PIA MHANNA

Climate change

Climate Changes and Impacts on Food Security in European Countries

Table of contents:

Climate Change and Impacts on Food Security in European Countries

Introduction

Over the past decades, human activities have led to the release of large amounts of greenhouse gas emissions into the atmosphere. The majority of greenhouse gases stems from anthropogenic sources such as burning fossil fuels to produce energy as well as industrial processes, agricultural activities and many others processes. The excessive buildup of greenhouse gases in the atmosphere has markedly trapped heat and energy leading to global warming. Hence, a threatening phenomenon of climate change has started to hit the Earth. Climate change is one the most critical public health problems nowadays as it poses a complex, multifaceted risk to humankind and to the ecosystem. In essence, climate change is known to impose serious risks to provide sustainable and affordable supplies of natural resources such as food, water and energy for the current and upcoming generations (Lake et al., 2012). Shortages in these essential resources would increase global instability and conflicts among nations and communities especially with the amplified demands and consumption patterns of the growing world population (Fuhrer, J. 2009). Food is one the basic and essential necessities in life and the interaction between global climate change and food security has been a major focus for studies, governments and public discussions. Food security is defined as the access to adequate, safe and nutritious food to sustain an active and healthy lifestyle (Lake et al., 2012). According to the World Health Organization (2010), this public health burden is more prominent in developing countries as they suffer from potential food insecurity and malnutrition. On the other hand, although developed countries don't face problems from food shortages, their main concerns are directed towards nutritional quality and safety of foods (Lake et al., 2012). Indeed, whether in

developed or developing countries, the provision of healthy and sufficient food is a basic and acquired human right which is not subject to debate. Unfortunately, most governments are taken by the current political conflicts and financial crises ignoring the heart of the current problem, global climate change and its multiple impacts of which food insecurity is the primary one. The objectives of this paper are to investigate the impacts of climate change on food security in developed countries and more specifically in Europe. Thus, this work will address the impacts on food prices and availability, production methods, shifts to low greenhouse gases diets as well as food sourcing and consumption. To do that, it is important to know that food is a global commodity, bought from international markets by all countries. So, any changes occurring in food production in one country may lead to subsequent changes in food prices in other parts of the world. Additionally, this paper will discuss the impacts of climate change on nutritional composition and safety of foods consumed. Any available adaptation measures will be addressed as well.

Impacts of climate change

Food prices and availability

Several studies have addressed the potential effect of climate change on the world food prices. Results have stated a small reduction in food prices upon a 3°C rise of the global temperature. However, prices are postulated to rise again due to the decreased production and availability of food products (Easterling et al., 2007). For instance, the 2006 extreme weather events worldwide and particularly in Murray-Darling Basin, Australia, have led to reduced global cereal production which in turn contributed to a global increase in food prices (Piesse & thirtle, 2009). Another similar case occurred after the 2003 European heat wave was followed by a 25% reduction in

French fruit harvest (Battisti & Naylor 2009). On the other hand, by using biofuels in order to reverse climate change, agricultural lands for food crops would be displaced yielding less food availability. This would then shift the problem from climate change to elevated global food prices as seen in 2007. (Lock et al, 2009). In addition, the European Union Biofuels Directive is thought to slow down or reverse the declining of global food prices on the long term (Banse et al. 2008). This implies that policy makers are somewhat responsible for making the balance between climate change control and global food prices.

On the other hand, with the rises in food costs, people will start consuming cheaper food products. For instance, evidence has shown that consumers in Scotland have shifted to lower cost food items, cheaper brands which resulted in negative health consequences (Lake et al., 2012).

Production methods

Around 15-30% of global greenhouse gases emissions are attributed to food production, processing, storage, transport, preparation, purchasing and consumption. Of those, 45% comes from agriculture, 12% from food manufacturing and 12% from transportation. In view of this, control measures can be performed such as feeding cows with high-sugar grasses to reduce methane emissions (Garnett et al., 2008). Additionally, climate change may affect pesticide use due to abundance of diseases and changes in seasonal trends and patterns. The impact depends on the geographical locations and specific crops. For instance, pesticides use has increased as a result of climate change in the United States (Chen et al., 2001). On the other hand, high temperatures lead to more pathogens and vectors which would in turn contribute to a greater usage of biocides and veterinary medicines in livestock management. Thus, according to the Food and Agriculture Organization (2008), the prevalence of antibiotic resistant pathogens will increase substantially. Moreover, previous studies showed that *Salmonella*-related human

infections result from increases in temperature. This is because *Salmonella* bacteria reproduce in foods stored at higher temperatures levels (Kovats et al., 2004). Climate change has also been implicated in transferring chemicals and pathogens into food. Finally, climate change greatly affects food transportation from the farm to the consumer as higher temperature can cause bacteria reproduction and toxins formation such as aflatoxins in foods (Lake et al., 2012).

Shifts to low greenhouse gas diets

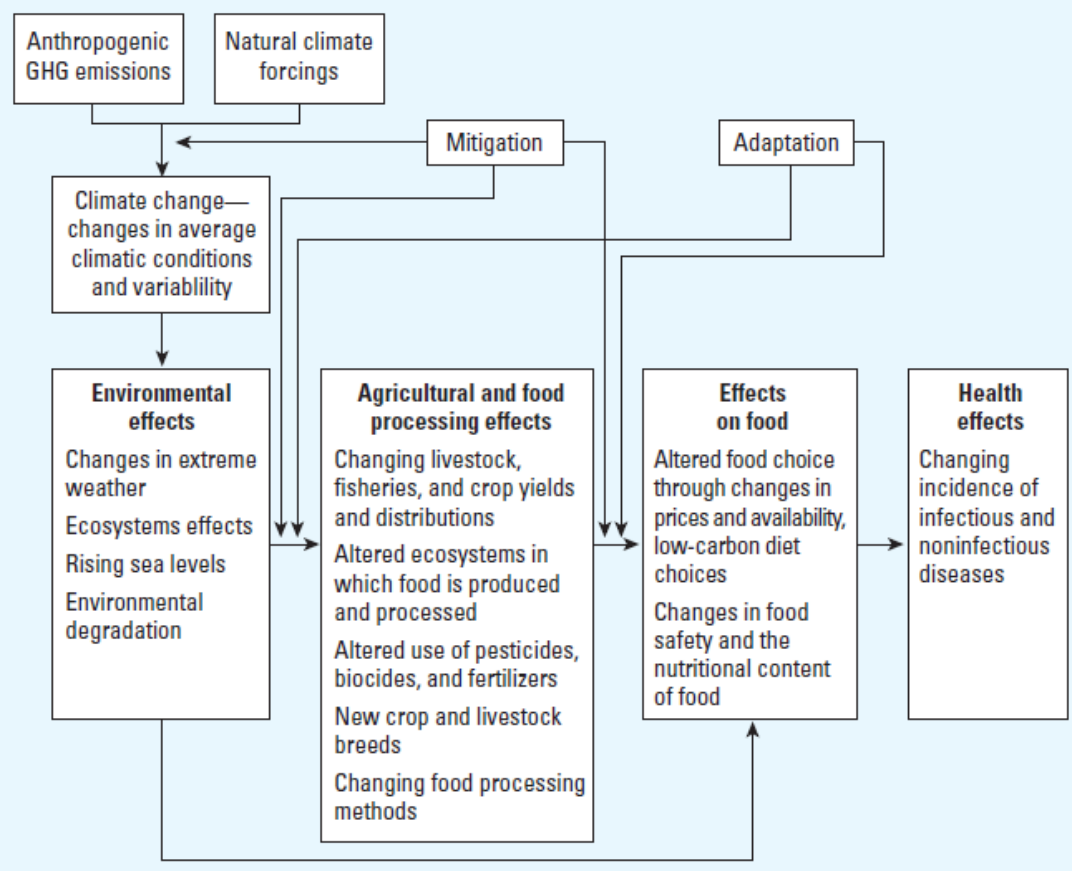
In an attempt to control greenhouse gases emissions, societies are shifting to the low greenhouse gas diets. It is known that 50% of foods-associated greenhouse gases are attributed to meat and dairy products in Europe. Analyses have shown that the consumption of meat and dairy products is associated with 3-13 times higher greenhouse gas emissions than vegetables do per unit of weight (Wallen et al. 2004). However, according to the World Health Organization (2008), substituting meat products with vegetables in the diet might lead to anemia which is prominent in Europe especially in pre-school children (22%), non-pregnant women (19%) and pregnant women (25%). Hence, when advising communities about dietary changes, all factors should be taken into consideration to ensure the safety and well-being of the public. On the other hand, consumption of in-season foods is likely to lower greenhouse emissions. This is explained by the bigger agricultural inputs used in the out-of-season foods such as heated greenhouses. However, to ensure an adequate diet with constant consumption of fruits and vegetables during the winter in some countries, food importation or food storage for other times of the year could be a solution (Lake et al., 2012).

Impacts on food sourcing and consumption

Climate change might lead to changing food belts as foods consumed will be obtained from other parts of the globe in the future (Easterling et al., 2007). It is quite known that the source of foods

determines their micronutrient and macronutrient composition because of differences in varieties and species grown, soil contents, harvesting techniques as well as storage and transportation methods. For instance, from 1997 to 2000, a 50% reduction in the UK dietary selenium intake occurred as a result of shifting from importation of Canadian selenium-rich grains to growing them in the UK selenium-poor soils. Moreover, climate change and temperature increases would cause changes in the choice and consumption of foods with different nutritional composition by people (Lake et al., 2012).

Figure 1: Main pathways of climate change impacts on food security in developed countries



Adapted from McMichael et al. 2006

Adaptations measures

Nutritional composition

The effects of changes in nutritional composition of people's diets depend on their ability to adapt to these alterations. For instance, regular monitoring of nutritional composition of foods such as grains, potatoes, meat, fruits and vegetables is needed urgently. In addition, food intake and nutritional status of societies can be monitored by performing food surveys of representative samples of the population. Moreover, regular monitoring of biomarkers such as vitamins and minerals is well-needed. On the other hand, vulnerable populations such as low-income individuals should be more regularly monitored as they can be affected by food prices increases to a bigger extent. Therefore, after nutritional compositions have been identified and linked to climate change, policies and measures can be set in order to force the food industries to fortify the foods either within agriculture or during processing. Another way to address these changes is for the governments to encourage food industries and manufacturers to change their products' compositions. Simple interventions such as public education and campaigns would raise awareness of the public about the importance of changing their food choices in adapting to nutritional changes (Lake et al., 2012).

Food safety

In Europe, the allowed levels of contaminants in foods are set by the FAO/WHO (2006) and this would ban foods with exceeding levels to enter the food chain. In addition, EU Food Hygiene Regulations and EU Plant Protection Products Regulation set strict measures for processes used in agriculture and processing to ensure food safety. Hence, these regulations and standards prevent any food safety issues related to climate change. Periodic food monitoring and risk

assessment are needed to make sure that these guidelines are met. Finally, food-related human illnesses and disease outbreaks should be observed regularly through hospitals, healthcare institutions and registries (Lake et al., 2012).

Conclusions

To face the challenging problem of food insecurity, the agricultural and food systems need to adapt in the near future. While facing the global warming and climate change, it is necessary to address the issue of food insecurity globally as the world population is expected to reach nine billion persons by the year 2050 (Royal Society 2009). With the large underlying uncertainty about the possible harmful effects of climate change on food security, future studies and risk assessment are needed to estimate the potential impacts of climate change on food security, dietary nutritional composition, food safety, food prices and consumer choices and behaviors. Thus, an intensive multidisciplinary effort is needed to come up with an aggregated knowledge of molecular scientists, physiologists, agronomists, modeling specialists, academic scientists, famers, industries, governments, food and environmental ministries and civil society.

Campaigns, public discussions and educational programs are also needed today to raise the communities' awareness about the seriousness of this emerging problem and the simple measures that might help resolving this matter. Finally, governments, politicians and communities are urged to prioritize the devastating problem of global climate change. Strict measures should be taken to reduce the global warming and reverse climate change in order to save the humankind, ecosystems, and the Earth before it gets too late.

References

Banse, M., Van Meijl, H., Tabeau, A., & Woltjer, G. (2008). Will EU biofuel policies affect global agricultural markets?. *European Review of Agricultural Economics*, *35*(2), 117-141.

Battisti, D. S., & Naylor, R. L. (2009). Historical warnings of future food insecurity with unprecedented seasonal heat. *Science*, *323*(5911), 240-244.

Friel, S., Dangour, A. D., Garnett, T., Lock, K., Chalabi, Z., Roberts, I., ... & Haines, A. (2009). Health and Climate Change 4 Public health benefits of strategies to reduce greenhouse-gas emissions: food and agriculture. *Lancet*, *374*, 2016-25.

Fuhrer, J. (2009). Ozone risk for crops and pastures in present and future climates. *Naturwissenschaften*, *96*(2), 173-194.

Irland, L. C., Adams, D., Alig, R., Betz, C. J., Chen, C. C., Hutchins, M., ... & Sohngen, B. L. (2001). Assessing socioeconomic impacts of climate change on US forests, wood-product markets, and forest recreation. *BioScience*, *51*(9), 753-764.

Kovats, R. S., Edwards, S. J., Hajat, S., Armstrong, B. G., Ebi, K. L., & Menne, B. (2004). The effect of temperature on food poisoning: a time-series analysis of salmonellosis in ten European countries. *Epidemiology and Infection*, *132*(3), 443-453.

Lake, I. R., Hooper, L., Abdelhamid, A., Bentham, G., Boxall, A. B., Draper, A., ... & Waldron, K. W. (2012). Climate change and food security: Health impacts in developed countries. *Environmental health perspectives*, *120*(11), 1520.

Piesse, J., & Thirtle, C. (2009). Three bubbles and a panic: An explanatory review of recent food commodity price events. *Food Policy*, *34*(2), 119-129.

Tubiello, F. N., Amthor, J. S., Boote, K. J., Donatelli, M., Easterling, W., Fischer, G., ... & Rosenzweig, C. (2007). Crop response to elevated CO< sub> 2</sub> and world food supply: A comment on “Food for Thought…” by Long et al., Science 312: 1918–1921, 2006. *European Journal of Agronomy*, *26*(3), 215-223.

Wallén, A., Brandt, N., & Wennersten, R. (2004). Does the Swedish consumer's choice of food influence greenhouse gas emissions?. *Environmental Science & Policy*, *7*(6), 525-535.