Chapter 8

Distributional Effects of Disasters in Food Value Chains and Change of Risk Management Strategies: Experience from Europe and Implications for ASEAN

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CHAPTER 8

Distributional Effects of Disasters in Food Value Chains and Change of Risk Management Strategies: Experience from Europe and Implications for ASEAN

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8.1 Introduction

Today, we have a world population of almost 7.6 billion which is expected to grow to 9.8 billion by 2050 and 11.2 billion by 2100, taking a medium growth projection (United Nations Department of Economic and Social Affairs (UN DESA), 2017). Never before in history could more than 90% of the world's population fully satisfy their food demand, which is now the case. In 1974, the World Food Conference was held in Rome with the aim of eradicating hunger (United Nations, 1975). The goal to eliminate hunger was repeated twice by the Food and Agriculture Organization of the United Nations (FAO) at the Global Summit of Food Security in Rome (FAO, 1996; 2009) and reaffirmed as one of the new Sustainable Development Goals (International Food Policy Research Institute, 2016). While the goal to eradicate hunger came ever closer but was never reached, we can feed more people today than the populations of 1974 or 1996. This is related to the establishment of ever larger food value chains and people's increased budget to buy food originating from far away. However, the poorest people have no access to food value chains and depend entirely on local food production.

Changes are on the way: the current share of the urban and rural population – traditionally responsible for food production – is equal at the global level. However, this ratio will change in favour of the urban population, which is projected to grow to 80% by 2050 while the rural population will fall to 20%. We currently have a peak rural population of 3.8 billion in absolute numbers and expect this number to halve by 2050. Farming methods are changing. We currently have more than half a billion food production units, most of them traditional smallholders in the developing world. Their number will drastically decrease with the retreat

of the rural population. Society will no longer need as many rural people involved in food production.

The rapidly increasing urban population will be fed primarily by fewer units of industrial agriculture with ever larger resource inputs, capital-intensive agriculture, the continued application of biological/genetic science to food production, greater ability to save crops from pests, and higher capacity to preserve perishable products during transport. Technology in agriculture and food production will play an important role in reducing excessive resource inputs or food waste and is a tool to re-establish global food production in a more sustainable way.

Sustainable development is a long-expressed goal and can be tracked in many publications. The Club of Rome ordered the first report on 'Limits to Growth' (Meadows et al. 1972). Other reports such as the 'Global 2000 Report' to former United States (US) President Jimmy Carter followed (Barney et al., 1980). The United Nations World Commission on Environment and Development issued a document entitled 'Our Common Future', which became known as the Brundtland Report (Brundtland et al., 1987). 'Agenda 21' of the Rio Conference 1992 was derived from these publications and sustainable development became included in the work of many governments. In addition to an expected lack of resources, we are troubled by the pollution of resource use such as the emission of greenhouse gases. Such exploitation of natural resources on a global scale has brought with it climate change and other climate-induced disasters. Further additions were introduced by the Millennium Development Goals, and the 2030 Sustainable Development Goals (United Nations, 2015). All these documents give testimony to efforts that date back almost half a century. The degree of involvement is, however, different today than what it was initially, when few stakeholders were sufficiently aware of the issues to take action. Today, the broad consensus of most stakeholders and nations is that the globe is our scale of operation.

Ambitious and targeted frameworks have been in place since the establishment of the Kyoto Protocol (1997), which aimed to regulate climate change and greenhouse gases (GHGs). The protocol failed, and was substituted by a less ambitious and more realistic framework – the Paris Agreement (2015) – to reduce GHG emissions to levels that do not surpass a warming threshold of 2°C. However, after achieving this milestone, the US government, the second largest emitter, withdrew from the accord (Shear, 2017). The regulation of the global climate, one of the most important parts of sustainable development, remains uncertain.

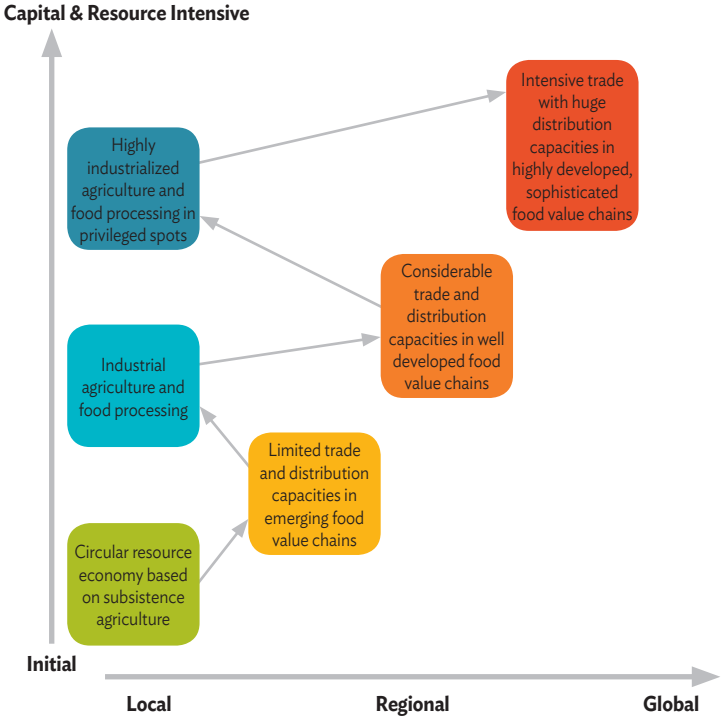
Agricultural production as the basis and food consumption as a final output have never been more distant to each other than today. While one family was traditionally the only stakeholder in a local subsistence farm unit, we now have ever more stakeholders in regional and global food chains. To appeal to new stakeholders, food chains need to create ever higher values and to develop into more efficient distribution systems covering large quantities and flows from various parts of the world. Food value chains cover every station from inputs to agricultural production, growing agricultural products, transporting them, processing food, retail in food stores, and consumption in homes or restaurants. The number of food items on the market, including variations and differentiations within food items, increases continuously. Globalisation, paired with higher average incomes and purchasing power for most people, accelerates changes in human lifestyles and modifies food consumption patterns.

Food availability and ever larger distribution channels play fundamental roles in food value chains. A long distance from the source (agricultural production) to the target (food consumption) means a high risk of food loss and damage and unwanted surprises along the way. The quantity and speed of distribution at and between the relevant stations of the food value chain are important for the smooth operation of sophisticated food value chains. This depends on the availability of infrastructure, technology, resources, and money, which are not equally spread throughout the world.

Figure 8.1 indicates that food value chains and their vulnerability are scale-dependent. In traditional resource-based subsistence agriculture, distribution is not yet very important, there is too little value involved, and farmers try to satisfy basic food needs for their families. Distribution becomes ever more important by widening the scale of action in regional and global value chains, where access to markets is decisive and the value of traded commodities increases. New industries and services find their way into food production and consumption, and ever higher values are generated in food chains.

Up to some 200 years ago, there were only local food production systems. This changed because of industrialisation, and food systems became regional, with increased trade and distribution necessities. In the current era, where food is traded all over the world, food systems are changing to achieve ever more variety and diversity. This process could prevail for a long period.

Figure 8.1: From Local Food Supply to Global Food Value Chains



Source: Author.

The following sections will inform on the role of disasters, resilience strategies for the food system, the food scarcity threat, the elements of the food value chain, changes in the context of food value chains, strategies against disaster damage, and recommendations for the Association of Southeast Asian Nations (ASEAN).

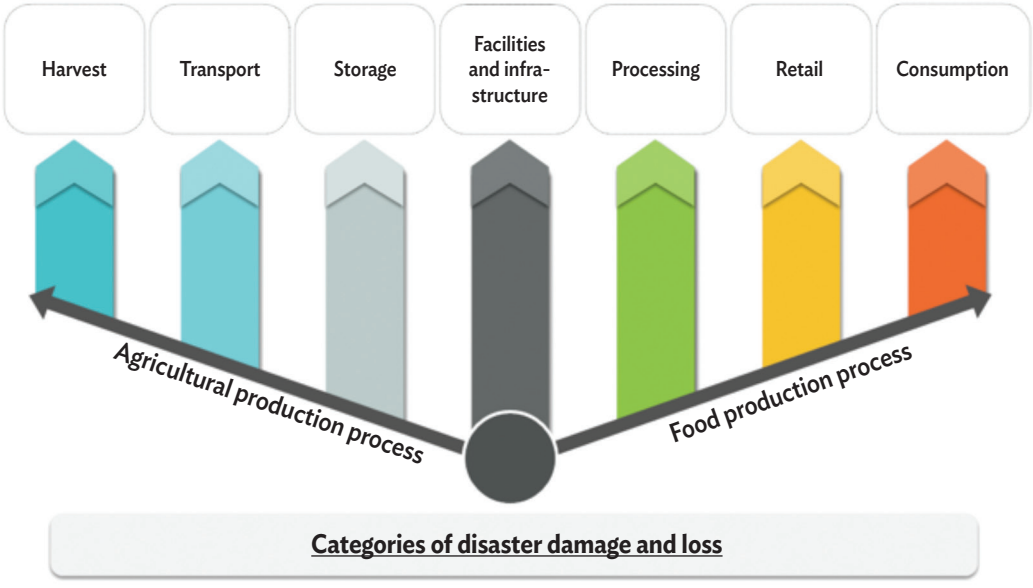
8.2 The Disaster Threat

Climate disasters are anticipated to increase over the next decades (Intergovernmental Panel on Climate Change (IPCC), 2014). Disasters can ruin parts or entire harvests of agricultural products, work as a hindrance to food distribution and storage, and impair serious hinders in the distributional flows of food value chains if infrastructure becomes damaged. However, there are important differences in relation to the scales of disasters and food value chains. Disasters hit particular areas that are specific for a disaster event. Droughts, cyclones, or floods have different impact and damage patterns. Losses are quantified in terms of

agricultural production, damage to the food processing infrastructure, and blocking of the transportation network. Disasters disturb the flow of the supply of certain food products. This may lead to growing disparities within regions.

Disasters can become hindrances to development, as many peripheral areas of countries with emerging economies depend on income from cash crops. They may even exclude certain areas from further development prospects when affected regions are abandoned and the local population has to migrate. While some parts of the world, regions, or countries lose profits and development potential, other areas may profit from disasters because of better prices for their products and decreased competition. In summary, more disasters mean more fluctuations, price insecurity, and difficulties in business operations. Figure 8.2 depicts the categories of disaster damage and loss. These relate to the agricultural production process or the food production process. We can differentiate between harvest/pre-harvest; transport by road or sea; storage and conservation of agricultural products; inputs to agricultural production; facilities and infrastructure such as machinery halls, irrigation systems, livestock shelters, fishing boats and equipment, landing sites, and hatcheries; food processing technology; and retail and distribution to customers or final consumption in households, restaurants, and canteens.

Figure 8.2: Vulnerability to Disaster Damage in the Food Value Chain



Source: Author.

The first World Conference on Disaster Risk Reduction (WCDRR) took place in Yokohama in 1994. The 10 principles of the Yokohama strategy for a safer world (International Decade for Natural Disaster Reduction (IDNDR), 1994), do not refer to agriculture and food. At that stage, food security issues were not prioritised. The second WCDRR in 2005 in Kobe produced the Hyogo Framework for Action (United Nations Office for Disaster Risk Reduction (UNISDR), 2005). Key activity 2d of the Hyogo Framework highlights the importance of the promotion of food security in ensuring the resilience of communities to hazards, particularly in areas prone to drought, floods, cyclones, and other hazards that can weaken agriculture-based livelihoods. Ten years later, the United Nations General Assembly approved the Sendai Framework for Disaster Risk Reduction, 2015–2030 as an outcome of the third WCDRR in March 2015 in Sendai. Article 28b of the framework targets collaboration across global and regional mechanisms and institutions for the implementation and coherence of instruments and tools relevant to disaster risk reduction, such as climate change, biodiversity, sustainable development, poverty eradication, environment, agriculture, health, food, and nutrition (UNISDR, 2015).

The Sendai Framework for Disaster Risk Reduction, 2015–2030 did not offer new ideas on how to deal with an increase in disasters and disaster damage in particular. A joint international methodology on how to assess disaster damage and losses in agriculture and food security is still missing (Cutter, 2017; Breiling and Anbumozhi, 2017), but is likely to emerge during the next few years. In 2017, the FAO came up with a climate change strategy (FAO, 2017) after analysing disaster impacts in previous years in developing countries (FAO, 2015; 2016). Advice on how to quantify damage and losses in a standardized way has not yet been provided, but should be a topic in the future.

Natural disasters work within a larger system of food security issues, and other – sometimes hidden – factors can aggravate or mitigate disaster damages. Disasters can thereby impact agricultural production, food production, food storage, food distribution, the durability of food, and more. Floods and droughts, the most common form of natural disasters, are primarily climate-induced. According to the FAO, there were an average of 149 annual disaster events during 1980–1990 and 332 over 2004–2014. While the number of climate-related disasters more than doubled, the related damage was seven times higher. Therefore, the average damage tripled in connection with each disaster. One can expect a continuation of this trend, with even more damages, in the future. The total annual damage caused by these disasters was $14 billion in the first period during 1980–1990 and $100 billion in the second 2004–2014 period (FAO, 2016a). This is equivalent to an increase in the amount of

disaster damage from less than 1% (1980–1990) to more than 3% (2004–2014) of the total global agricultural production value within a third of a century. The situation is particularly dramatic in developing countries, which are much more dependent on the agricultural sector and especially vulnerable to droughts, where the loss and damage from medium- to large-scale disasters already account for a 22% loss (FAO, 2015).

Disasters trigger and accelerate migration, primarily in developing countries (Lütz, 2013). How well countries cope with this situation depends on internal capacities. Natural disasters affect 218 million people or 3% of the global population each year – contributing to 65 million forcibly displaced persons and 22 million or 0.3% of the world's population as refugees (United Nations Development Programme (UNDP), 2016). Weather- and climate-related disasters are taking a heavy toll, which is difficult to calculate because of under-reporting in low- and middle-income countries, particularly on mortality caused by heatwaves. The period from 1996 to 2015 saw 7,056 disasters recorded worldwide by EM-DAT, the Emergency Events Database, taking the lives of 1.35 million people or 68,000 deaths per year. The number of weather- and climate-related disasters (floods, storms, and heatwaves) has more than doubled over the past 40 years, accounting for 6,392 events in the 20-year period from 1996 to 2015, up from 3,017 in 1976–1995. In comparison, the frequency of geophysical disasters (earthquakes, tsunamis, and volcanic eruptions) remained constant. In total, climate-related disasters claimed more lives than earthquakes (Centre for Research on the Epidemiology of Disasters (CRED) and UNISDR, 2016). The number of people under displacement risk because of natural disasters has quadrupled since the 1970s. This is twice the rate of population growth, meaning that people are twice as likely to be displaced now than they were in the 1970s. People in Asian countries have the highest risk of being displaced because a large number of vulnerable people in Asia are exposed to multiple natural hazards (Internal Displacement Monitoring Centre (IDMC), 2015).

8.3 Disasters and Resilience Strategies for the Food System

The increase in disasters coincided with a 70% increase in traded agricultural goods during 2006–2016 (World Trade Organization (WTO), 2017) and a general increase in exports of goods and services from 13% of global gross domestic product (GDP) in 1970 to 31% of GDP in 2008 (International Monetary Fund (IMF), 2009) before dropping slightly to 29% of GDP in 2015 (World Bank, 2017). A high proportion of domestically produced food in the total food supply is of key concern for almost all countries, although ever more food is imported.

Food security is not only related to continuous success in productivity but also safeguarding the current flow of resources, controlling the international trade in inputs, and providing an efficient global transportation network. Global energy prices fell by 45% during the decade from 2005 to 2015 (WTO, 2016). When the first General Agreement on Tariffs and Trade (GATT) agreement was negotiated during the 1990s (Saylor Foundation, 2017), special exceptions for agriculture were included, e.g. an allowance to use export subsidies. This enabled countries to keep prices for farm products high in domestic markets, but those prices generated a surplus of food which was dumped on international markets by using export subsidies. Agricultural producers in developing countries were thereby forced to compete with low-priced subsidised food from the developed world.

The global food security system offers flexibility and trade-offs for most people around the globe. Some 90% of global citizens enjoy food security while 10% suffer from occasional or even permanent food insecurity or hunger (von Grebmer et al., 2016). Comprehensive food security became widely possible because of a combination of inexpensive external energy, fertilisers and material inputs, and sufficient internal land and water resources. It is a declared aim of the United Nations (2015) to eradicate hunger by 2030 – an expressed Sustainable Development Goal – and more than 97% of the global population should become food secure by 2030. Accordingly, appropriate food production and distribution policies should be put in place to guarantee food availability for all consumers.

Many ways to improve efficiency between agricultural production and food consumption will have to be considered to counter an increase in disasters and an even greater increase in disaster damage and losses. One option is to produce more food (FAO, 2013) than what can be eaten. We already produce food for more than 10 billion people (Holt-Giménez et al., 2012) or even 12 billion people (Tiwari, 2017). However, so far, the food security system has failed in distributing food to all the people in need. Challenges arise in deciding how the food will be distributed amongst the people, who has the power of distribution, and what methods should be used for distribution (Mission, 2014). Producing more food than necessary leads to more robustness after harvest failures in the case of additional climate-induced changes (Worldwatch Institute, 2013), unexpected animal diseases, or other sorts of crises. The food price plays an important role in the distribution system. If it is not high enough, local producers may be pushed out of business in favour of larger food producers. If it is too high, the number of poor and hungry people not able to buy sufficient food will increase. Food price fluctuations relate to petroleum prices, crop yields, food stock levels, and exchange rates (Ghanem, 2011).

A second option is to change the ratio within the agricultural production of non-food uses (in particular feed and fuels) and food consumption in favour of the latter. For example, grain can be feed for livestock or food for humans. In 2016, 1.03 billion tons – or 136 kilograms (kg) for every person on earth – was used as feed for animals, an increase of 8% over 2012 (Alltech, 2017). A high percentage of meat in a society's diet can also be considered a hidden food reserve if people were to substitute meat with cereals. In addition, a vegetarian diet is considered an efficient means to cut GHG emissions from agriculture (Hedenus et al., 2014). We should further question if cereals or palm oil are a good alternative for ethanol fuel production. In the case of India, it was considered a viable option for marginal lands while it should not compete with food production in densely populated areas (Srinivasan, 2009). In total, global cereal production amounted to 2.49 billion tons in 2016/17 (Statistica, 2017) or 328 kg per person. Considering 200 kg as the annual minimum requirement for one person, the amount produced implies that 12.45 billion people could theoretically obtain food from the current cereal production.

A third option is to minimise agricultural production losses and avoid food waste. Here, disaster-related damage and losses are relevant. On the demand side, reducing food waste can have a significant impact on the availability of food. The FAO (2011) suggested that about one-third of food produced for human consumption is lost or wasted globally, which amounts to about 1.3 billion tons per year. Huge amounts of the resources used in food production are used in vain. The related GHG emissions are also in vain. The average European wastes 179 kg of food in the value chain from the farm gate to the lunch or dinner table (Stenmarck et al., 2016). This is close to the annual consumption of a poor person mainly living on 200 kg of cereals. Reducing food waste can improve the efficiency of food value chains and help to improve food security.

A fourth option is to support the poorest nations with targeted food programmes. Assisting 80 million people in around 80 countries with 12 billion meals, the World Food Programme (WFP, 2017) is the leading humanitarian organisation fighting hunger worldwide, delivering food assistance in emergencies and working with communities to improve nutrition and build resilience. In the case of ASEAN countries, Myanmar and Cambodia have profited from such programmes and have seen the largest percentage reductions in hunger worldwide since 2000 (von Grebmer et al., 2016a). Particular directions of the WFP are the food for work, school meals, and first 1,000 days actions. The food for work action targets repairing

irrigation facilities or other infrastructure after emergencies. Some countries such as India have established their own national work for food programmes for disfavoured regions within the nation. The school meals action and the first 1,000 days action are directed at children and infants and their mothers, usually the most vulnerable individuals after disasters (WFP, 2017).

Yet another strategy is to improve food safety further and detect emerging food security issues early. While the eating of insects is common in some Asian countries, it is entirely new in Europe. In recent years, entrepreneurial activities have been developed to introduce insects as food. Several start-ups established in the European Union, e.g. the Austrian Zirpinsekt (2017), produce high protein content food from grasshoppers. Appropriate standards and government ordinances have to be issued as the introduction of new food items is critical. This has led to a process within the European Union to regulate risk and safety aspects related to insect food. The European Food Safety Authority (EFSA) Scientific Committee (2015) considered introducing insects as food and feed, and common standards may be published in the near future.

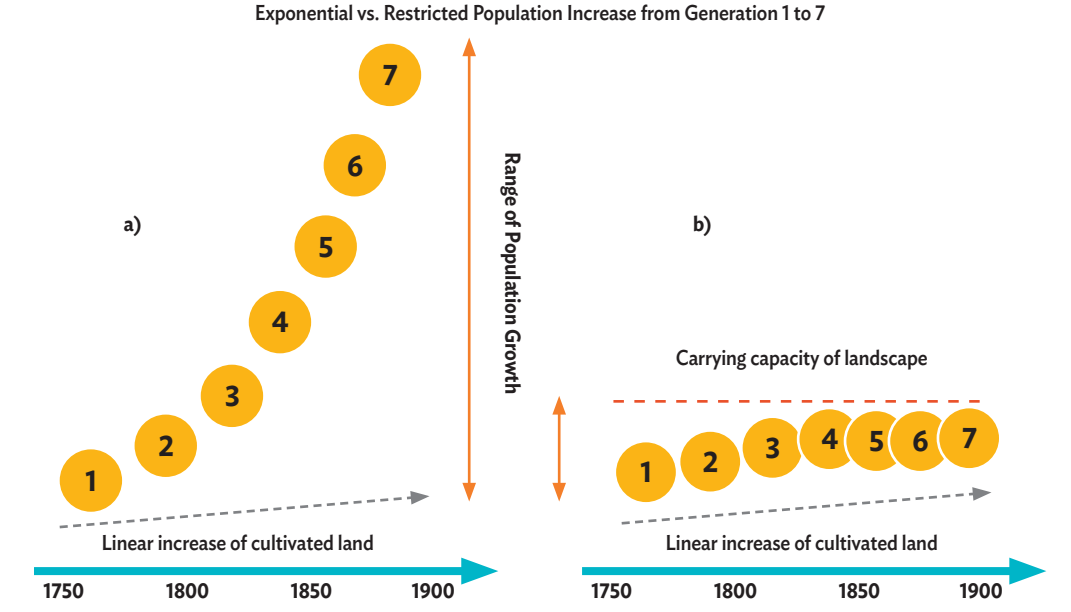
8.4 The Food Scarcity Threat

Climate change and increased frequencies of extreme weather events are a recent phenomenon, alongside many old ones in the history of food security, as the human population is dependent on food and available food quantities. For hundreds of years, there has been a persistent concern and theory that human population growth would not be met by sufficient increases in agricultural production. Malthus (1798) drew attention to the fact that the population doubles in a given period, so-called exponential growth, while agricultural production increases due to more agricultural land, with linear growth rates. At that time, this situation related primarily to gaining agricultural land through clearing forests. As land is limited and the possibility of converting forests to agricultural land gradually becomes impossible, famine and war are a logic consequence after a few generations because of the reduced food supplies.

Figure 8.3(a) depicts an example of the exponential population growth in a condition of limited arable land supply. This is typically for development in the centre of a region. We start in 1750 at generation 1. After six generations, on average 25 years, the arable land has grown modestly while the population has skyrocketed. Malthus intended to show his contemporaries the impossibility of such a development and that any society has to break down sooner or later because of famine and war. However, his doom model was – and still is – viable for urban areas. A precondition is that enough food can be imported from adjacent rural areas.

The Malthus model was contrasted by a resource constraint theory model (Verhulst, 1838) and stabilisation function to describe the relationship between population and food supply. The population cannot grow out of a certain range because of resource constraints, which define the carrying capacity of a given territory. If exceeded, the people have to migrate to other areas or suffer from scarcity, famine, and bad health, which also limit the reproduction rate. An equilibrium between agricultural land area and population will, therefore, be reached before extraordinary population growth. This situation is depicted in Figure 3b and is typical for rural areas. The surplus population of rural areas has to migrate to urban areas within the region or new less populated regions. In Malthus and Verhulst's time, many people emigrated from Europe to America and other continents. The global population increased from 679 million in 1700 to 957 million in 1800 and 1,650 million in 1900 (Demeny, 1990). For a very long time, the scale of operation was comparatively small – people were restricted to local food resources and limited interactions farther afield were limited. Optimisations in food production were achieved within territories.

Figure 8.3: Land and Population in Dependence to (a) Malthus and (b) Verhulst

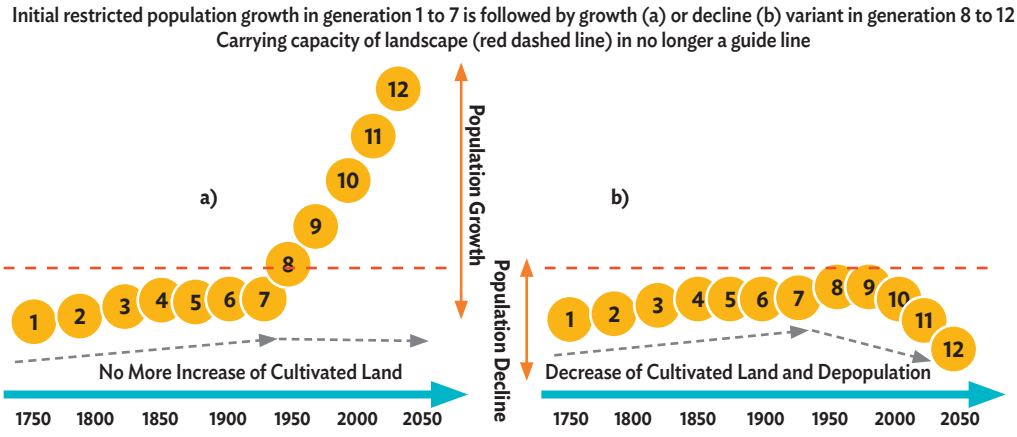


Source: Author.

In 1960, the world's population was 3 billion people. Gradually, the resource supply region extended and more resource imports became possible. Farmers produced surpluses and became richer. The scale of interaction was no longer restricted locally and could be optimised for larger areas. Non-local inputs such as machinery and chemical fertilisers increased productivity widely. The laws of economies of scale could be applied, and larger territories could be regarded as food markets because of higher productivity and larger quantities of food. Arable land was for a long time considered the single most important asset of grain and food production (Malenbaum, 1953). Local resources such as water and traded resources such as energy, fertiliser, pesticides, machinery, and more input materials become equally or even more important as access improves. This allows an unprecedented expansion of food supply which could not be anticipated under historical conditions. Rural regions (as shown in Figure 8.3(b)), up to the eighth generation restricted in growth, can now leave the state of equilibrium and overcome the limits provided by the carrying capacity of the landscape. They can start an intensification process (Figure 8.4 (a)) similar to the one projected by Malthus (Figure 8.3 (a)) or become urbanised. Alternatively, they can become marginalised, less populated, or even unpopulated areas because of better living conditions

elsewhere and the strong incentive to migrate to places with more opportunities (Figure 8.4 (b)). We have both a decline in population and land in use because of marginal profitability. Fields that were used under hard conditions of external resource constraints are no longer managed in the new economic context. The disappearance of smaller local settlements – livelihoods, hamlets, villages, and sometimes even towns – happens in parallel to the prospering of new regional centres with access to more food items.

Figure 8.4: Land and Population in Verhulst Models Modified by Economies of Scale



Source: Author.

Access to foreign resources and trading changes land use dramatically. This section discusses cases from Austria in Europe.

The Case of Austria

Recently, Austria, in Europe – like other rich industrialised countries – has enjoyed a previously unknown variety of foods. Looking back to the times before Malthus and Verhulst, Austria's 84,000 square kilometres (km^2) of territory could hardly feed its 2 million people who were then living within its borders in the 18th century. Major famine periods were reported in 1709, 1770, and 1772 (Linsboth, 2008). Some 80% of the population was working in agriculture, struggling hard to cultivate food from their land. There were frequent famine periods, often leading to armed conflicts and migration to other parts of the empire in Southeast Europe. Today, 8.8 million people live on the same territory, perfectly served with a

great and diverse supply of food: tropical fruits, out-of-season food items, and fresh seafood are now offered throughout the year not only in the capital Vienna but even in smaller towns in the countryside. The country could possibly provide food for 20 million people although the local resource base has not changed.

During less than 12 generations from 1750 to date, the capacity to feed the population has increased 10 times. In addition, the food is of higher quality and is continuously available. What has changed is the global resource availability facilitated by international trade, previously unavailable access to capital, a sharp decrease in transport costs, and the resulting possibility to import and export more kinds of foods in different qualities and larger quantities from various countries. In addition, less land is needed and marginal agricultural fields are again afforested.

From 1990 to 2010, more than 2,000 km^2 – 2.5% of the total land area or 6% of the agricultural land area – were afforested (Austrian Ministry of Agriculture, Forestry and Environment, 2015). About 1.5% of the Austrian land area was converted to land for construction, supporting the wish of many Austrians to move from the city centre to the rural fringe. Austrian society got used to full food stores where a diversity of inexpensive food is available. The former necessity of the non-farming population to produce food turned into a hobby to produce one's own food. Many people use their gardens for recreation rather than fruit and vegetable cultivation like two generations before. Sometimes fruits are not even harvested as the owners are busy with more profitable tasks than gardening. This indicates a radical change both within the society and the food support system.

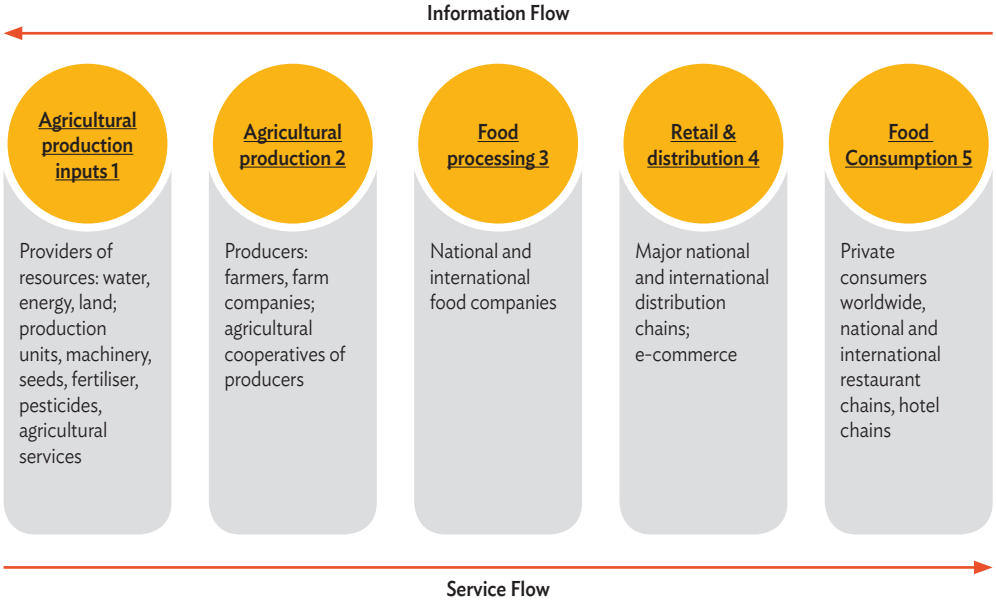
Endogenous population growth, as experienced in ASEAN countries with 639 million people (2016), does not happen in Austria or the European Union (EU) with 512 million people. It happened before during 1850–1970 when the fertility rate was well over two and far above the simple reproduction rate. In 2015, it was 1.47 and principally in a situation of decline. However, Austria is an attractive immigration or refuge country, and population growth has continued though many peripheral subregions experience depopulation. Primarily in these remote areas, people have fewer services and a less sophisticated food supply.

Austria's accession to the EU in 1995 offered a much larger and wider food market. National food value chains turned into regional EU food value chains. The protection of national agricultural markets became more difficult. Austrian farmers had to compete harder with their peers in other EU member countries with better production conditions. The former preference for agricultural productivity changed to a preference for tourists because of the importance of tourism – which is economically three times more important than agriculture (Breiling, 2006). Before, a beautiful landscape was a by-product of agricultural activity; now it is the main product. Landscape maintenance is a precondition for modern mass tourism. A healthy ecologically well-functioning landscape is not only the source of tourism revenue but also a means to cope better with disaster risks, which will be discussed later.

8.5 The Food Supply Chain

Food consumption is the end of a production chain. Figure 8.5 divides the food supply chain into the following groups of stakeholders: (i) providers of agricultural inputs, (ii) producers of agricultural outputs, (iii) the food processing industry, (iv) retail and distribution organisations, and (v) food consumers.

Figure 8.5: Actors in the Food Supply Chain



Source: Author.

The first group of stakeholders relates to agricultural inputs. Any agricultural production depends on inputs. We need the provision of basic resources such as farmland. With some 1.5 billion hectares globally, the right amount of water resources and energy in various forms (e.g. gasoline and electricity) are vital. Then, we need inputs such as seeds, fertiliser, pesticides, and machinery; and production units such as greenhouses, storage facilities, and other built environment. Finally, agricultural research and services can be named as an input class. During the last decade, following the financial crisis in 2008, farmland has become an important asset in trade and investment. Since then, every year at least 10 million hectares have been sold from family farms to institutional investors at a price of about $500 per hectare (based on Deloitte (2013)). Climate-induced water problems challenge agricultural production, and more frequent drought and flood disasters have increased prices for agricultural commodities. Unpredictable energy prices may further aggravate the situation. Progress in agricultural research – such as the introduction of drought-resistant wheat varieties – counters some of the new threats. Decreased levels of fertiliser and pesticides caused by precision farming allow important reductions in inputs. The development of smart farming may offer important new possibilities at even lower resource inputs.

The second group is producers, which is the group dealing with growing agricultural crops and breeding animals. Global producers comprise several hundreds of millions of mainly small family farm units, often organised in cooperatives, and a few large agricultural production units. They represent the core of agricultural production. The persistent trend is for smaller farms to be bought up by larger more profitable agricultural units, and the number of producers is constantly decreasing. Still, the current farm structure is considered too small to run profitably for many farms. Developed states usually support their farmers with product, production, or environment improvement subsidies to keep farmers alive economically. Many poor countries cannot support their farmers in a similar way. Here, the production base is challenged by lack of capital to compensate for the threats of land and soil degradation or more frequent water scarcity. Wu et al. (2014) reported on the implementation of genetically modified organisms in developing countries to make crops more durable, avoiding post-harvest food losses which can be as high as 50% by introducing small silos, appropriate transport, refrigeration, and storage facilities.

The third group of stakeholders includes food processing, which is organised in many national and international food companies. Food processing has been done on a regional scale but is now becoming global. Ever more food companies are merging or trying to buy each other to use synergies in producing more cheaply for a worldwide market. In February 2017, US food giant Kraft Heinz attempted to buy Unilever, its competitor from Britain/the Netherlands, for $143 billion (Hughes and Felsted, 2017). The takeover did not take place, but it would have been the largest in history. In 2015 (2 years earlier), the world's largest food processing company, Swiss-based Nestlé, tried to buy Heinz but the deal failed. Instead, Kraft and the Brazilian 3G investment companies bought Heinz and founded Kraft Heinz – the fifth largest food company in the world. We can expect even further moves in food companies which try to reduce costs by becoming ever larger multinational companies and overtaking each other. The number of players will be thereby reduced.

The fourth group of stakeholders is retail and distribution chains. Distribution is the key issue for global food chains, as the production capacity is high enough to produce food for some 12 billion people but we cannot distribute it to all the people who need it. While we produce up to twice the food needed (Deloitte, 2013), some 800 million people (FAO, International Fund for Agricultural Development (IFAD), and WFP, 2015) are still affected by hunger. Many states particularly target improving food distribution and access to healthy food for the global poor.

The global food retail industry has been experiencing steady growth in the last couple of years. During 2016, the highest growth in merchandise trade has been achieved in agricultural products, which have increased by 67% in value (WTO, 2017). The global food retail industry accounted for $7 trillion in annual sales or 8% of global GDP in 2016. The top 15 global supermarket companies account for more than 30% of world supermarket sales. With improved technologies and economies of scale, these retailers enjoy operating cost advantages over smaller local retailers. With a marked change in consumer preference, online shopping, rising populations, and an increase in purchasing power in emerging markets, the global food retail industry continues to grow. The entry of global food giants in emerging economies has led to a boom in the food retail sectors of these markets. China and India, in particular, are driving rapid growth in the global food retail industry as the Asia-Pacific region remains the largest market for food retail globally. Indonesia and Thailand are also witnessing excellent growth, as traditional outlets are being modernised. Meanwhile, the food retail market in Europe, particularly Western Europe, is thought to have reached a saturation point. Denmark, France, Italy, Greece, and Spain are in fact seeing a decline in their food retail industries.

The final group of stakeholders is consumers. The value of food consumption increases continually. People eat food in restaurants, canteens, food stalls, private households, and other places. Consumer preferences lead to changes in food consumption patterns, which depend on disposable income, education, availability, and more. In recent years, food delivery chains like Foodora, UberEat, and others have celebrated success and expansion by delivering restaurant foods directly to offices and homes (Nicola, 2016). Apart from the price, freshness, quality, customer service, and shopping experience are high on the agenda of food consumers. Very often, countries do not have only one single food market but several markets for different consumer types. In Europe, the US, and other countries, organic, green, or sustainable food is high on the agenda, while high quality might be sufficient for buying a food item in other countries. The complexity of food items has increased. For example, the EU has three classes of eggs, all of them fulfilling the hygiene quality criteria but with different ethical standards. The fourth kind of eggs, with the worst ethical standards but an appropriate hygiene standard, are eggs from cage breeding. This method has been banned by the EU but is still used outside the EU (Utopia, 2017).

Operational efficiency, food waste management, a high degree of control over nutrition norms, gaining technical expertise on data management, and innovative packaging solutions are additional focus areas (Frost and Sullivan, 2017). Yet the question arises as to whether this process of improvement can continue to meet the needs of all people in mature economies. So-called food deserts have come into existence (Cutter, 2017), where particular parts of the population have no access to adequate or high-quality food in otherwise wealthy countries. In the US, individuals spending less than $5 a day on food are considered at risk of being food-insecure. They lack access to healthy and affordable food. Other parts of the population living in scarcely populated areas do not have access to supermarkets where most food is traded. In total, some 7% of the US population is endangered. We can assume that considerably more people in ASEAN countries do not have adequate access to healthy food.

8.6 Adjusting for Global Food Distribution

The process of scaling up agricultural production and food consumption is visualised in Figure 8.6 with global, regional, and local food chains. Distribution is accorded an ever more important role with the extension of scale. At the beginning, in the circular economy of subsistence agriculture, the food produced is consumed locally. With more sophisticated agricultural production, food distribution and consumption emerge on a regional scale. Finally, we reach a global exchange food system. The distance between agricultural production, food processing, and food consumption can become very wide and food components may travel several times around the globe. Currently, local, regional, and global food systems exist in parallel. They compete with and complement each other. Food is overproduced on a larger scale, and the global or regional surplus can balance out shortcomings of the food supply at a local scale. A higher share of domestic food production makes countries less vulnerable to price fluctuations.

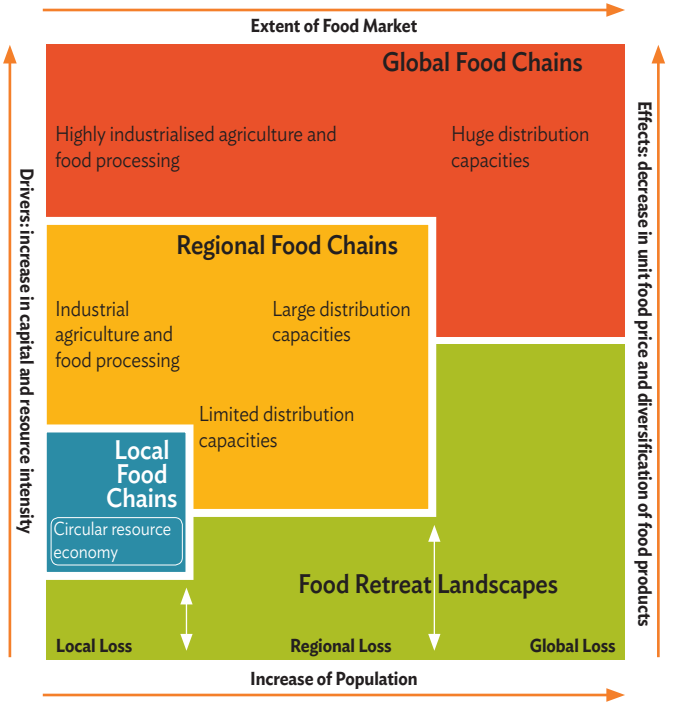
The local food system stretches into peripheral places inaccessible for the regional and global food systems. Here, poor people find a place for subsistence agriculture. They still follow local resource economy traditions and can cultivate food according to the given carrying capacity of the landscape without major inputs from outside. In local food systems, the number of foods is limited to the availability of local foods, which can vary from place to place. No or little money is needed to make a living in modest circumstances. These systems were often stable for centuries, but as the population increases they do not fulfil the needs of larger population groups.

The global food systems provide ever more food based on highly industrialised agriculture connecting major centres efficiently, and lead to population densities many times larger than what any dense network of local food systems could provide, but they can only prosper close to centres in favoured spots. They are dependent on huge capital investments and a secured supply of external resources. The intermediate regional food system connects centres within the region and is within local and global food systems. The most successful regional food chains develop into global chains while others become challenged by more efficient competitors.

A few regional networks have developed into huge international food production and trade networks, and are now major companies. Under the current conditions of globalising food trade, these players become ever more important by cooperating with, buying, or merging with their competitors. Large holdings enable global food availability over different climate and production zones to every state and region that is wealthy enough to import food. As with global distribution, the largest possible operational scale is reached. Additionally, other means to alter the food value chain are needed. This includes more differentiations of conventional food items and the invention of new food items, e.g. energy drinks.

More energy will be needed to fuel the growth of the global food chain. This will lead to additional GHGs in the atmosphere and more severe climate change. The IPCC (Fleurbaey et al., 2014: 327) cited research 'that food accounts for the largest share of consumption-based GHGs with nearly 20% of the global carbon footprint, followed by housing, mobility, services, manufactured products, and construction'. This, in turn, could cause more climate-related disasters and even higher damages than current disasters. The direct GHGs from global agriculture are 10%–12% of total emissions (Smith et al., 2014: 822), including non-food agricultural production. However, the indirect load of GHGs, including the inputs to agricultural production, is much higher. In the case of Japanese rice production, direct agricultural emissions were calculated for 1990 to be 40% of total emissions within the production process (Breiling et al., 2005). The remaining 60% comes from secondary emissions related to industrial inputs of rice production such as agricultural machinery, chemical fertiliser or pesticide inputs, and transportation. In line with this, we could hypothesise that global agriculture and its inputs contribute as much as 30% of the climate change carbon footprint.

Figure 8.6: Food Distribution – Scaling Up from Local to Global



Source: Author.

Figure 8.6 explains the transitions and trade-offs. It also depicts so-called 'food retreat landscapes'. The retreat of food production from landscapes can be forced by land degradation or done voluntarily through land conversion from agriculture to other purposes. This indicates that, with increasing spatial scales, technical progress, and resource inputs, less land is needed to produce sufficient food for an increasing global population in an industrial way.

The distance from agricultural land to markets and food streams (von Thünen, 1842) becomes ever more important. In the time of Malthus and Verhulst (Figure 8.3), the entire land was used for food production and a food retreat landscape did not exist. The world was covered by a web of independent small-scale food supply chains with limited interactions. Humans were fighting not to exceed the given carrying capacity of the landscape, which was the limiting factor. The world's population doubled during 1750–1900 from 0.8 billion

to 1.7 billion (Durand, 1977). Up to a few decades ago, an increase in agricultural land was the sole means to increase food productivity (Malenbaum, 1953). With the increasing affluence brought about by the developing regional and global food chains, some, many, or most food items are now imported. Difficult-to-manage agricultural fields are given up first or afforested. Gradually, more land is taken out of food production because of limitations in increasing productivity. Finally, only the most suited, easy-to-cultivate landscapes targeted for regional and global markets are used for food production. In a local system, the share of food retreat landscapes is small. In a regional system, this share is considerably larger. In a global system, large parts of former food production areas can be used for other purposes such as bioenergy, afforestation, or ecosystem services.

The trend is for many family farms to be bought up by international investors in the food business and for small-scale production to turn into large-scale production or local into regional. Many regional food value chains compete against each other. In an attempt to avoid competition and overproduction, former regional food chains become more economically efficient and valuable in global food chains, which often connect several regional food chains under an umbrella structure. In other cases, regional food chains that formerly covered a broad range of food products concentrate on a few food products where they have a comparative advantage to compete in a much wider world market.

The idea of food retreat landscapes can be perceived as strange, knowing that until now huge areas were converted from rainforest to agricultural land. In ASEAN countries, this conversion favoured palm oil plantations. From 2000 to 2012, 50,000 km^2 of tropical rainforest were cleared each year globally (Mongabay, 2017). Initially, these were small-scale landholders, but larger companies became the actors in later years. In many cases, the land conversions were done in an unsustainable manner to generate quick income. This land contributes to one-third of the globally degraded agricultural land, totalling 5 million km^2, and needs to be restored ecologically. An estimated 24 billion tons of soil are lost annually according to a global land outlook (United Nations Convention to Combat Desertification (UNCCD), 2017a). Land degradation neutrality goals were articulated recently, and while this land is unattractive for industrial agriculture, it has an important role in providing ecosystem services (UNCCD, 2017b).

Another trend is that food production does not need to be on agricultural land. It can be on residential land, and many timely initiatives for urban agriculture to reoccupy urban people with food production and gardening prove that local food production is still popular (Foo and Teng, 2017). Yet another way, far from land and soil, is to use buildings for indoor food production (Specht et al., 2014). Information and communication technology and smart farming methods are technology-driven ways to boost food production in a limited land area. Many smart farming systems are under development, primarily in highly developed countries (Wolfert et al., 2017).

It is estimated that the current area devoted to food production is much higher than needed if perfect food distribution could be granted. Much of the land is kept for overproduction. The aims are to compete smaller food producers out of business at ever cheaper prices while fulfilling the food needs of a still growing world population inexpensively. This, despite the expectation of more environmental deterioration such as desertification, water scarcity, soil erosion, more frequent disasters, and more adverse impacts induced by climate change. In addition, a considerable part of the land classified 'agricultural' might be underused or even unused because of decreased fertility. According to UNCCD (2015), one-third of the agricultural land, estimated to total 15 million km^2 globally, has been lost since 1975. Out of the total global land area, estimated to cover 130 million km^2 including agricultural land, 25% is classified 'highly degraded' or is undergoing high grades of degradation.

8.7 Different Disaster Risk Strategies According to Scale of Food Production

Disasters have the worst impact on developing countries with traditional economies where ordinary people have no flexibility if hit by a disaster. Poor people rely on local food production and depend on the typical weather conditions for their climate region. Food availability and diversity are considerably lower than in countries with large food imports. With every disaster, these countries become more dependent on international aid and relief programmes. Decision making within the countries also becomes more limited after a disaster.

There is a firm connection between environmental and ecosystem management, climate change adaptation, and disaster risk reduction (Munang et al., 2013). This is particularly valid at the local scale. The attribution of a single hazard event or specific losses to climate change is still difficult because of the relevance of different spatial and temporal scales (Birkmann and von Teichman, 2010). Over time, there can be feedback reactions to the larger regional or even – assumingly very robust – global scale. The length of time this can take depends on the disaster frequency and preparedness to mitigate the effects of disasters.

On the local level, a disaster has much more disturbing consequences. Very often, a disaster entails the additional weakening of an already weak local society or in an extreme case a collapse of local villages. Local people primarily rely on the ties and support of family members. These ties are disturbed when children migrate. Sometimes local people do not trust that their fate can be positively influenced by local governments or public authorities. Many small villages are being abandoned, and old and weak people are the main remaining inhabitants. A drought or flood disaster event might be seen only as the last step in a series of decline processes. Therefore, many disasters in remote locations are not reported, and they are not dramatic enough to find their way into the news. Such events can be a further stimulus for younger inhabitants to migrate for a better future.

On the regional level, the observed increases in disaster events and the even higher increase in damage and losses have been widely balanced by the increase in GDP and the enlarged food trading possibilities. Local disasters might not be felt on the regional scale, and a regional disaster eventually has a limited effect on the global scale. We can postpone the adverse effects of disasters up to a point when larger regions or particular strategic nodes of the global food value chain are affected. Better access to more foods and a higher variety of food in regional centres can be an important pull factor for migration to well-supplied areas.

If a global food value chain is established – usually in richer countries and regions – it seems initially very robust. Disasters are not critical, as even food failures of entire world regions can be balanced on the global scale. If important parts of the harvest are destroyed by a disaster – e.g. coffee, tea, or spices – the price will increase. Following the price increase, fewer people are able to afford to consume a food product or have to reduce the frequency of consuming those food items. This often relates to luxury food products, not basic food commodities like rice, wheat, or corn. Here there is flexibility, as much of this product is consumed as animal fodder or even used to produce fuel. Many consecutive large disasters would need to occur before a major food crisis could happen in central areas of wealthy countries.

Wars and serious political crises could change the effects of disasters on food security. While drought or flood disasters may have limited consequences in peaceful conditions – e.g. when some damaged infrastructures can be replaced easily in a normal trade situation – the situation can become catastrophic when there are trade restrictions. South Sudan experienced serious droughts during 2011, 2015, and 2016 in a situation of civil war (Reliefweb, 2016). The agricultural production was disturbed, and coincided with repeated drought periods and extremely limited trading possibilities. Up to 5 million people, about half of the country's population, were severely food insecure – leading to the starvation of an estimated 30,000 people. Within ASEAN, Cambodia had a similar experience in 1979. Vietnamese troops invaded the country after 4 years of rule by the Khmer Rouge and a genocide in the country. Many people also died as landmines complicated local agricultural production and imports of agricultural commodities were not possible (Li and Rothstein, 2012).

Asian history shows dramatic examples of famines that were driven by disasters. The largest famine in human history took place in China during 1959–1961. Although drought was a contributory factor, this was largely a manmade catastrophe based on the policy of Mao Zedong and the Great Leap Forward. The precise number of casualties is unknown, but demographic reconstructions indicate 30 million dead (Smil, 1999). Long-term health effects were found in survivors of the great famine, in particular the children of that time (Chen and Zhou, 2007). Famine and long-term economic development have a crucial relationship, and disasters contribute adversely. The long-term economic consequences of famine in China prevail, even after more than 50 years (Gooch, 2017). Another example of a combination of policy and disaster-driven food scarcity is North Korea and the famine after flooding episodes, in combination with the breakdown in trade connections with former communist partner countries during the 1990s (Lee, 2006).

The dynamics of general development indicators and the frequency of disasters are important. As long as GDP and international trade growth rates are higher than the rate of increase of disasters, the challenge of food security in relation to disasters can be managed. Sudden changes in the availability of resources – like oil price shocks – can be more problematic than the increase in climate-induced disasters. Urban farms producing paprika or cucumber in indoor environments need long-term contracts with fixed energy prices granted by local governments. Water scarcity induced or aggravated by droughts, the infiltration of salt water, and a much higher price for water can become a serious hindrance to irrigation or the profitability of agricultural production. Current prices might not last in a time frame of 10 or more years and food producers should have emergency plans.

As we have local, regional, and global food supply, we have different types of disaster protection strategies:

- A recommended disaster protection action for local food chains is to (i) have a regular and continued food supply, with locally available agricultural and horticultural crops and traditional farm animals; and (ii) employ organic farming methods or agroforestry methods to manage local resources such as soil and water in the best possible way to achieve high and sustainable yields and improved local disaster resilience, even during the coming years.
- In the case of regional food chains, the following strategy against disasters is worthwhile: (i) produce more food at cheaper production costs with less resources per unit product; (ii) increase transportation and storage capacities for a fast exchange between regional markets; (iii) ensure appropriate food safety and control standards; (iv) minimise chemical fertiliser and pesticide use; and (v) make emergency food supply plans for all settlements, in particular remote ones.
- In the case of global food chains, the following recommendations are provided to minimise disaster damage: (i) ensure distribution capacities; (ii) limit resource inputs and become more efficient with the available resources by using smart farming methods and advanced technologies; (iii) avoid planning businesses in disaster-prone areas; (iv) diversify from established food products to a range of products with different levels of sophistication; (v) find a better mix of food diet for each target group in the market, considering that food tastes and food needs are different; and (vi) try to find new markets for food items all over the world and ensure a high-quality and sufficient quantity supply.

8.8 Change in Disaster Risk Strategies in ASEAN

ASEAN countries have large differences in economic performance and disaster risk reduction potential. An easy indicator can be GDP. Differences within the ASEAN region are huge. An inhabitant of Singapore has almost 50 times the income of a person from Myanmar. Countries with very high per capita GDP are Singapore and Brunei Darussalam, with about six and three times the average global per capita GDP at their disposal, respectively. These countries are primarily importers from the global food market. Thereafter follow Malaysia, Thailand, Viet Nam, Indonesia, and the Philippines, with average to half of the average global GDP. These countries contribute to both imports and exports of the global food market. In these countries, large groups of the population can participate in the global food chain, while the majority is still more bound to local and regional food chains. The Lao People's

Democratic Republic (Lao PDR), Cambodia, and Myanmar – with low GDP and less than a quarter of the global per capita GDP – have difficulties participating in the global food market as consumers, but consider a global market for their products. Even the EU has considerable differences in economic development between member countries. In 2007, new member countries – Bulgaria and Romania, formerly centrally planned economies – entered and required adjustments. This is similar to ASEAN, where countries such as Cambodia, the Lao PDR, or Myanmar are rooted in systems with centrally planned economies.

Table 8.1: Food Insecurity in ASEAN, 1992–2017 (% of population)

GHI Rank	Country	1992	2000	2008	2017
44	Malaysia	19.8	15.5	13.7	10.2
46	Thailand	25.8	18.1	12.0	10.2
64	Viet Nam	40.2	28.6	21.6	16.0
68	Philippines	30.5	25.9	20.2	20.0
72	Indonesia	35.0	25.5	28.3	22.0
75	Cambodia	45.8	43.6	27.1	22.2
77	Myanmar	55.6	43.6	30.1	22.6
91	Lao PDR	52.3	48.1	33.4	27.5

GHI = Global Hunger Index, Lao PDR = Lao People's Democratic Republic.

Note: GHI scores out of 119 observed countries.

Source: von Grebmer (2017).

ASEAN countries are more diverse than the 28 EU countries, the risk of hunger is higher, and they are more exposed to natural disasters. In principle, ASEAN countries follow a similar development pattern to developed countries in Europe. Models developed by Malthus or Verhulst in the 18th and 19th century are also valid in ASEAN countries, but the dynamics are different and change proceeds much faster than what was the case in Europe. Reasons for this are the partly established transition to regional and global food value chains with sophisticated technological development, access to the global infrastructure, considerably more capital, and well-developed international trade.

A current indicator on food security is the Global Hunger Index (GHI), which regularly monitors 119 countries at risk. Economic progress in ASEAN, the development of regional food chains, and partial participation in global food chains were beneficial in terms of food security. For the East and Southeast Asian region, the GHI fell by 57% during 1992–2016 (von Grebmer, 2017). This is remarkable, considering that the region was most severely hit by disasters during this period.

Five ASEAN countries – Cambodia, Indonesia, the Lao PDR, Myanmar, and the Philippines – still had alarming GHI scores, with more than one-fifth of their population partly food-insecure in 2017. Viet Nam showed the best progress within one generation and reduced the percentage of food-insecure people from more than 40% in 1992 to 16% in 2017. Malaysia and Thailand are at the global average regarding the risk of becoming food-insecure. This risk does not exist in the richest countries of ASEAN. Singapore is an excellent performer and Brunei Darussalam is a good performer with regard to food security and the GHI. Fast integration into the global food market, combined with a gradual retreat of the most remote areas in ASEAN, seems a plausible way to become food-secure. In addition to differences between ASEAN countries, we find large differences in and between provinces or regions of ASEAN countries. Conditions differ widely and the ASEAN community is at an early stage of integration (ASEAN, 2016).

The economic differences and resulting ratios in the mix of local, regional, or global food chain participation enforce different disaster risk and food security strategies for ASEAN food producers. All ASEAN countries have producers in the local, regional, and global food chains, but the ratio is varied. Many consumers within ASEAN are mostly dependent on local production, but the shares of regional and global food products are continually increasing. Extreme disruptions in the food supply system of ASEAN countries are currently not in view. ASEAN countries are intensifying regional cooperation and trade volumes are increasing (ASEAN, 2016). This is good for both regional food security and disaster resilience. Severe conflicts, in combination with disaster events, could destabilise the region. Conflicts like the Moro conflict in the Southern Philippines could hinder food distribution efforts and lead to crisis. If such conflicts could be eliminated, food security could be achieved all over the ASEAN region, despite an increase in climate disasters.

8.9 Conclusions

Food security depends on food distribution. More food than necessary is already produced. However, poor people do not generate a market and producing more food at ever higher values does not help the poor and food-insecure people. Instead, food becomes feed for animals or fuel for machines. Deprived places and regions become less populated and more susceptible to disaster damage and losses. Food waste is another serious issue, amounting to one-third of the food produced. Elevated food health standards and differentiation of food products might challenge a lot of food producers in emerging economies if they intend to sell in the global food market.

Disaster damage and losses in agriculture and the food value chain are not yet systematically accounted for. It is possible to differentiate between harvest, transport, storage, infrastructure, processing, retail, and consumption damage and losses. In poor nations, production losses are much higher than in rich nations, and account for more than 20% of the annual harvest value. This damage could be even higher because of under-reporting.

The role of land or soil – historically the single most important resource of food production – becomes less pronounced. Access to external resources such as water, energy, minerals, and capital, allows farmers to exceed the former local carrying capacity at the expense of more pollution and climate change. Out of the global freight traffic, amounting to some 10 billion tons annually, almost 40% is related to agriculture and food. Some 20% of GHGs are attributed to food consumption. Much of the 1.5 billion hectares of agricultural lands become marginalised and are transferred to non-food uses. The best suited lands are used for ever more intense agriculture and food production.

Within the global food chain, production depends on several groups. Inputs became cheaper during the last decade as global energy prices decreased by 45%. New food industries were established, particularly in emerging economies. The number of players in the global food chains is reducing. Many family farms are bought up by industrial investors. Large multinational food companies buy up competitors, and record business transactions are happening in the food business. Food distribution is changing as new forms of retail are emerging offering online food orders to offices. Consumers are becoming more demanding, and both the hygiene and ethical standards of animal breeding are under scrutiny.

The food chains are scaling up as larger global food chains are coming into existence. This gradually changes the human interactions and settlement structures. People are living more densely in central parts of regions, and food retreat landscapes are emerging. Food retreat landscapes comprise more than 30 million km^2 of globally heavily disturbed land and include 5 million km^2 of agricultural land. Much of this land is in the ASEAN region, and there is a need to restore the land to natural areas for proper ecological performance and the provision of ecosystem services. Optimisation of food production for global markets and access to regional and global food are important drivers for this densification. Global food chains need sufficient distributional capacities in both directions. Specialisation in food niche products allows intensification for future growth areas. A side trend of this development is the local (re-) establishment of food cultivation in densely populated urban areas. This marks an important trend to bring back some parts of food production to the people. A revival of local food production could generate more healthy food and decrease dependence on the larger scale food value chains.

In emerging economies – the majority of ASEAN states – local areas develop intensified trade with agricultural commodities and food products on a regional basis. Companies of national and regional importance are established. The resource flow is multiplied by orders of magnitude and capital is generated to develop infrastructure with higher capacity. In addition, major regional disparities exist within these countries. Some parts of the countries, usually capitals or large cities, are considerably more developed than others; and several systems of agricultural production and food consumption exist in parallel. Rich segments of the population participate in global food value chain operations, while other parts cannot.

In mature economies, everyone participates in global food consumption in principle. Singapore and Brunei Darussalam have no hunger risk. Mature economies also have the highest per capita GDP. Food is generally available cheaply. However, there is considerable product differentiation between healthy food – generally expensive and particularly appealing to the better-earning groups of society – and mass production of cheap and unhealthy food. Food safety and consumer preferences are of dominant importance in the food and beverages industry and have a significant impact in dictating terms to food manufacturers and associated companies. There is increased concern regarding maintaining the nutritional benefits of food products because of rising health consciousness amongst consumers globally.

The efficiency of global food chains is connected to global environmental deterioration, forced migration, or gradually becoming poorer in remote rural areas. The costs of transportation and distribution of traded commodities are widely passed on to customers. These costs can be divided amongst many consumers in densely populated regions, while few people share the burden of distribution costs in remote areas. In some countries, governments try to balance inequalities between unequal parts by supporting remote areas at the expense of central areas. This generally works well during economic growth periods, but the support may be given up during stress periods. The inhabitants of remote areas are often aged, with far less income than the national average. Economic downturns also reduce food availability and quality. Foods might be less fresh than in cities, which are easier and more profitable to reach for distributors. Consequently, more rural areas are losing people, making it even more difficult to live in those areas for the remaining populations.

An increasing number of natural disasters does not seem to be a hindrance to the development of ASEAN region countries if GDP and food trade volume rates can be further augmented. This, however, means a concentration of population in more favourable areas of ASEAN countries and migration from disfavoured areas and regions to favourable ones. While some disasters will not be noted as they happen in depopulated remote areas, others will take an extraordinary toll on lives and values if they affect the core production areas of agriculture and food. The number of disaster damage or disaster events alone is not necessarily a decisive indicator. If several disasters happen in a short space of time or distance simultaneously, food prices will increase. Political instability and armed conflicts are a danger in particular areas of ASEAN. Here, like in all other war-affected regions, food security is not a given. The effect of natural disasters will increase and further aggravate the political situation.

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