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Integrating climate change, food prices and population health

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ABSTRACT

The inter-related nature of food, health and climate change requires a better understanding of the linkages and a greater alignment of policy across these issues to be able to adequately meet the pressing social and health challenges arising from climate change. Food price is one way through which climate change may affect health. The aim of this study of the global and Australian food systems is to provide a whole-of-system analysis of food price vulnerabilities, highlighting the key pressure points across the food system through which climate change could potentially have the greatest impact on consumer food prices and the implications for population health. We outline areas where there are particular vulnerabilities for food systems and food prices arising from climate change, particularly global commodity prices; agricultural productivity; short term supply shocks; and less direct factors such as input costs and government policies. We use Australia as a high-income country case study to consider these issues in more detail. The complex and dynamic nature of pricing mechanisms makes it difficult to predict precisely how prices will be impacted. Should prices rise disproportionately among healthy foodstuffs compared to less healthy foods there may be adverse health outcomes if less expensive and less healthy foods are substituted. Higher prices will also have equity implications with lower socio-economic groups most impacted given these households currently spend proportionately more of their weekly income on food. The ultimate objective of this research is to identify the pathways through the food system via which climate change may affect food prices and ultimately population health, thereby providing evidence for food policy which takes into account environmental and health considerations.

Introduction

Food systems are the complex and dynamic interactions between and within the biogeophysical and human environments that result in the production, trade, processing, distribution, preparation and consumption of food (Ericksen, 2008; Gregory et al., 2005). The activities undertaken within the food system have broad ranging impacts, including on the economy and environment, but also on social welfare, food security, diet and human health (Lang et al., 2001). Food security is defined as 'all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active life' (FAO, 1996). The health implications of food insecurity are significant: poor nutrition plays a prominent role in morbidity and premature death from many chronic health conditions in all countries including Australia (Australian Institute of Health and Welfare, 2010; WHO, 2003).

Evidence is accumulating internationally on the current and expected impacts of climate change on food system sustainability and human health (Easterling et al., 2007; Tirado et al., 2010). The food sector relies on ecosystems' ability to provide the resources, such as nutrient-rich soils and water, and the climate regulation necessary to produce food (Garnaut, 2008; UNEP, 2010). Climate change represents an additional pressure on food systems and diet-related health, and on the production of nutritious, plentiful and affordable food, though the nature and extent of impact is likely to vary around the world, as well as within countries (FAO, 2011; Friel et al., 2008).

There is growing awareness of the impact of climate change on crop productivity and food production and the implications for food security (Gregory et al., 2005; Schmidhuber and Tubiello, 2007). Relatively less analyses consider the impact of climate change on other dimensions of food security including affordability, which relates to the purchasing power of households relative to the price of food (Ericksen, 2008; Gregory et al., 2005). Issues associated with food prices and affordability have been emerging in recent years, partly in response to the global food price increases of 2008 and the complexity of factors, including climate events, that combined to produce the price increases (Ericksen et al.,

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2009). However, to date, a whole of food systems approach to understanding vulnerability to climate change and the implications for food price, food security and health has been lacking. Governments have many tools available to them to individually address the issues of climate change, food and health, but often these issues are considered in isolation. This, however, can neglect to recognise the interconnectedness of these issues, and the implications that each can have for individuals, societies, and for other areas of the economy and society beyond the immediate intent of the policy.

Given the key role of food systems and the potentially significant burden of poor health, understanding the impacts of climate change on food prices will be essential. Not only will this enable a more informed food policy, but it will also diminish uncertainty around the potential outcomes for food prices of policy decisions made in other areas, such as agriculture, trade and manufacturing.

Aim and outline of the paper

The aim of the paper is to examine the food system so as to identify pressure points through which climate change will likely have most impact on food prices and the subsequent implications for human health. By considering food prices as part of an integrated system, the significance of climate change for the economy and population health is evident (Pettoello-Mantovani, 2005). The ultimate objective of this research is to provide evidence for food policy such that it can take into account environmental and health considerations.

The research draws upon agricultural economics theory (Tomek and Robinson, 2003) and eco-nutrition theory (Lang, 2005; Pettoello-Mantovani, 2005) to examine the food system, and specifically the Australian food system as a case study, in the context of the global food system and climate change. A food systems approach is now well established for identifying particular activities and actors involved in the food system, and the study of issues such as environmental and sustainability impacts (Ericksen et al., 2009; Hawkes, 2009). It is worth noting that Australia, as a highly developed country will face different challenges related to climate change and food compared to low and middle income countries. The analysis presented in this paper, therefore, focuses on the implications for high income countries. We recognise that the health consequences due to increasing food prices are likely to be quite different in developing countries, leading often to chronic malnutrition, impaired cognitive development, and high rates of morbidity and mortality (Tirado et al., 2010).

There are three analytical sections to this paper. First it describes traditional food price drivers within a food system in a developed open-market economy. We then explore in more detail, four price drivers and the extent to which they are likely to be vulnerable to climate change. In the second section we consider these climate-related price drivers in the context of the Australian food system, and what they might mean for Australian prices. The final analytical section of the paper draws together food price vulnerability and implications for food security and health, with a focus on high income countries. The paper concludes with some implications for food policy.

Methods

Conceptual development

A conceptual diagram was developed, drawing on agricultural economics and agri-food systems theories, to visually describe the supply chain process through production, processing, manufacturing, retail and consumption, and the drivers at each stage of the food system that impact on food price. The diagram is discussed in section one.

Evidence base

The study is based on a narrative synthesis of existing peer-reviewed and grey literature (Waters et al., 2011). A literature search of a cross-disciplinary range of databases was undertaken, including Science Direct, PubMed, ProQuest and SpringerLink. Google Scholar was also used. The grey literature was also searched and reports from government and non-government organisations were used. In particular, we have drawn upon a review conducted for the International Panel on Climate Change in 2007 (Easterling et al., 2007). Databases were searched for English language papers from 2000 onwards.

Criteria for the selection of price drivers

Two criteria were considered when selecting which price drivers were most vulnerable to climate change: (i) the potential for climate change to influence a price driver; and (ii) the extent to which a climate-induced change in a price driver would influence consumer food prices. The first of these criteria considers the vulnerability of a price driver to climate change. In making our assessment we selected those price drivers for which most evidence exists. In large part, evidence is focused on the price drivers at the primary production stage of the supply system. Less is known about impacts on price drivers throughout the other activities of the food system, such as retail competition and price transmission. The second criterion asks the question: even if climate change impacts upon a price driver, will there ultimately be an impact on prices paid for food by consumers? Considering the final flow through to consumers of a climate change induced price change is essential when assessing dietary behaviours and health implications. We hypothesise that in many cases, the impact of climate change on the final retail price will be dependent on the nature of the product, and the relative strength of the price driver compared to others (that is, the degree to which that price driver contributes to the end retail price).

Section 1: Mechanisms through which climate change could affect food prices

Traditional price drivers through the food system

In an open industrialised country, the price a consumer pays for a food product has been determined by a complex range of forces. Agricultural economics and food systems theory (Spencer, 2004; Tomek and Robinson, 2003) can be used to conceptualise these factors to a greater degree of detail, and consider how they can influence the price of a food product as it moves through the food system. This study focuses on industrialised open economies, using Australia as a case study. For developing countries, and countries that are closed to trade, these factors are likely to look different.

The key components of the food system are primary production, processing and manufacturing, retail and distribution, and consumption (Hawkes, 2009). The factors that influence price are called the 'price drivers', and are summarised in Fig. 1. Food prices are influenced by factors that affect the supply or demand of a product, with variations dependent on the nature of the product. These forces are not all equal in determining the final price of a food product, with some drivers likely to be stronger than others.

Supply side factors

On the supply side, costs of factors such as the inputs that are used to transform plants and animals into food can often play a