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Title: Food security during climate change : the challenge of European diversity

Year: 2015

Version: Accepted version (Final draft)

Please cite the original version:

Brunori, G., & Silvasti, T. (2015). Food security during climate change : the challenge of European diversity. In A. Paloviita, & M. Järvelä (Eds.), Climate Change Adaptation and Food Supply Chain Management (pp. 70-81). Routledge. Routledge Advances in Climate Change Research.

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Food Security During Climate Change: the challenge of European diversity

Introduction

Food security is the main outcome and the principal policy objective of food systems. According to the Food and Agriculture Organization of the United Nations (1996): 'Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life'. Food security involves four dimensions: 1) Adequacy of food supply or availability; 2) accessibility to food or affordability; 3) utilisation or quality and safety of food; and 4) stability of supply without seasonal fluctuations or shortages (UNEP 2009, 78). Food systems consist of food supply chains and include four types of activities: producing, processing and packaging, distributing and retailing, and consuming food. All these activities comprise social, economic, political and environmental processes and dimensions.

Until recently, the dominant industrial food systems have been a great success. Increases in efficiency and the productivity of agriculture have reduced the prevalence of hunger and improved nutrition. However, in the current context of environmental, social, political and economic changes, food system activities also generate substantial threats (Ericksen 2008) because their environmental impacts – including climate impacts – are huge and unpredictable (UNEP 2009), thus food security is not fully guaranteed for all people, even in the richest countries of the world (Riches & Silvasti 2014).

The capacity of food systems to produce food security – previously considered self-evident in the industrialised world – is now endangered by challenges such as global population growth and urbanisation, environmental degradation, resource scarcity, climate change, economic and financial concentration, inequality and poverty. Consequently, the concept of food security has been reassessed. The 'old' analysis focused primarily on the problems of hunger and undernourishment in the developing world. The anticipated solution to the problem of hunger was to increase food production by investing in science, technology and the agri-business. With intensified distribution and reduced wastage this was thought to bring food prices down and improve the availability of and access to food. Such a productionist policy paradigm was strongly promoted internationally and state policies focused on farming and agricultural sector rather than broader food system activities (Lang & Barling 2012).

Nevertheless, the world food crisis in 2007-8 showed that food systems are under serious stress and its indicators show that certain parts of it are in decline. The emerging 'from farm to food' approach to food security acknowledges a myriad of economic, social and ecological problems connected to food system activities. Besides the need to guarantee production, there is a desire for more complex analysis and policy design. It has become necessary to redesign sustainable food systems by applying social and environmental criteria in addition to economic arguments because only sustainable food systems are thoroughly secure (Lang & Barling 201). To promote sustainable food systems in the long-term, ecological impacts must be taken into consideration when determining the prerequisite for overall sustainability (Norton 1992).

There are no undisputed definitions for the concepts of vulnerability or sustainable food system. According to Ericksen (2008), vulnerability is 'a function of exposure, sensitivity, and coping or adaptive capacity. Exposure means that a unit must be exposed to a shock, threat, or stress to be vulnerable to it. Identifying exposure as a separate component implies that the potential for harm is only one part of vulnerability […] environmental shock or stress may be the trigger that sends

people into a vulnerable state, but other shocks, such as a changes in agricultural policy, can coincide with or contribute to this underlying vulnerability'.

The Sustainable Development Commission (SDC 2009, 10) in the UK considers food systems sustainable when their core goal is to feed everyone equitably, healthily and sustainably in a way that addresses needs for availability, affordability and accessibility, and which is diverse, ecologically sound and resilient while building the capabilities and skills necessary for future generations. Resilience is understood as the capacity of the system to absorb shocks and still maintain its functions as well as the capacity for renewal, re-organisation and development in a changing world where the future is unpredictable (Folke 2006).

This chapter focuses on climate-related vulnerabilities and opportunities as well as climate change adaptation in the food supply chains of two largely food secure European countries located in different climate zones: Italy and Finland. The aim is to compare key elements of the climate change adaptation of the national food systems. This leads to the questions: What kind of nationally embedded policy measures have been applied? And is there any ground for a common European adaptation policy from the perspective of food security? The chapter begins with a presentation of the country cases of Finland and Italy, including the climate change adaptation measures that have been adopted. In the following two sections a summary of the national adaptation measures is presented and the possibilities for common European adaptation policies – in the context of European diversity – are discussed.

Diversity of Europe's climate and adaptation measures

Europe has a hugely diverse climate. This diversity is not only clear between northern and southern Europe, but also within many states. Thus, the climatic impacts set direct limits on what is feasible in terms of maintaining food security in a region. Furthermore, a variety of food system activities have an influence on food security outcomes. Yet, these outcomes vary according to historical, political and social contexts (Ericksen 2008). In addition, there can be genuine conflicts of interest between different dimensions of sustainability. It may be hard to find win-win-win solutions for ecological, social and economic problems, especially when different interpretations of sustainability or, for example, different regional interpretations of the risks and opportunities connected to climate change are taken into account. In the following the cases from Italy and Finland are introduced.

Italy

Due to its shape and geographical location, Italy has a variety of climate systems, that range from regions with an average temperature below 10° Celsius (mainly in the Alps) to regions with averages between 28-30° Celsius in the summer (mainly in southern Italy). Also precipitations vary from 2500-3000mm in the highest altitudes to below 500mm in Sardinia and Sicily.

According to Cecchi et al. (2008), Italy has undergone an increase in maximum temperature by 0.6° Celsius in the north, and by 0.8° Celsius in the centre-south over the last 50 years; a decrease in precipitation together with an increase in precipitation intensity; an increase in the number of tropical nights between 1981 and 2004; an average reduction in the number of frost days. Furthermore, in the near future Italy can expect a reduction in precipitation by up to 25% in winter and an increase in average temperature.

Italy ratified the Kyoto protocol in 2002. The Italian target under the Kyoto Protocol was to reduce total GHG emissions by 6.5% over the period 2008-2012 with respect to 1990. This target was not met, as the reduction in the given period was only 4.6% (ISPRA 2014), thus Italy will have to activate some compensation mechanisms.

According to the Ministry of the Environment, in 2007 the agricultural sector contributed to 6.7% of Italy's national GHG emissions (Ministero dell'Ambiente, 2009). According to the estimates of the project AGRICARBON (Rete Rurale Nazionale, 2012), the share is higher: 19% because transportation, packaging and industrial processing are included in their calculation. The reductions in greenhouse gases from agriculture amount to about 16% (ISPRA, 2014) and are due to the reduction in the number of animals, variations in cultivated surface/crop production and the use of nitrogen fertilizers, which are mainly linked to the Common Agricultural Policy (CAP) measures. It is expected that the 'greening' measures in the new CAP will contribute to a further reduction in GHG emissions.

The food industry, like other industrial sectors, has developed reduction strategies for GHG emissions in order to comply with Kyoto targets. According to Federalimentare (2009), a syndicate of food processing firms, since the beginning of the 1990s food companies have reduced water consumption by 30-40%. In the last decade, energy savings have reached about 15-20% and packaging volume as well as package material weight has been reduced by about 40%, also resulting in savings on transportation costs. Some companies have dealt with the targets of sustainable development by initiating a proactive approach. Among these, Barilla, an international leader in pasta and bakery, has developed a sophisticated environmental reporting system that documents progress in the reduction of the consumption of water, energy and materials used per unit of product. Granarolo, a dairy system of cooperatives, has issued an environmental product declaration (EPD) for a dozen of its products. Also, CoopItalia, the biggest retail chain in Italy, has

launched a project ‘CoopItalia for Kyoto’ that involves 199 suppliers. Since the beginning of the project, CoopItalia reports an efficiency increase of 63% and a decrease in the GHG emission rate from 0.194 to 0.182 CO_2/Kg (CoopItalia, 2013).

In addition, food companies increasingly communicate with consumers about their efforts to become more ecologically efficient. Barilla is one of the most active in this regard as, in addition to communicating its achievements in the field of ecological efficiency, it promotes campaigns for sustainable consumption and food security. The recent Milan Protocol, for example, offers a charter of principles that aims at encouraging political leaders: ‘To promote healthy lifestyles and fight obesity, to promote sustainable agriculture and to reduce food waste by 50% by 2020’. The protocol has been launched by Barilla in collaboration with civil society organisations like WWF, Slow Food and many others. Despite these initiatives, however, the Italian food industry as a whole is not among the most active in making sustainability efforts, and the enduring economic crisis has made firms reluctant to invest in sustainable development.

Even if it is sometimes difficult to make a difference between mitigation measures and adaptation measures, it is fair to say that attention on climate change has focused mainly on mitigation during this first period. However, recent events have signalled to the public that the impacts of climate change are actually a present certainty and not merely a future possibility. As a consequence of reduced precipitation, a safe water supply has become a social and economic emergency in several regions. On the other hand, heavy precipitation events have increased the frequency of floods and landslides. Crop failures, as in the case of olives, in central Italy in 2014 have created panic and anxiety among farmers.

Extreme events make food systems more vulnerable. In an already fragile territory like Italy, floods and landslides put crops and herds at risk, plus they damage the transport infrastructure, undermining food distribution systems. Climate change also affects future food availability, for

instance, the development cycle of many crops, such as grape, olive and wheat, has already been reduced, anticipating changing harvesting times and creating problems in the organisation of the operations of food chains. In addition, it is forecast that the yield of the main summer crops might decrease, mainly as a result of the increase in the frequency of extreme climate events, such as increased rain during the spring sowing time or climate stress during flowering or the course of the crop development stage. Also, as a consequence of change in the geographic range of pests – due to their ability to survive in regions where previously harsh winters would have killed them – new or more intense use of pesticides is foreseen. In Italy regions that produce high quality food products are among the most vulnerable to the impacts of climate change. It is estimated that an increase of 2° Celsius in temperature would cause a loss of 0.7% in the Italian GDP (Wolf and Menne 2007).

A consequence of this increased risk level has been that the debate on adaptation has intensified. Round tables, research projects and other initiatives have been promoted or participated in by the Ministry of Agricultural, Food and Forestry Policies and by the Ministry of the Environment. The increased sensibility to the impact of climate change has raised the attention of the public regarding initiatives such as community gardens, zero km food chains and zero packaging shops. Also, the issue of waste has become central in the media, addressing company strategies as well as consumer behaviour.

Italy has high external dependency on commodities like soybeans, wheat and maize, and concerns have been raised about the likelihood that climate change can influence their availability and affordability on international markets. Under these circumstances re-localization initiatives have been taken by the food industry. For example, Barilla reports that it has developed a high quality variety of wheat suitable for growing in Italy, thus contributing to the re-localisation of sourcing (Barilla, 2013). Another example of localisation in the Italian food systems is AsdoMar, a canned tuna producer, creating a 100% Italian supply chain. At the same time, Italy relies upon regionally

produced products for its export-oriented strategy, and there is evidence that many of the areas where Denomination of Origin products are produced are among the most sensitive to climate change conditions.

As a planned adaptation action the Ministry of the Environment released the “Strategy for Adaptation to Climate Change” in 2013 (Ministero dell’Ambiente, 2013) for public consultation. In the section dedicated to agriculture, the report distinguishes between short-term and long-term adaptation actions. In the first set, actions such as a change in the sowing date, changes in the cultivar and practices to retain soil moisture are considered. In the second set, the report lists land use change as well as investing in the improvement of the efficiency of irrigation systems and the modification of agricultural systems.

Moreover, the “Strategy for Adaptation to Climate Change” recognises the role of knowledge systems as a key factor of planned adaptation. Climate change alters the cognitive environment of the farmers, requiring the reconstruction of new cognitive environments that reflect higher instability, changes in the seasonality of biological cycles and the occurrence of new pests. Such reconstruction would be necessary in order to avoid inadequate responses to perturbations. Monitoring and early warning systems would also have to become components of this environment as would investing in research, which is necessary if innovation is to be fostered.

Finland

Finland is one of the northernmost countries in the world, with a quarter of its territory within the Arctic Circle, which makes agriculture demanding. It is believed that global warming will improve

farming conditions due to the rising average temperature and the lengthening of the growing season. It is also anticipated that arable land could be expanded further north and new crops like corn and alfalfa could be included in the agricultural variety (Peltonen-Sainio et al. 2009; Schulz 2009). Even after the risks have been identified, for example, new pests, plant and animal diseases as well as challenges in plant breeding, it is estimated that the short-term economic benefits of climate change may outweigh the farming disadvantages (MMM 2014, 13-14).

Finland also ratified the Kyoto Protocol in 2002. The target under the Protocol was to maintain emissions at the level of year 1990 over the period 2008-2012 and this target was met. According to Statistics Finland (2012), in 2011 the agricultural sector contributed about 9% of Finland's national GHG emissions. However, the contribution of the Finnish food chain as a whole to climate change has been estimated to be somewhat bigger, 14% in all (Virtanen et al. 2010).

There are many ways to measure climate change adaptation in agriculture, although the methods are not particularly vigorous. In addition, it is difficult to separate the expressed measures of mitigation and some forms of adaptation from each other. For instance, in anticipatory adaptation some resources in research and development are focused on charting, profiling and following the new risks resulting from disease, pests and extreme weather conditions. Furthermore, breeding and sustainable cultivation measurement techniques are being developed. At the same time, however, it is emphasised that agricultural environment and climate conditions are and have always been in continuous state of change (MMM 2011).

However, the CAP together with national agricultural and environmental policies has established the most influential adaptation measures in Finland. Regular policy interventions, such as regulations for fertilizing and manure processing, have been conducted to mitigate the climate impacts of farming (MMM 2011). Nevertheless, the most remarkable decrease in greenhouse gas emissions in Finnish agriculture occurred during the early 1990s when the agricultural industry

adjusted to fit with CAP – Finland joined the European Union and CAP in 1995 – by decreasing the number of farms, resulting in a decrease in the amount of livestock (Tilastokeskus 2012). Given the continuous long-term economic pressures following the rapid structural change in agriculture and the temptation to increase productivity and economic profitability due to the anticipated improvements in farming conditions, it is likely that these changes will lead to contradictions and thus conflict between future economic and environmental goals. An example of this can already be seen in the Farmer's Union opposing the legislation of a specific climate change law in Finland (MTK 2014).

In processing, packing, distribution and retail it is emphasised that climate impacts should be explored in the context of the whole food supply chain, and that adaptation measures should be prepared in cooperation. According to the anticipatory adaptation strategy multidisciplinary research that is focused on improving energy and resource efficiency, cutting down waste, rationalising logistics and developing packing materials and technologies is expected to improve cooperation. In addition, the importance of consumer behaviour is heavily underlined: it is crucial to find ways to guide consumers to make responsible, climate friendly choices and decrease wastage.

In the processing sector the adaptation measures seem to be mainly reactive. The need for energy efficiency as well as ensuring the quality of water under conditions of a rising average temperature have been recognised. It is also anticipated that the variety of raw materials will change as the crops farmed in Finland change. Additionally, fossil fuel dependency is mentioned as a potential risk and the need to develop renewable energy sources has already been identified (Molarius et al. 2010).

In distribution the challenges of climate change are understood to be problems of guaranteeing food safety rather than guaranteeing food security. Food safety entails controlling temperatures in storage and transportation, developing early warning systems for microbes and harmful metabolites, and

improving risk assessment systems and in-house control. Along with global warming, the relevance of hygiene and maintaining high-quality cold chains is expected to be increased.

The role of consumers is emphasised not only in connection with eco-friendly consumer choices but also in connection with health education. According to the new Nordic nutrition recommendations healthy and sustainable diets can be easily connected, while food choices can also be made from the perspective of sustainable development. In addition to the effect of agriculture on the eutrophication of waters, the environmental impacts of food systems are being used as a means to illustrate climate change, for instance, through carbon footprinting. Local and organic food produce have been identified as eco-friendly products, whilst diets rich in vegetables and seasonal products are recommended for both health and environmental reasons. Additionally, the need to reduce food waste has been underlined (Terveyttä ruoasta 2014), leading to some catering services already offering 'climate lunches' in their daily menus. For example, AgriFood Finland, the National Institute of Health and Welfare, a few Ministries, and some NGOs and enterprises have been involved in the development of the concept of the climate lunch. The basic idea is to give consumers the opportunity to easily make food choices that are climate friendly and healthy.

In Finland the grocery market is controlled by a strong oligopoly. There are two main retail chains – the S-Group and the Kesko Group – who dominate 80% of the grocery trade. Some anticipatory as well as planned adaptation measures, like energy and resource efficiency in building, logistics and in-store recycling and waste recovery as well as decreasing packaging will be and are used by them to mitigate climate change. The Kesko Group also has an experimental farm to promote Finnish agriculture. It invests in developing plant varieties and research to achieve sustainable cultivation methods and to improve domestic food production. The Kesko Group also aims to start an organic cultivation programme (Kesko 2013). The S-group is investing in wind power and aiming to produce 50% of all the power it needs via its own wind farms by 2016 (Sitoumus 2050). Both of

these chains will increasingly reduce food waste by donating edible but unsellable food to charities, which will deliver it to people in need. While these chains have rebuilt their logistics to minimise climate impacts and maximise profits, one of the consequences of their success has been the closure of small shops particularly in remote areas. Consequently, access to food has been endangered in remote rural areas due to the distance between the consumer and retailer.

Scanning adaptation strategies in Italy and Finland

Although it is sometimes difficult to separate the methods used for mitigating climate change impacts from various forms of adaptation, the food systems in Italy and Finland, which are responsible for producing food security, will be first explored here according to the four types of climate change adaptation presented by Fankhauser et al. (1999): 1) Reactive adaptation, i.e., measures that are taken in response to climate change after the fact; 2) Anticipatory adaptation, i.e., deliberate decisions to prepare for potential effects; 3) Autonomous adaptation, i.e., natural or spontaneous adaptation for facing climate change; 4) Planned adaptation, which requires conscious intervention. Secondly, we will address some further policy issues of interest with regard to adaptation strategies in Italy and Finland.

In Italy at least some of the short-term actions concerning adaptation of agriculture, such as changes in the sowing date and the cultivar as well as practices to keep soil moist, will probably take the form of natural or spontaneous adaptation by farmers to climate change. In Fankhauser's terms they could, thus, be classified as autonomous adaptation. However, in the "Strategy for Adaptation to Climate Change," Italian public authorities also address the long-term actions of adaptation and recognise the need for more deliberate public action in encouraging land use change, investments

for improving the efficiency of irrigation and the modification of agricultural systems. Thus, both planned and anticipatory measures in agriculture are also on the agenda.

Along with the agricultural sector, other food system actors have foreseen the need for climate change adaptation in Italy. A major fluctuation in prices as well as reductions in the availability of some basic products, like soybeans, maize and wheat, on global market is anticipated. Under these circumstances important re-localization initiatives, which may be interpreted as anticipatory adaptation measures, have been taken by the food industry. However, it seems obvious that in the near future there will remain a serious need for further deliberately taken decisions to prepare for the potential effects of climate change. This need most emphatically concerns the development of anticipatory adaptation measures established for endorsing the resilience of the many vulnerable regions producing high quality food, including the Denomination of Origin food products for export from Italy.

In Finland the context of constructing adaptation measures is very different from Italy as global warming is expected to improve farming conditions in the country. A rising average temperature and lengthening growing period are foreseen as resulting in a situation where arable land could be expanded further north and new crops could be included in agricultural variety (Peltonen-Sainio et al. 2009; Schulz 2009). Although it identifies many risks, it is estimated that the short-term economic benefits of climate change exceed the disadvantages for farms and farming.

However, in the name of anticipatory adaptation, some resources have been focused on the research and development of agriculture, for example, breeding and developing sustainable cultivation techniques. At the same time, it is also emphasised that both the agricultural environment and climate conditions are continually changing. Therefore, it is presumed that successful farmers will be able to spontaneously react to climate change by changing sowing and harvest times and the selection of crops accordingly, indicating trust in autonomous adaptation (MMM 2011).

Simultaneously, in packing, distribution and retail adaptation, mitigation and adaptation methods should be prepared in co-operation with the whole food supply chain. Notably, consumer behaviour is emphasised. The food industry and retail stores claim that they will, according to market logic, supply whatever consumers demand, suggesting an orientation towards reactive adaptation measures, even in the future. On the other hand, there is occasional debate on planned price policies or price controls based on climate protection, although no serious policy measures have been taken (Molarius et al. 2010).

According to these land case studies of food system activities in Italy and Finland, an array of nationally embedded climate change adaptation measures can be found in both countries. However, it seems to be quite problematic to separate the methods used for mitigating climate change impacts from those of climate change adaptation, both analytically and in practice. The most remarkable difference appears when interpreting the policy measures taken in practice. For example, after the ratification of the Kyoto Protocol and during the first period of attention on climate change impacts on food systems, the focus in Italy was mainly on mitigation measures. The primary goal was to reduce emissions in order to avoid negative climate impacts. Nevertheless, recent extreme weather events, like droughts, flooding and landslides, have convinced public opinion and food system actors and politicians that climate change with multiple environmental, economic and social impacts is not only a future possibility – it is a present day certainty. Consequently, the mitigation of climate change impacts is seen as being inadequate and the development of adaptation measures is gaining more serious attention. At the same time, while concrete policy actions are fairly stable, the interpretation of the goals and practices has changed. Under these circumstances, earlier mitigation measures may be re-interpreted as measures of adaptation.

In the national context of Finland, the target set for the Kyoto Protocol was to maintain emissions at the level of the year 1990 over the period 2008-2012. The target was met, and although the contribution of the Finnish food supply chain to climate change is estimated to be about 14%

(Virtanen et al. 2010), there has not been any particular national pressure to cut emissions resulting from food system activities. Within the Finnish food system, climate change adaptation has, so far, been more about monitoring and charting threats and possibilities rather than emphasising possibilities. However, the concrete adaptation measures initiated by food processing companies, distributors and retailers – improving energy and resource efficiency, reducing waste, rationalising logistics and developing packing materials and technologies – can be interpreted as mitigation measures. Thus, the actors are certainly informed about the need to prepare themselves for future climate change impacts. Nevertheless, the very same measures can also be interpreted as economically profitable business acts with potentially positive effects on climate change adaptation.

This examination of two geographically different European countries – located in different climate zones and which have differing anticipations and expectations concerning the impacts of climate change – shows how difficult it is to claim that adaptation policies could be arranged in a multi-level fashion within Europe's diverse climate regions. It seems to be clear that adaptation measures have to be tailored to not just national needs but also to regional needs – according to the specific natural and climate conditions. For example, Sicily differs greatly from the Italian Alps and Lapland, in the susceptible Arctic, differs greatly from southern Finland. When making these observations it is important to consider the fact that there is no common policy for securing food supply in the EU. Nor is a national self-sufficiency in production emphasised in the CAP. Instead, self-sufficiency is now believed to be guaranteed through the common agricultural market, which means that sufficiency is market-based. In summary, this means that climate change adaptation policy should be included not only in CAP and national agricultural as well as environmental policies, but also in the corporate social responsibility policies of food processing companies as well as distributors and retailers. Educating consumers to make climate friendly consumer choices will not be sufficient action, even if it is inevitable.

Conclusion

Finally, are there any grounds for common European policies for climate change adaptation from the perspective of food security? It is clear that the Common Agricultural Policy together with national agricultural and environmental policies have the power to establish influential adaptation measures, including environmental and climate subsidies, tax deductions and other "greening measures". Consequently, agriculture appears to be the main target for effective policy measures. CAP and national policies are relatively influential due to their power to sanction action through political means and the imposition of law. On the other hand, the production, distribution and retail sectors operate under market conditions, which will always involve market forces. This means that economic profitability will be a prerequisite for doing business, in which competition of some sort is generally understood to guarantee greater efficiency. In the name of consumer sovereignty, consumers cannot be forced by law to make certain choices, although they can be and should be educated to make responsible choices that indicate soft coordination between business concerns and the state with respect to long-term environmental food and environmental security. Therefore, it is essential that CAP policies and national policies maintain sensitivity to the regional particularities of the food chain when formulating new measures for climate change adaptation.

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