abolished in the 1990s.

Debate

These analyses stand opposed to studies by the FAO and OECD. In a preliminary analysis, these organisations came to the conclusion that there was little empirical evidence for a major, decisive role for speculation in the food crisis. At the same time they – like Pennings – argued that speculators have little effect on prices over the long term. However, the problem in 2007/08 was primarily with the price spikes in the *short* term. Surprisingly, the OESO
concluded that the index funds actually had a *stabilising* effect on prices: as the number of index funds increased, price fluctuations decreased. Recently, the OECD has called for more openness about global reserves and more transparency on the futures markets. The Commodity Futures Trading Commission in the USA was cited as an example: it keeps track of the positions taken by traders and what their interest is. The Chicago exchange limits how much a commodity price can rise or fall in one day. But at the same time, the OECD warned about excessive regulation.

The IFPRI shifted positions during its analyses. Initially, it presented several reports that emphasised financial speculation as a cause of the price developments on the food markets: "Overall, our empirical analysis mainly provides evidence that financial activity in futures markets and proxies for speculation can help explain the observed change in food prices; any other explanation is not well supported by our time series analysis." But in a later analysis, the IFPRI became more cautious, saying that it was difficult to prove the effect of speculation. According to the IFPRI, a more important cause of the prices spikes at the beginning of 2008 was the export limiting measures taken by Vietnam and India for rice, and by Ukraine, Russia, Kazakhstan and Argentina for wheat.

Critics have responded to this analysis – on the website tripelcrisis.com and elsewhere – with the following:

- It is almost impossible that the astronomic amounts of capital invested by financial speculators in the commodities markets had *no effect* on the prices.
- During the past 10 years, the ratio between the trade in commodities and the trade in commodity derivatives reversed – from about 4:1 to 1:4 – which made the trade in derivatives dominant.[261]
- In 2000, when the commodity trade in the USA was deregulated, 10% of the commodity trade was conducted by investment banks and pension funds; in 2010 that was 80%. During the first half of 2008, trading in commodity derivatives doubled.
- Only five investment banks control 96% of the trade in derivatives.

[261] Through mergers, the exchanges tried to recover market share from the OTC. In February 2001 a merger was announced between the exchanges of New York/Euronext, London, Toronto and Germany. This could create the biggest player in derivative trading. The mergers were intended to result in cost savings and lower rates. Former European Commissioner Fischler even called for a single futures market for the EU (*agd* 8 February 2011).

Box 8.4 *continued*

- Between 80% and 90% of the trade is "over the counter" (OTC). This trade is often on a bilateral basis, outside the exchange, which is not transparent and is unregulated. For example, Glencore (see below) operates under Swiss bank secrecy laws and is therefore exempt from current and planned EU regulations on market fraud. Investment banks often report their contracts only after they have taken effect. As a result, their role in price discovery is negligible or even negative. Even some commercial parties are therefore calling for re-regulation.
- Index funds may have taken more positions than allowed in the USA by the regulations, which were not enforced.
- The most important component of index funds is energy. As a result, high energy prices pull up food prices, regardless of the development of supply and demand. This effect is amplified because the funds work with a fixed value proportion between components; with higher energy prices they buy more futures contracts in wheat and soya, and consequently drive the prices for these commodities even higher.
- According to the *Financial Times*, the Russian export ban in 2010 took place at the insistence of Glencore, the world's largest commodity trader. In this way, Glencore tried to create a situation in which it could escape from its supply contracts with an appeal to *force majeure*.

For the sake of completeness: there are also big speculators who do combine the trade in derivatives with large purchases of physical stocks. As a result, they are able to manipulate the market. One spectacular example is the purchase by the British hedge fund Armajero of no less than 7% of world stocks of cacao in 2010. As a result, the hedge fund forced cacao prices up. This also led to criticism from conventional traders.

In summary: the final word about the role of speculation has not been said, and more in-depth analyses appear to be necessary. However, the following aspects are clear:

- "Classical" speculation by players who are interested in physical purchases can be a blessing, while speculation by financial players can be destabilising.
- Financial speculation does not affect long-term prices – speculators have to sell everything they have purchased – but it can affect short-term prices.
- The proportion of financial players on the agricultural futures markets has increased enormously.
- Big players can invest such vast amounts of capital that they can greatly influence short-term prices.
- Speculation by financial players is not a *primary* cause of price increases, but it can operate as an *amplifier* because financial speculators tend to follow existing price movements.
- Deliberate *price manipulation* cannot be excluded either, but the only examples we could find are the ones we already referred to (Glencore and Armajero).

The interest of financial players will depend partly on developments in other markets, especially shares, bonds, currency exchange rates, etc. In that respect, creating dollars is also a risk for food security. For 2010, GoldmanSachs expected a 10% return on the futures markets for agricultural commodities. This can be an attractive safe harbour if bonds and the dollar decline in value.

In the meantime, a new target for speculators has appeared: the global market in carbon credits (emission rights for CO_2). And because agriculture can participate in this trade, it is also a new source of food price instability. Investment banks in the USA are already lobbying for the deregulation of this market as well.

Sources:

Baffes, J. & T. Haniotis 2010. Placing the 2006/08 Commodity Price Boom into perspective. The World Bank. Cooke, B. & M. Robles 2009. Recent Food Prices Movements, IFPRI.

Source, J.C. 2010. Somo: beperk invloed niet-agrarische beleggers. [Somo: limited influence of non-agricultural investors.] Agrarisch Dagblad 24 April.

Depuydt, P. 2011. Nerveuze overheden drijven voedselprijzen op. [Nervous governments drive up food prices] NRC Handelsblad 25 January.

De Schutter, O. 2010. Countries tackling hunger with a right to food approach. Briefing note 01 – May 2010. Group, Policy Research Working Paper 5371.

De Schutter, O. 2011. "Voedselhandel is verworden tot casinospel". [The food trade has become a casino game] Interview in NRC Handelsblad 23 February 2011.

de Gruyter, C. Frankrijk wil EU-regulering van handel in grondstoffen. [France wants EU regulation of trade in commodities] NRC Handelsblad 1 September 2010.

Blas, J. & I. Gorst 2010. Moscow urged to ban grain exports. Financial Times 3 August 2010.

Box 8.4 *continued*

Heady, B. & S. Fan 2010. Reflections on the Global Food Crisis. IFPRI. http://www.ifpri.org/publication/reflections-global-food-crisis.
Institute for Agriculture and Trade Policy 2008. Commodities Market Speculation: The Risk to Food Security and Agriculture. www.iatp.or/climate
Institute for Agriculture and Trade Policy 2009. Speculation on Carbon: The Next Toxic Asset. www.iatp.or/climate
Irwin, S.H. & D.R. Sanders 2010. The impact of index and swap funds on commodity futures markets - Preliminary results. OECD Food, Agriculture and Fisheries Working Papers, No. 27, OECD Publishing.
OECD-FAO 2010. Agricultural Outlook 2010-2019.
Pennings, J., interview in Agrarisch Dagblad, 10 September 2010.
OESO: betere informatie noodzak in landbouw. [OESO: better information is essential in agriculture] agd 18 March 2011.
Prijzen van mais, soja en tarwe stijgen verder. [Prices for maize, soya and wheat continue to rise], agd 27 January 2011.
typo3.fao.org/fileadmin/user.../ODS_Briefing_Note_01_May_2010_EN.pdf World Development Movement 2010. The great hunger lottery - How banking speculation causes food crises. The Independent, 2 July 2010.
http://www.telegraph.co.uk/finance/financetopics/davos/8261856/Unilever-chief-warns-over-global-crisis-in-food-output.html
http://www.independent.co.uk/opinion/commentators/johann-hari/johann-hari-how-goldman-gambled-on-starvation-2016088.html
http://www.guardian.co.uk/commentisfree/2010/jul/22/food-speculation-starve-world-poorest
http://ourfinancialsecurity.org/2010/06/economists-support-regulation-of-commodities-futures-markets-in-the-reconciliation-of-the-financial-reform-bill/ (Letter from 18 American economists to the US Congress). http://www.srfood.org/images/stories/pdf/otherdocuments/20102309_briefing_note_02_en_ok.pdf
http://triplecrisis.com (various contributions by critics of speculation).

Option 6. Regulate speculation

There are forms of speculation with a stabilising effect on prices, and forms with a destabilising effect (Box 8.4). There have been calls from countries and organisations – including the FAO, IFPRI, France, Unilever and Dutch supermarkets – to regulate the second form of speculation. Some classic players on futures markets are also calling for regulation.[262]

In the USA, President Obama signed the Dodd-Frank Act in 2010, which regulates the financial markets. Investment banks are allowed to remain active on the commodity markets, but their financial commitment is limited. The American Commodity Futures Trading Commission (CFTC) has announced new regulations for the trade in "swaps" (speculative contracts) that affect the trade in wheat futures.[263] The EU has also started regulating the financial markets, including the trade in derivatives. The European Commission wants to conduct additional research into the relationships between physical and financial commodities markets.[264] In any case, the EU wants to have more transparency in the futures markets. But it

[262] For example, the sugar industry recently called for regulation. On 9 February 2010, the following notice appeared on *agd.nl* : "Global sugar trading companies want speculation to be controlled. In a letter to the ICE exchange in New York, the World Sugar Committee, which represents the concerns, referred to "parasitic behaviour". In the letter, the companies said that they are losing interest in trading on the futures market. The letter (31 January 2011) was first reported by the *Financial Times*. The chair of the committee, Sean Diffley, stated that the sharp fluctuations in the market are distressful for the "real sugar community". The committee referred to the increase in computerised trading. As a result, the trading is faster, and because assumptions are entered in advance, the trade loses contact with the reality of supply and demand. The committee urged the ICE to shorten the opening hours of the exchange and to deploy a computer system that registers rapid fluctuations."

[263] http://www.cftc.gov/PressRoom/PressReleases/pr5847-10.html

[264] European Commission 2011. *Tackling the challenges in commodity markets and on raw materials.* Brussels.

is questionable how effective that can be without regulation. The EU is also considering a limitation on the number of positions that a speculator can hold on the market.[265]

The IFPRI has also presented other policy options:

- requiring a portion of the contracts to be completed with physical delivery;
- discouraging speculation in futures by requiring traders to deposit more money to the account of the exchange.

As chair of the G20, France has given a high priority to regulating the trade in grain, oil, metals and CO_2 emission rights. As a first step, the country wants to promote transparency and European regulation of these markets. Germany supports the proposal with respect to agriculture. As a subsequent step, worldwide agreements must be made about transparency and regulation. In the EU, the Netherlands should obviously support the call for more transparency, as a minimum.

Option 7. Strengthen the resilience of developing countries

A final option that can contribute to the preparedness of developing countries is to strengthen the resilience of their food systems. For the EU and the Netherlands, this requires improved coordination of development policy and disaster policy. As we saw previously, food aid in disaster areas is sometimes in direct conflict with the recovery and development of agriculture. The Hyogo Framework for Action, established by the UN following the tsunami of 2004, focuses on local measures to reduce the effects of disasters. For this purpose, the framework urges the creation of platforms that include a broad spectrum of stakeholders. Western countries, including Germany, have already established such platforms, but the Netherlands does not yet have one. It is an option for the Netherlands and the EU to support the creation of such platforms.

Interesting in this context is a recent policy document from the European Commission: *An EU policy framework to assist developing countries in addressing food security challenges* (2010). This document refers to improving the resilience of small farmers as the first priority. Also interesting is the Food Facility, which the EU created in 2008 to fill the gap between food aid and long-term development aims.[266] The Facility has a budget of €1 billion for three years. Concrete aims:

- encourage food producers to increase the food supply by giving them better access to fertiliser and services, among other things;
- temper the consequences of price shocks for the local population;
- increase production capacity and improve the long-term management of agriculture.

According to the European Commission, the Facility is a fast and efficient instrument in the battle against food uncertainty. The accent lies primarily on what the countries can do themselves. After 1.5 years, more than €500 million had been paid out, and 97% of the funds had been committed. Worldwide, around 50 million people have received support from the Facility. The Commission has appealed to other donors to contribute to the financing of projects, which are to be "auctioned".

Strengthening the resilience and productivity of developing countries is therefore already embedded in EU policy. It is now important to properly evaluate this programme; if successful it should be continued and expanded. The creation of Hyogo platforms can perhaps also be supported with this budget. Moreover, coordination with the CAP is essential; the recent Commission proposals have placed a one-sided emphasis on increasing production in the EU itself.[267]

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[265] *agd* 3 February 2011.

[266] Sources: http://ec.europa.eu/europeaid/how/finance/food-facility_en.htm
And: europa.eu/rapid/pressReleasesAction.do?...IP/...

[267] Random Hacks of Kindness (RhoK) is a remarkable, voluntary and advanced initiative in disaster risk management: “On December 4 and 5, in over twenty locations around the world, Google, Microsoft, Yahoo!,

9. Conclusions

The central question of this study was, how vulnerable is European agriculture and food supply for calamities and geopolitics? We limited ourselves to calamities affecting food *volume*; calamities affecting food *safety* were beyond the scope of our study. The scope was also limited to calamities that primarily affect agriculture, not those having much broader impact on society, such as war or a power blackout. The time horizon of our study was 2020.

General conclusions

1. **The European food system has two Achilles heels: its dependence on soya imports and its vulnerability for contagious livestock diseases. The system is also vulnerable for failures of domestic feed crops and grass. This makes livestock farming and the meat and dairy chains the most vulnerable sectors.**
2. **The biggest risks for the feed supply appear to be prolonged drought and a severe volcanic eruption.**
3. **The biggest risk for soya imports appears to be geopolitics.**
4. **The biggest risk in terms of livestock diseases appears to be extremely contagious diseases for which no vaccine exists and which can spread on a large scale (possibly through bioterrorism).**
5. **The market has a large self-regulating capacity, but can be seriously inadequate, especially for agriculture and during calamities. The Common Agricultural Policy of the EU does not take sufficient account of this risk.**
6. **The European market will respond to possible animal feed scarcity by exporting less grain and importing more. This response can be amplified by the EU policy measures, driving up grain prices on the world market and leading to major risks for food-importing developing countries.**
7. **The EU and the Netherlands have many policy options to reduce the probability of calamities and to build buffers ("shock absorbers") into the system. The most important of these options are:**
   a) **reinstate emergency stocks**
   b) **reinstate a form of land set-aside**
   c) **regulate speculation on the agricultural futures markets**
   d) **encourage production of protein crops in the EU**
   e) **selectively reinstate the use of meat-and-bone meal in feed**
   f) **encourage consumption of less meat.**

NASA and the World Bank will host the third Random Hacks of Kindness (RHoK), their progressive initiative that brings together volunteer software developers and experts in disaster risk management for a weekend-long “hackathon” to create software solutions that can help mitigate or respond to disasters around the world and help save lives.
The first RHoK event was held in Mountain View, California in November 2009 and resulted in applications that were later used on the ground during the devastating earthquakes in Haiti and Chile. The second RHoK hackathon was held simultaneously in six countries around the world in June 2010 and one of the winning applications from the Washington D.C. event - a tool that allows engineers to easily visualize landslide risk to help guide urban and rural development and building planning - is already being piloted by the World Bank in the Caribbean”. See: wbws.worldbank.org/feeds/main/urlRedirector.html

Specific conclusions

1. Risk-increasing trends

Agricultural productivity can still increase greatly in many parts of the world, but in several regions productivity is approaching the biophysical ceiling. Moreover, there are at least 14 societal trends (such as increasing welfare) and ecological trends (such as depletion of freshwater reserves) that can increase the demand for food and feed, inhibit the growth of agricultural production and/or destabilise prices. These effects are already noticeable and will continue to increase in the decades to come, but in the current decade they will probably not yet become very strong.

2. Vulnerability of EU agriculture for *external* calamities

Because the EU is self-sufficient for most important agricultural products, it is not particularly vulnerable for calamities *elsewhere*. But there are two important exceptions: vegetable oil (import dependence 44%), and – much more importantly – soybeans and soybean meal (import dependence 98%); both figures are from 2007. Soybean meal is used primarily as animal feed.

The **riskiest external calamity** is therefore the **collapse of soya imports**. This collapse could be caused by crop failures in South America and/or North America, by war or by a "powerplay" of state-owned companies (such as Chinese companies).

3. Vulnerability of EU agriculture for *internal* calamities

The **riskiest internal calamities** for the European agriculture and food system are:

- a prolonged and large-scale **drought**
- a severe and prolonged **volcanic eruption**
- a large-scale outbreak of contagious **livestock disease.**

4. Vulnerability of Dutch agriculture

Relative to other countries**, agriculture in the Netherlands** is less vulnerable for prolonged drought, but is **much more vulnerable** for a collapse of **soya** imports and a large-scale outbreak of **livestock disease.**

5. Relevant probabilities

The **probability** of an internal or external calamity cannot be quantified precisely; at most, an order of magnitude can be indicated. For a large-scale drought or a severe and prolonged volcanic eruption, this probability is in the order of 1/100 years. This probability appears to be low, but is actually significantly higher than the probabilities that are assumed in national security policy for serious disasters. Viewed in this light, there are good reasons to take precautions.

The probability of a large-scale livestock disease outbreak cannot be quantified, but has certainly not become any smaller due to the expansion of the EU and the growth in international traffic and transport. The probability of a bioterror attack has certainly not decreased either, considering the dissemination of the required expertise and the emergence of international terrorism and radical animal rights activism. The risk of a "bioterror 9/11" has become tangible.

The probability of a sudden collapse of soya imports has also increased due to geopolitical developments, especially considering the greatly increased purchasing power of China and its growing need for soya. The probability that a collapse of soya imports would take place *simultaneously* with a severe drought or volcanic eruption is certainly much

smaller, but if this did happen, the consequences could be much greater (low probability, high impact) than for either of the individual calamities.

6. Impact of a collapse of soya imports

A collapse of soya imports can cause severe damage to the **livestock sector and meat chains** (the damage to the dairy farming sector and dairy chains would be much less because relatively little soya is used in cattle feed). We examined a scenario involving a two-year import collapse. To calculate the effects of such scenarios on production and prices, Jansen *et al.* of Wageningen UR developed an indicative model.

According to the model, the price of soya in this scenario triples. Dairy and beef production and prices change little. In contrast, **the production of pork falls by 25% and that of chicken by 60%.** As a result, the **prices of pork and chicken rise up to 200% in the third and fourth quarters, respectively.**

Because such price spikes usually go hand-in-hand with **hoarding, criminality and speculation**, the price shocks could be **even more severe**. In addition, **smuggling** of livestock and meat would increase, which leads to an increased risk of introducing **livestock diseases**.

Bankruptcies in the livestock, meat and dairy sectors appear inevitable. But that does not have to lead to a prolonged drop in production, because those livestock farmers who survive the initial crisis are encouraged by the price increases of meat and eggs to increase their production, initially based on non-soya proteins (but after two years returning to soya). As a result, prices decline sharply after one year – first chicken and pork prices, followed by egg prices. Following a number of fluctuations, **production and prices return to their previous levels after 5 to 6 years.**

Over a number of years, a collapse of soya imports can be compensated by the inherent productivity increase in European grain production. However, this will not happen in 3 years – as asserted by some researchers – but will take 11 or more years.

7. Impact of drought

Drought primarily affects cattle (chicken and pigs are much less susceptible because they eat little roughage). We looked at the scenario of a large-scale drought that lasts two years.

During the first winter, roughage becomes scarce and expensive. This can scarcely be compensated by imports, because transporting roughage over long distances is relatively expensive. Therefore, livestock farmers begin **disposing of animals more quickly**. According to the indicative model, **the production of beef increases by 40%, causing its price to decline by 15%. Beef production then falls sharply to -20% in the third year, after which the price peaks at 140%. In the second year, dairy production falls by 40%, and prices peak at 160%**.

Bankruptcies in the livestock, meat and dairy sectors appear inevitable. But for livestock farmers who survive the initial crisis, the increased prices are a stimulus to expand production. In the third year – when the drought is over – sufficient roughage is again available. Following a number of fluctuations, production and prices return to their original levels after 10 years. This process takes longer than with pigs and chickens because cattle have a longer lifecycle and produce fewer offspring.

Generally speaking, the price shocks are less extreme than in the previous scenario, but the effects last longer. In this scenario as well, **hoarding, criminality and speculation** can be expected; as a result, the **price shocks can be more severe** than calculated. Moreover, **smuggling** and the risk of **introducing livestock diseases** would increase.

8. Impact of drought + collapse of imports

With a double calamity involving import collapse + drought, feed shortages become even more acute. Livestock farmers have fewer possibilities to replace roughage with concentrate or soya with grain, which causes prices to spike even higher and leads to even more bankruptcies.

The indicative model indeed predicts **higher prices** than with a drought alone or a collapse of soy imports alone. This does not apply to pork prices, but it does apply to **chicken prices (which peak at 210%), eggs (186%), dairy products (184%) and beef (163%).**

The impact on consumers is somewhat alleviated due to differences in the lifecycles of chickens, pigs and cows. On the other hand, with a double calamity the socio-psychological impact is expected to be even more severe. As a result, side effects such as **hoarding, speculation and criminality occur more often.** This can lead to **more severe price shocks** and a **more severe crisis in the sector.** The risk of introducing livestock diseases through smuggling is also higher.

9. Impact of a volcanic eruption

On the local scale, a volcanic eruption leads to deposition of toxic substances, and on a very large scale it can attenuate sunlight and cause temperatures to fall, which in turn leads to **declining agricultural production**. For example in 1815, eruptions of a volcano in Indonesia reduced agricultural production in Europe, Japan and North America, resulting in famine.

We have not yet been able to calculate the effects of this scenario, but it is possible to think about them systematically. The effects will depend greatly on the scale of the eruption and the regions that are impacted. If the primary impact is on **Europe** (for example due to an eruption in Iceland), then roughage (grass and maize silage) will become very scarce, but concentrates will not, because European companies can purchase feed commodities on the world market at only slightly higher prices. This limits the cost increases for pig and chicken farmers, but does little to help cattle farmers, who would then reduce their herds, leading to **higher prices for beef and dairy products.**

If a **much larger area** is impacted, then agricultural production would decline – including grass and feed crops – and plant-based food and feed would become more expensive worldwide. This would – on balance – be **beneficial in financial terms for arable farmers but detrimental for livestock farmers.** After this, if livestock production also declines, then the consequences for the livestock sector will be at least partially compensated by higher prices for meat and dairy products. **For consumers, foods of plant as well as animal origin can become much more expensive.**

10. Impact of livestock diseases

The consequences of a large-scale livestock disease epidemic can be enormous, especially if outbreaks occur simultaneously in multiple regions. Such a multifocal outbreak is conceivable in a scenario involving a coordinated bioterror attack. **In that case, millions of animals would be culled**, certainly if there is no effective vaccine for the disease. **Bankruptcies** in the livestock, meat and dairy sectors are inevitable, although the number of bankruptcies would depend on facilities such as insurance and compensation funds, which differ between countries. The financial damage can amount to **hundreds of billions of euros**.

The indicative model is based on a hypothetical disease that affects all species of livestock simultaneously. With an extreme scenario of 10% mortality per quarter, the production levels decline by 10% (chicken) to 70% (beef). As a result, prices riso to 150% for eggs and at more than 500% for beef. Here as well, the impact on consumers is moderated somewhat because the peak prices for different livestock species – due to different lifecycles – are not synchronous.

Due to the severe price increases, **hoarding, speculation and criminality** are even more likely than in the previous scenarios. This includes **smuggling**, which can lead to the introduction of **even more livestock diseases**. For those livestock farmers who survived the initial crisis, the high prices are a stimulus to expand production, as soon as this is permitted by the government. As a result, prices begin to decline, and after several fluctuations, **stabilise after about 10 years**.

Whether or not the prices actually increase so severely also depends on the **consumer response**. If many customers lose confidence in meat and dairy products (for example if the epidemic – like BSE – is a zoonotic disease), then demand would collapse and prices would rise less drastically or could even fall. This would be an unexpected benefit for those consumers who continue to purchase meat and dairy products, but would make the crisis even more severe for the sector, the economy and society at large.

In any case, of all the above-named calamities, a major livestock disease epidemic is potentially the most dramatic and disruptive for society

11. Risks for food security in the EU

Although the damage in the livestock, meat and dairy sectors in the various regions could be severe or very severe, **the availability of food is not threatened immediately**. This is due to a wide range of **buffers**.

Buffers available to agriculture and trade:

- Livestock farmers can partly replace soya with grain.
- Arable farmers can partly replace grain in their crop rotation plans with protein-rich feed crops.
- Cattle farmers can start using grass from road verges.
- Traders can export less grain and import more.

Buffers available to consumers:

- Reduce food wastage.
- Consume less meat and dairy products.
- Replace expensive meat with cheaper meat, dairy products or eggs.

However, the **affordability of meat and dairy products for vulnerable groups** can be affected, especially in cities in the least prosperous Member States. Nutritional deficiencies of iron and vitamins then become a real danger, especially for children.

12. Shifting the burden to the world market

As soon as a calamity results in higher prices for feed in the EU than those on the world market, grain traders will reduce exports and increase imports. This can moderate the price spikes in the EU. If the EU believes this effect is insufficient, then it can actively discourage exports (with an import tariff or a quota) and/or encourage imports (with a subsidy or a lower tariff).

The same applies to an increased price differential for meat and dairy products on the European market and the world market: the trade would then export less and import more, despite the relatively high tariffs on these products. The EU can also amplify this market response.

Such responses would slow the inflation of food prices in the EU, but would actually drive up prices on the world market. The EU would then be "exporting instability", as it did in the past with export subsidies and recently with tariff cuts. Moreover, encouraging imports of meat could make **the crisis in the sector more severe** and could hamper recovery – even more so because such a measure would not be easy to reverse in the trade policy arena. In that case, the EU would **become less dependent on imports of feed, but more dependent on imports of meat.**

13. Land grabbing

Another way in which the European feed industry can protect itself against feed scarcity is **land grabbing**. More and more state-owned and privately-owned companies – including some European companies – are doing that already, and the Dutch feed industry has plans in this direction as well. In principle, land grabbing can lead to agricultural development, improved food security for the local population and economic development. But there are few examples of such successes; most reports on land grabbing are **negative in social and ecological terms.** Sometimes land grabbing even undermines food security, especially where the production of biofuels is concerned.

14. Risks for food-importing developing countries

However, the **biggest risks** of the above responses are not for consumers in the EU, but for poor population groups in **developing countries that are net food importers**. This is due to the upward pressure on prices. In Africa and the Middle East – the most important markets for European grain – this can lead to food shortages, both urban and rural. Farmers who are net sellers of food can benefit, but only if the price increases are passed onto them, which traders often avoid. Farmers who are net buyers of food can become malnourished. In the cities, price increases can lead to **food riots, social unrest, political instability and large-scale emigration**. In a dictatorship, this can lead to a shift towards more democracy, but in a more democratic regime the opposite can happen. Governments can defuse the unrest with higher food subsidies, but this puts a heavier burden on the budget and can damage the economy.

For that matter, these risks are low in the livestock disease epidemic scenario. In that case the European demand for grain and soya *falls*. As a result, soya imports decline, grain exports increase and the prices of both commodities on the world market can fall sharply, which can benefit consumers, but not farmers in developing countries. In fact, price shocks are always detrimental for producers and consumers worldwide.

15. Handicaps for agriculture in developing countries

In recent decades, **agricultural development in many developing countries (especially in Africa) has lagged far behind.** Among other reasons, this was because agriculture was faced with the following handicaps:

- food dumping from Western countries via overly prolonged food aid, export subsidies and corporate dumping;
- the low priority for agriculture in developing countries from the World Bank, the USA and the EU;
- the low priority for agriculture in the developing countries themselves. To keep peace with urban populations, many governments aimed their policy at low food prices, which was detrimental for the development of agriculture. They also did little in other ways to promote their agricultural sectors;
- governments who tried to protect their farmers against cheap imports by imposing import tariffs (which the WTO permits, within limits) were threatened with sanctions by the World Bank and IMF;
- the World Bank and IMF also made other counterproductive demands, including privatisation (which in practice often amounted to abolishment) of institutions that are important to agriculture, such as extension and veterinary services.

One of the consequences was that most sub-Saharan countries became net food importers (after having been net food *ex*porters). As a result, they became even more vulnerable for price shocks resulting from physical calamities, export restrictions by other countries and other forms of geopolitics.

In recent years agricultural development has received new impulses due to land grabbing, but as noted previously, this has rarely benefited the local population.

16. Limits on the self-regulating capacity of the market

The market has a large self-regulating capacity, but it is not always sufficient, certainly not in agriculture and even less in case of calamities:

- Self-regulation often works **slowly**, especially in agriculture, which is a biobased sector where production is linked to the seasons, weather and biological lifecycles.
- Agriculture has **biorisks** in the form of unsafe food and the introduction of plant and livestock diseases.
- It creates **unstable food prices**, also due to the increasing interweaving with the energy markets and financial markets.
- During calamities, the market is incapable of **preventing the destabilisation of production**.
- During calamities, the market **shifts the burden to vulnerable groups in the EU**, in extreme scenarios even leading to malnutrition.
- Similarly, during calamities, the market **shifts the burden to food-importing developing countries**, resulting in malnutrition.

In addition, there are indications that agricultural futures markets have been severely **disturbed due to speculation** by new, highly capitalised players from outside the sector who destabilise the prices. The speculation is not driven by supply and demand, but purely by prices. Although speculation does not cause price increases, it can amplify them, and can then result in prices falling abruptly.

These are all legitimate arguments for government intervention, both permanent and incidental, at various levels.

17. Emergence of geopolitics

The Netherlands and the EU continue to assume that the free market will be the triumphant economic system in the world. But as time goes on, this assumption has become increasingly uncertain. On the world market, we are seeing the emergence of **partially and fully state-owned companies with enormous purchasing power**, which not infrequently operate with a geopolitical agenda (primarily focusing on long-term domestic food security). A division is emerging. On one side, the EU and the USA have largely eliminated their reserves and are increasingly relying on private companies operating on a free market. On the other side, China, Russia, India and other countries are stockpiling large reserves and are operating through fully or partially state-owned companies.

Because it is still entirely uncertain what the winning system will be, for the Netherlands and the EU it is **naïve to place all bets on the free market scenario**.[268] A more sensible policy would be one which is less dependent on specific scenarios: a "no-regret" policy.

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[268] See also: I. Bremmer 2010. *The end of the free market – Who wins the war between states and corporations?* Discussed by B. Knapen in *NRC Handelsblad* 16 July 2010. Of the giant energy companies in the world, three-fourths are state-owned. And: F. Hoogeveen & W. Perlots (eds) 2005. *Tomorrow's Mores – The International System, Geopolitical Changes and Energy.* Clingendael International Energy Programme. A similar recommendation for energy policy was made some time ago. In 2005, the *Algemene Energieraad* (General Energy Council) and the *Adviesraad Internationale Vraagstukken* [International Affairs Council] argued that the Netherlands should no longer base its energy security policy exclusively on the free world market and the EU, but also on bilateral political agreements. See: *Energiek Buitenlands Beleid* [Energetic Foreign Policy] (www.aiv-advies.nl/.../AdviesEnergiekBuitenlandsbeleid11_januari_2006.pdf)

18. The EU is inadequately prepared

The EU is **inadequately prepared** for sudden food scarcity. The weak points in the disaster cycle of prevention, preparedness, response and reconstruction include the following:

- regarding prevention: inadequate measures to prevent a sudden collapse of soya imports and to counteract the threat of bioterrorism on the livestock sector;
- regarding preparedness: the elimination of stocks and mandatory land set-aside. Moreover, private companies are also keeping lower stocks due to their just-in-time delivery;
- regarding response: the absence of European disaster planning.

19. Global governance

At the global level, there is policy for prevention, preparedness, response and reconstruction, with important roles for organisations such as the FAO, World Food Programme, Food Aid Convention and the World Bank. Nevertheless, the global governance of food *security* is weak. There are large-scale programmes and flows of funds, but few obligations and sanctions. This pales in comparison with the much more stringent governance on food *safety*, livestock diseases, and plant diseases – at least to the extent these problems can disturb international trade. Global governance of food security should also be made more binding.

The vulnerability of the European agriculture and food system to calamities and geopolitics

A stresss test

B. Advice to the Dutch Minister for Agriculture and Foreign Trade

This advice should be read in conjunction with the previous report:
The vulnerability of the European food system to calamities and geopolitics – A stress test

The advice contains more recommendations than are usual.
It can be used as an agenda for Dutch and European agriculture and food policies.

Platform Agriculture, Innovation and Society

Main points of this advice

1. **The European agriculture and food system, especially the livestock sector, is vulnerable to calamities and geopolitics. The EU should add the following objective to the Common Agricultural Policy: strengthening the resilience of the food system.**

2. **The EU and the Netherlands should no longer focus exclusively on liberalisation, but should also consider other geopolitical scenarios: a *no-regret* policy.**

3. **The EU should reduce its dependency on soya imports by producing more protein-rich animal feed itself and by again permitting meat-and-bone meal to be used in animal feed (under strict conditions).**

4. **In the meantime, the EU should create buffers for:**
   a. **a collapse of soya imports as a result of geopolitics;**
   b. **crop failures caused by prolonged drought or a serious volcanic eruption;**
   c. **large-scale livestock disease epidemics, possibly caused by bioterrorism.**

5. **The following buffers against scarcity of animal feed should be promoted:**
   a. **create strategic stockpiles of grain and feed (as China and Russia already do);**
   b. **promote reserve production capacity through land set-aside schemes and extensification;**
   c. **regulate speculation on commodity futures markets.**

6. **Regarding livestock diseases, the following measures are required:**
   a. **limit long-distance livestock transport;**
   b. **reduce concentration in intensive livestock farming;**
   c. **develop preventive policy against bioterrorism;**
   d. **strengthen the resilience of livestock against infectious diseases.**

7. **Analogous to the banking system, conduct stress tests to identify the weaknesses of the European food system in view of possible calamities.**

8. **The existing EU buffer strategy of "buying itself out of the problems" on the world market should be used very cautiously since it can trigger price shock waves that can harm food-importing developing countries.**

9. **In fact, the Netherlands and the EU should help developing countries to strengthen their own resilience with respect to calamities. This requires investment, codes of conduct for land grabbing and less rigid loan conditions of the World Bank and IMF.**

10. **During the next two years, unique opportunities will be available to address these points in the EU, the G20 and the WTO. Try to leverage these opportunities to make the food systems of the EU (including the Netherlands) and developing countries more shock resistant.**

Food security in Europe

Since the food crisis of 2007/2008, global food security has once again risen to the top of public and political agendas, also in the Netherlands. However, the vulnerability of *European* agriculture and food security has remained underexposed. In recent years, the Dutch Platform for Agriculture, Innovation and Society has explored the vulnerability of the European agriculture and food system to physical calamities and geopolitics. We focused on calamities (such as a prolonged drought) that can affect food security, not on calamities that primarily affect food *safety* (such as a nuclear disaster). The time horizon of our study was 2020.

Questions raised

The Platform addressed the following questions:

- To what extent will the EU remain self-sufficient in food in the mid term (10 years), assuming a scenario of continuing liberalisation?
- Which relevant physical calamities and geopolitical trend reversals could take place until 2020, both in the EU and elsewhere?
- What would be the consequences of these calamities and reversals for agriculture and the food system in the EU?
- To what extent can the market, with its self-regulating capacity, solve the problems itself? Where will market failures be expected and where will government interventions be required?
- Assuming that the EU market will respond to scarcity by exporting less grain and importing more, and the EU will possibly stimulate this response as well, what would be the consequences for developing countries?
- Which preventive and reactive options does the EU have to reduce the risks for itself and for developing countries?

Conclusions

These questions have been partly answered by desk studies, workshops and several research projects conducted by Wageningen UR, which developed an indicative computational model for this purpose.

In very general terms, the conclusions can be summarised as follows:

- The European food system has two Achilles heels: its dependency on imports of soya and soybean meal and its vulnerability for contagious livestock diseases. The system is also vulnerable to crop failures of feed crops and grass. This makes livestock farming and the meat and dairy chains the most vulnerable sectors.
- The biggest risks for animal feed security appear to be prolonged drought and a serious volcanic eruption.
- The biggest risk for soya imports appears to be geopolitics.
- The biggest risk in terms of animal health appears to be contagious diseases for which no vaccine exists and which can be spread on a large scale (possibly through bioterrorism).
- The market has a large self-regulating capacity, but can seriously fail, especially in agriculture and in case of calamities. The Common Agricultural Policy of the EU does not take sufficient account of this situation.
- The European market will respond to possible animal scarcity by exporting less grain and importing more. This response can be amplified by policy measures. However, that can drive up the grain price on the world market, which may imply major risks for food-importing developing countries.
- The EU and the Netherlands have many policy options to reduce the probability of calamities and to build buffers ("shock absorbers") into the system.

Recommendations

EU Agricultural Policy

Recommendation 1. Broaden the CAP to become the CFAP
During the forthcoming reform of the Common Agricultural Policy (CAP), the Netherlands should aim to broaden the policy to become a **Common *Food and* Agricultural Policy** (CFAP).

Recommendation 2. Include resilience in the aims of the CFAP
Objectives should be put first in the CFAP. The European Commission has done so in its recent reform proposals. Food security was rightly maintained as a priority. However, the Commission proposed one-sided crisis measures (including prolonged intervention) to counteract very *low* prices, but not to counteract very *high* prices resulting from calamities or other factors.[269] However, the Commission has announced initiatives to reduce price peaks on the world market.
Such policy is also needed in the EU itself order to attain three aims:
- to make the production chains in the EU **less vulnerable** to natural disasters inside and outside Europe, epidemics of plant and livestock diseases, volcanic eruptions, the whims of the world market and geopolitics;
- to ensure that **vulnerable population groups**, especially urban residents in the least prosperous EU Member States, also have access to affordable basic food commodities;
- prevent the EU from simply shifting the consequences of calamities to the world market, and hence to **food-importing developing countries**.

Commit the EU to the add following **sub-objectives to the CFAP:**
- where possible, **reduce the likelihood of calamities** affecting agriculture and food security. Of course, nothing can be done about extreme weather conditions or volcanic eruptions, but measures can be taken to reduce the likelihood of pest infestations and diseases. The existing policy in this area requires strengthening, for example regarding the risks of bioterrorism;
- **strengthen the resilience** of agriculture and food security with respect to calamities. The policy in this area is also inadequate.

Recommendation 3. Prevent and correct market failures
To improve resilience, do not rely entirely on the "invisible hand" and the self-regulating capacity of the market. This capacity is large, but can fail, especially in agriculture and certainly in the face of calamities. Companies in the Dutch food sector are also promoting more active policy from the EU with respect to calamities.

Recommendation 4. Take better account of geopolitical risks
It cannot yet be predicted with any certainty which economic system is going to win on the world market: the free market with private companies as key players or politically driven trade with state-owned or partly state-owned companies. A mixed form including both systems is another possible outcome. **No longer rely entirely on the free market scenario, but also consider other potential scenarios. Spread the risks by choosing a *no-regret***

[269] The aims of the CAP still have broad support among the European population. For example, refer to the periodic opinion survey held in 2009: *Eurobarometer: What Europeans think of agriculture and the CAP*. ec.europa.eu/agriculture/survey/index_en.htm. Also refer to a summary of the Internet debate held by the European Commission: *The Common Agricultural Policy after 2013. Public debate.* ec.europa.eu/agriculture/cap-post-2013/debate/.../executive-summary_en.pdf

policy. If the EU takes further steps towards liberalisation, **then these steps should be conditional on providing crisis mechanisms for calamities.** This particularly applies to the Netherlands.

Recommendation 5. Hold a debate on risks and crisis mechanisms
Hold a **debate** with experts from divergent disciplines, government departments and stakeholders to address the following questions:

- What **risks** are incurred by the ag and food systems of the EU and the Netherlands as a result of calamities and geopolitics?
- What are the **weaknesses** in the EU and Dutch policies on agriculture, trade and development in the light of potential calamities and geopolitics?
- What are the options for ***no-regret* policy**?

Collapse of soya imports, drought and volcanic eruptions

Recommendation 6. Promote preventive policy against the collapse of soya imports
The most important external risk for the livestock sector in Europe, and especially that in the Netherlands, is if soya imports suddenly collapsed due to physical and/or geopolitical causes. Obvious preventive policy options are the following:

- promote the spreading of risks in soya imports: import more from the USA, less from South America;
- promote long-term contracts;
- maintain good trade relations with soya-exporting countries;
- establish a trade agreement with the Mercosur States ensuring long-term access to soy;
- promote *land grabbing* by the European and Dutch animal feed industry.

All these options can help, but they do not guarantee supply in times of calamity. Moreover, many forms of land grabbing are detrimental for local populations in developing countries.

A more effective policy would be to promote **structurally less dependence of the EU on soya imports**. This could take place as follows:

- Promote **the cultivation of protein crops** in the EU through innovation policy and if necessary by imposing a tariff on soya imports. An import tariff would compel the EU to offer concessions to its trading partners, such as more market access for meat, dairy products or sorghum.
- The Netherlands already supports the proposal of the EU **to again allow - under strict conditions - meat-and-bone meal from pigs to be used in poultry feed, and meat-and-bone meal from poultry to be used in pig feed**. This could replace approximately 4-11% of soya imports. With its large poultry and pig farming sectors, the Netherlands could benefit significantly from this measure. The Netherlands should also ask the EU to explore whether **meat-and-bone meal from cattle** can be used responsibly in pig feed.
- In the Netherlands and in the EU context, initiate a campaign to **discourage meat consumption** or – formulated more positively – to promote **high-value/low-meat diets.** This could take place on different tracks:
  - regulation or self-regulation of advertising for meat, especially advertising directed at children;
  - regulate the practice by many supermarkets of selling meat and beef at artificially low prices (while simultaneously keeping the prices of fruit and vegetables artificially high);
  - encourage more innovation on high-value/low-meat food.

The effect of such a discouragement policy will be modest, but it can also contribute to healthful nutrition and sustainability in a broader sense.

Recommendation 7. Explore perspectives for the production of energy/protein crops

Another preventive option is to promote the production of dual-purpose energy/protein crops. The EU is already doing this through the existing biofuel blending mandate, which will increase to 10% in 2020. This obligation can theoretically make an important contribution to protein self-sufficiency, but only if the EU requires that a substantial percentage of the biofuel originates from Europe-grown crops and that the protein is suitable for animal feed. According to the indicative model, this approach can largely eliminate the need for soya imports. The EU is rightly demanding that the climate and energy scores of biofuels be improved. This demand should equally apply to the environmental and biodiversity scores overseas, but there are still too many uncertainties in this regard.

We recommend:

- Commission a comparative study into the ***comprehensive*** **sustainability scores of various systems for combined biofuel/proteins production.**
- For combined production systems with positive scores: to benefit protein self-sufficiency, as part of the biofuel blending mandate the EU should also require that **at least 80%[270] of the biofuel originates from Europe-grown crops;** these crops must also produce high-quality animal feed protein as a by-product. If this proposal encounters trade policy objections, then the EU should enter negotiations on this topic with its trading partners.

Recommendation 8. Take precautionary measures for the first year of feed scarcity

Because prevention may sometimes be limited or even impossible, it is important to be well prepared for a possible crisis (preparedness) and to react adequately (response). The EU should prepare for scarcity of both roughage and concentrates, primarily with respect to soya; the Netherlands in particular should be prepared for soya scarcity.

For the *first year* of scarcity, the EU should take the following precautionary measures:

- establish **emergency stockpiles of animal feed and meat**. This measure is not intended to restore obsolete policies of income support for farmers. During scarcity, the emergency stockpiles will moderate shocks between exceptionally low and very high prices, discourage speculation and illegal imports and prevent the consequences of scarcity from being passed on to developing countries. Improper use of stockpiles for speculation or purely for income support can perhaps best be prevented by placing the administration in the hands of an independent body. The **private sector** can also be made **co-responsible** for emergency stockpiles, analogous to the General Food Law in which the EU had made food business responsible for food *safety*;
- promote the **resilience of farms** in biological and financial terms. The financial resilience of Dutch intensive animal husbandry is relatively weak due to the high level of borrowing;
- create **emergency funds** for credit or bank guarantees in case viable farms or chains are threatened with failure. The EU already co-finances private **insurance** against calamities;
- an obligation for Member States to establish **emergency plans** that guarantee **access for everybody to affordable meat and dairy products**.

The EU should not take such measures in a *top-down* fashion, but in consultation with key players in the business community and with NGOs where necessary. Consider establishing a national multi-stakeholder "**Hyogo platform"** to prepare for unexpected shortages of food, feed and meat. Such a platform could, among other things, prepare **codes of conduct** for times of scarcity. Also explore the opportunities for such a platform at the EU level.

[270] 80% is the current percentage of European oil seeds in biodiesel.

Recommendation 9. Take precautionary measures for the second year of feed scarcity
Reserves are necessary to absorb the initial shocks, but establishing stockpiles for two years is very costly. Instead, the EU should establish additional buffers for the *second year* of animal feed scarcity:

- A **land set-aside scheme**, preferably in a form that also provides environmental and biodiversity benefits. Three types of such schemes are possible:
  - a mandatory minimum percentage of set-aside land for each farm;
  - voluntary land set-aside in exchange for payment;
  - a minimum percentage of set-aside land as a condition for farm allowances *(cross compliance)*.

  The EU has experience with the first and second types. The second type offers the most possibilities for customised solutions to benefit the environment and biodiversity.
- Analogous to the above measures, develop an **extensification scheme** where arable land or grassland is used, but not fertilised. Here again, there are opportunities for environmental and biodiversity benefits.
- Provide coordination at the European level to establish public/private **emergency stockpiles of production inputs, in particular seed**.

Livestock disease epidemics

Recommendation 10. Strengthen preventive policy against livestock diseases
Regarding contagious livestock diseases, an advanced preventive policy is in place in the EU (and worldwide to some extent) which includes veterinary inspections in slaughterhouses and on the outer border, and identification and registration (I&R), along with a reactive policy including import bans, transport bans and compulsory culling.
In addition, propose the following preventive measures to the EU:

- coordinated **prevention of a "biological 9/11"** for the European livestock sector;
- promote **preventive vaccination** against several highly contagious diseases, especially diseases that lend themselves to bioterrorism attacks;
- promote the **development of new vaccines, especially marker vaccines and vaccines against diseases for which a vaccine is still lacking**, such as African swine fever;
- **reduce long-distance transport of livestock**. This reduces the risk of a contagious disease spreading on a large scale, and can also benefit the welfare of transported animals. For the Netherlands, this policy can have consequences for the structure and size of the sector, resulting in a smaller international "nursery function" for pigs (Europe) and poultry (worldwide) and a smaller regional rearing function for veal calves. The biorisks of these sectors for the entire livestock industry and society are simply too great;
- promote the **resilience** of animal production chains by:
  - developing livestock with improved *general* resistance (natural) and improved *specific* resistance (through vaccination) against infectious diseases;
  - livestock farms that are more resilient to price volatility.

Recommendation 11. Improve preparedness with respect to livestock diseases
The EU should also have a policy focusing on **improved preparedness** with respect to livestock diseases:

- **promoting buffer capacity** for livestock farms, manure storage and slaughterhouses. This can also benefit animal welfare. Buffer capacity could be promoted by making it compulsory or semi-compulsory, i.e. making it a condition for farm payments (cross compliance);
- at the European level, promote coordinated creation of **emergency stockpiles of vaccines and antibiotics, and coordination of the corresponding application capacity and culling capacity**;
- prevent a livestock crisis if vaccination takes place after an outbreak because the food industry and supermarket chains boycott meat and dairy products from vaccinated animals, or offer a much lower price, resulting in healthy animals being culled because their products are unmarketable. **The EU should make agreements about this with large buyers**. In addition, promote a European **fund to compensate livestock farmers for vaccination-related price cuts**.

Developing countries

Recommendation 12. Hold the EU to its commitment to phase out export subsidies
During the Doha Round of the WTO, the EU agreed to **phase out its export subsidies by 2013**. This offers developing countries better opportunities to develop their agriculture and in this way to improve their food security. **The EU must be held to this commitment.**
Even so, the EU continues farm payments. These are also a form of dumping – although a less aggressive one – in the sense that they have made it possible for the EU to lower agricultural prices to the level of the world market without encountering massive resistance from its farmers. **Ask the EU to conduct research into the consequences of this policy for developing countries and into possible modifications to minimise the consequences.**
The USA also provides financial support for its agriculture, though less than the EU. More important is the practice in the USA where large companies with strong market power purchase agricultural commodities from farmers at below the price of production then dump them on the world market at low prices. Determine whether this practice is also prevalent in the EU. **Put this "corporate dumping" on the WTO agenda with the aim of making agreements on mutual reduction**.

Recommendation 13. Allow countries room for self-sufficiency
The right to sufficient food is enshrined in the Universal Declaration of Human Rights. Given the lagging progress on the Millennium Development Goal of halving hunger by 2015, that right deserves higher priority. Most hunger is suffered in the countryside, not least by farmers. **Continue to support the rightful demands of developing countries that they should be allowed to protect their own farmers with import levies or quotas against invasions of cheap products from the world market.**
In addition, support government-wide policy – therefore including your colleague ministers for Development Cooperation and Finance – to put pressure on the **IMF and World Bank** to allow room in their **loan conditions** for developing countries to protect their agricultural sectors (at least temporarily) from destructive floods of cheap imports.

In order to simultaneously respond to the interests of trade (which for each country is also an internal buffer against calamities), this law can possibly be combined with a **compulsory minimum market access**.

Recommendation 14. Maintain increased funding for agriculture in developing countries
After the food crisis of 2007/08, agriculture is once again high on development agendas, also that of the World Bank, the EU and the Netherlands. The new Dutch government has confirmed this priority. The previous government also initiated a global conference about food security and climate change held in 2010. There will be a sequel to this conference in 2012.
In that context, also prioritise the following:

- Risks ***other* than climate change**, such as livestock diseases, volcanic eruptions and extreme price fluctuations on the world market. How can developing countries strengthen their resilience to these risks?
- Besides food production, also prioritise the **storage and transport** of food, where there are still many losses.
- Besides technical improvements, also prioritise **institutional improvements**, such as providing farmers with access to markets, capital, means of production and expertise.

For that matter, at the global level there is still a small risk of the opposite effect: **overinvestment in agriculture**. This can result in surplus production and falling agricultural prices, which discourage investments, after which production again lags behind demand, and a new food crisis results. Consider for The Netherlands to take the initiative to anti-cyclical investments.

Recommendation 15. Promote more sustainability in land grabbing and biofuels
After the food crisis of 2007-08, foreign investments in farmland in developing countries increased sharply. While these investments can theoretically contribute to the welfare and resilience of the rural population, there are too many examples of negative developments.

- Support the World Bank in the further development of a broadly supported public/private **code of conduct for land grabbing**, followed by implementation and monitoring.
- Promote the application of the **certification system for sustainable biofuels,** recently established by the Roundtable on Sustainable Biofuels.

Recommendation 16. Encourage prevention of severe price volatility
Severe price volatility can be harmful to producers as well as consumers, especially in food-importing developing countries. The EU can help prevent severe volatility by:

- continuing to stop overproduction and dumping
- creating stockpiles
- establishing a scheme for land set-aside and/or extensification.

However, ***global governance*** it is also required, focusing on food security and price stabilisation. France has already placed two related topics on the agenda in the EU and the G20:

- global transparency about **stockpiles** facilitating *early warning*;
- transparency and regulation of commodity futures markets (both inside and outside the commodity exchanges) to limit **speculation** by large financial players.

Support this initiative and add two **supplementary agenda points:**

- coordinate the **global reserve production capacity** in the form of land set-aside schemes or a flexible biofuel blending mandate;

- coordinate the **global level of investments in agriculture,** including investments in energy crops, to prevent underproduction as wells as overproduction.

Box Research questions for the knowledge and innovation agenda

Risk analysis

1. **Stress tests**: to what extent is the European livestock sector resistant to calamities such as bioterrorism attacks? And which **calamities, other than those referred to in this report**, are relevant to food security? And which are relevant to food *safety*? What could be the consequences of these calamities? In any case, these other calamities include power and/or Internet outages, food contamination in large chains and a crash of the financial system.
2. What are the **interactions between the markets for food, raw materials, energy and capital?** For example: to what risks are the other three markets subjected as a result of the massive creation of dollars and euros on the capital market?
3. Which **geopolitical scenarios** – besides those already explored as part of the interdepartmental programme *Schaarste en Transitie* (Scarcity and Transition) and the *Strategie Nationale Veiligheid* (the National Security Strategy) – are conceivable and what are the advantages and risks of these scenarios for agriculture and food security in the EU and developing countries? And how can these risks be reduced?
4. What is the nature and impact of the remaining levels of **dumping** in the US and EU? In how far can the European farm payments be regarded as dumping? And the US practice of *corporate dumping?* Does the latter also occur in the EU? Which options are available for mutual reduction?

Prevention

5. The current agricultural support of the EU primarily relies on farm payments. The basis of this support is possibly too narrow since it does much less to protect food chains. Explore whether the support can be expanded with **support for chains** that would enable them to be more resilient to calamities.
6. How can the **production of protein crops** in the EU and the Netherlands be promoted? In more concrete terms:

- **innovation** of protein crops and production systems, for example through breeding and selection;
- options for **trade policy exchange** with other products.

7. What are the possibilities and limitations of the **production of combined energy/protein crops**? More specifically:

- What are the **sustainability pros and cons of various systems of combined energy/protein production?**
- Are there options for a **flexible biofuel blending mandate** that can reduce severe price fluctuations for *both* grain and proteins, while also avoiding conflicts with trading partners?

8. What are the possibilities (also in the area of trade policy) for a **blending mandate for European-grown vegetable proteins in animal feeds**, with or without compensation for trading partners?
9. What options are available to **strengthen the resilience of the European agriculture and food system** with respect to calamities and geopolitics? Besides biological and technical options, this also concerns options in logistics, sector structure, farming styles and social networks. What new opportunities are offered by social media?
10. More specifically: what are the options for strengthening the resilience of the **intensive livestock farming in the Netherlands**, which is relatively vulnerable to contagious livestock diseases and a collapse of soya imports. How can the structure and magnitude of the sector be adapted in such a way that it becomes less vulnerable to livestock diseases and a collapse of soya imports?

Preparedness

11. Where are the **gaps in the public knowledge base** of the EU and the Netherlands in the area of **plant and livestock diseases**, also regarding *new emerging diseases* (such as Rift Valley fever and the wheat diseases stripe rust and yellow rust) and the risk of bioterrorism? How can access to vital knowledge be secured in an era of commercialisation?

12. How can an **extensification scheme** combine reduced production with environmental and biodiversity benefits? Can such a scheme be monitored for compliance?
13. Does a **flexible nitrogen levy** have possibilities as a buffer? What are the possibilities and advantages/disadvantages from the perspective of sustainability?
14. What are the **costs and benefits** of various options for prevention and preparedness? These options include replacing soya imports with Europe-grown proteins, stockpiling and a set-aside scheme. Where are the optimalities?
15. How can the **private sector be made co-responsible** for the resilience of the European agriculture and food system?

Geopolitics and global governance

16. Which **no-regret options** are conceivable for the EU and the Netherlands with respect to various **geopolitical scenarios**, particularly regarding the increasing role of state-owned or partly state-owned companies on the world market?
17. What are the options for **strengthening the global governance of food security** so that it becomes more binding, analogous to national and international policies for food *safety*;
18. What are the options for **global governance of world stockpiles of vital inputs such as phosphate, zinc and seeds**?

Recommendation 17. Encourage preparedness in developing countries

For preparedness and response there is also global governance in place, including the Food Aid Convention and the Global Food Crisis Response Programme of the World Bank, which enables developing countries to continue to finance their food imports. In addition, in 2000 the EU created a Food Facility with a budget of €1 billion. The aims of this Facility include alleviating the consequences of severe price fluctuations for the local population.
In addition, commit to:

- **Trade regulations of the WTO that are more resilient to scarcity**. Such regulations should offer exporting countries *limited* room to reduce their exports during times of high domestic prices. This could prevent more drastic and more harmful export obstacles and reduce the probability of panic reactions, domino effects and trade policy anarchy.
- Encourage developing countries to strengthen their **resilience** with respect to severe price fluctuations. This can be done for example by investing in climate-smart types of agriculture. Establishing **national Hyogo committees** can also help. Such committees make agreements about how to deal with calamities, in the spirit of the Hyogo Framework for Action of the UN, which was signed after the tsunami of 2004.

Research and innovation

Recommendation 18. Give calamities and geopolitics a higher priority on the knowledge and innovation agenda

Knowledge and innovation are key for the crisis-resilience of agriculture and food security. Put the **18 research questions listed in the Box** on the knowledge and innovation agenda of the Ministry of Economic Affairs, Agriculture and Innovation**.**

Opportunities

Recommendation 19. Leverage the promising years 2011 and 2012

The next two years offer excellent opportunities to address some of the abovementioned issues on European and global agendas: the CAP will be reformed, the G20 has put food security on the agenda,[271] commodity markets will be regulated and the WTO negotiations are entering a decisive phase. **Try to leverage these opportunities** to make the agriculture and food systems of the EU (including the Netherlands) and developing countries more shock resistant.

[271] Although the Netherlands has not been invited to participate, it is involved in the preparations.

Appendix 1: Abbreviations used

CVI	Central Veterinary Institute
EL&I	Ministry of Economic Affairs, Agriculture and Innovation
EU	European Union
FAO	Food and Agriculture Organisation
FAOSTAT	Statistics of the FAO
G20	Group of 20 (19 largest economies + the EU)
GATT	General Agreement on Tariffs and Trade
GFCRP	Global Food Crisis Response Programme
CAP	Common Agricultural Policy
GMO	Genetically Modified Organism
GPS	Global Positioning System
IATA	International Air Transport Organisation
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
ISO	International Organisation for Standardisation
KNMI	Royal Dutch Meteorological Institute
KNMvD	Royal Netherlands Society for Veterinary Medicine
LEI	Agricultural Economics Research Institute
LNV	Ministry of Agriculture, Nature and Food Quality
LOG	Agricultural development area
FMD	Foot-and-mouth disease
NAFTA	North American Free Trade Agreement
NATO	North Atlantic Treaty Organisation
NGO	Non-governmental organisation
OECD	Organisation for Economic Cooperation and Development
PBL	Netherlands Environmental Assessment Agency
PD	Plant Protection Service
RDA	Council on Animal Affairs
RhoK	Random Hacks of Kindness
RLG	Council for the Rural Area
SADC	Southern African Development Community
SOER	State of the Environment Report
UvA	University of Amsterdam
VEI	Volcanic Explosivity index
UK	United Kingdom
UN	United Nations
USA	United States of America
WW I	World War I
WW II	World War II
WTO	World Trade Organisation
WUR	Wageningen University and Research centre

Appendix 2: Participants in preliminary sessions

Participants in 20 April 2009 workshop on *Calamities and food security*

Prem Bindraban	Wageningen UR, PRI
Kees Burger	Wageningen UR, Development Economics
Don Jansen	Wageningen UR, PRI
Foluke Quist	Wageningen UR, PRI
Jeroen Warner	Wageningen UR, Disaster Studies
Aline de Koeijer	Central Veterinary Institute
Jan Schans	Plant Protection Service
Anne Gerdien Prins	Netherlands Environmental Assessment Agency
Hannah Koutstaal	Ministry of Agriculture, Nature and Food Quality
Marije Breedveld	Ministry of the Interior and Kingdom Relations
Evert-Jan Aalpoel	Platform Agriculture, Innovation and Society (Platform LIS)
Carin Rougoor	Executive Secretary Platform LIS
Prof. Helias Udo de Haes	Platform LIS
Wouter van der Weijden	Chair, Platform LIS

Participants in 4 September 2009 workshop on *Geopolitics and global governance*

Kees Burger	Wageningen UR, Development Economics
Eefje Derix	Wageningen UR, Disaster Studies
Nico Heerink	Wageningen UR, Development Economics
Jeroen Warner	Wageningen UR, Disaster Studies
Prof. Michiel Keyzer	World Food Supply Research Foundation (SOW-VU)
Gerd Junne	Professor of International Relations, UvA
Prof. Rob de Wijk	HCSS
Prof. Coby van der Linde	Netherlands Institute for International Relations Clingendael
Bertram Zagema	Oxfam Novib
Marije Breedveld	Ministry of the Interior and Kingdom Relations
Peter Besseling	Ministry of Agriculture, Nature and Food Quality
Peter Keet	Ministry of Agriculture, Nature and Food Quality
Hannah Koutstaal	Ministry of Agriculture, Nature and Food Quality
Sicco Stortelder	Ministry of Agriculture, Nature and Food Quality
Evert-Jan Aalpoel	Platform LIS
Carin Rougoor	Executive Secretary Platform LIS
Prof. Helias Udo de Haes	Platform LIS
Wouter van der Weijden	Chair, Platform LIS

Participants in 7 October 2010 Roundtable Discussion on *Geopolitics and food security*

Michel Rademaker	HCSS
Hugo Stam	CEO, Cefetra
Prof. Rudy Rabbinge	University Professor, Wageningen UR
Joost de Jong	Ministry of Economic Affairs, Agriculture and Innovation
Hans Sprangers	Ministry of Economic Affairs, Agriculture and Innovation
Evert-Jan Aalpoel	Platform LIS
Anne Loeber	Platform LIS

Ger Roebeling	Platform LIS
Carin Rougoor	Executive Secretary Platform LIS
Wouter van der Weijden	Chair, Platform LIS

Appendix 3: Mandate and composition of the Platform Agriculture, Innovation and Society

The work of the Platform Agriculture, Innovation and Society *[Platform LIS]* contributes to the knowledge policy of the Dutch Ministry of Economic Affairs, Agriculture and Innovation through:

1. Exploring the consequences of possible technological developments and considering alternatives and/or;
2. Exploring possible technological contributions to the solution of societal problems relevant to the policy fields of the Ministry and/or;
3. Exploring and making explicit the standards and values that are involved with specific developments, as well as the differences in standards and values between various groups in society.

The following people, all in an individual capacity, are members of the Steering Committee:

- *Drs*. W.J. (Wouter) van der Weijden, Chair (Centre for Agriculture and Environment)*
- Mr E.J. (Evert-Jan) Aalpoel (dairy farmer)
- Dr. G.J. (Bart) Knols (MBA)
- Dr A.M.C. (Anne) Loeber (Researcher and Senior Lecturer, University of Amsterdam)
- *ir.* G. (Ger) Roebeling (Management Development Foundation)*
- Prof. G. (Guido) Ruivenkamp (Professor of Critical Technology Construction, Wageningen University)
- Prof. H.A. (Helias) Udo de Haes (Emeritus Professor of Environmental Sciences, CML, Leiden University)*
- *Drs.* J.A.C. (Hans) Vink (General Manager Nutreco Aquaculture [Skretting] NW Europe)*

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* Member of the ‘Calamities’ project group, which prepared this report and advisory document.