



Agriculture and Climate Change: Introduction

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Climate change poses new challenges to agriculture and society in general, in particular regarding land use and the supply of food. For years it has been out of the food policy agenda, both for policy-makers and social movements. However, the discussions of climate change in and after the 2009 United Nations Framework Convention on Climate Change Copenhagen conference and the publication of data showing both the role of agriculture in climate change and the effect of climate change on agricultural production, increased the interest of climate change as inserted in the food system. Together with other factors, such as increasing demand for food in many countries, peak oil and rising crude oil prices, bio-fuel production on agricultural lands, food market speculation and land grabs, climate change pushes agriculture towards a new era of major uncertainties and shocks. The instability and lacking resilience of the global agri-food system is apparent and new and radically improved solutions are urgently needed. This special issue of the *International Journal of Sociology of Agriculture and Food* addresses these issues on several levels: structural, political, practical and conceptual.

Many observers, policy-makers and academics have agreed that the post-war 'productivist years' of global agriculture, which may have fed more mouths but also led to over-supply of agricultural goods and malnutrition and starving, not to mention major environmental disasters, should be brought to an end (Wilson, 2001; Almås, 2004). To replace this productivist regime, governments developed agri-environmental programmes, focusing on the multifunctionality of agriculture in coexistence with greening exports from food-exporting countries (Rønningen et al., 2005; Potter and Tilzey 2007). But the current situation introduces two major challenges for policy-makers: how to feed a growing world population under increasing conditions of uncertainty, whilst maintaining a vulnerable environment after decades of agro-ecosystems' overexploitation. In such context, mitigation and adaptation strategies are proposed and improvisation seems to be a common characteristic.

One example of improvisation is bio-fuel policies. Bio-fuels were at first proposed as an alternative fuel to reduce CO₂ emissions. This perspective was disputed later, because of social opposition and new scientific evidence showing inefficiency in terms of greenhouse gas emissions and land use (Cassman, 2007; Mol, 2007; Runge

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and Senauer, 2007). Other contradictions arise as a result of the organization of the global agri-food system itself. While mitigation and adaptation strategies are proposed, a global food system is characterized by long-distance trade of food, dependence on fossil fuels, and direct negative impacts on CO₂ emissions. The question is how can agriculture become a part of the solution, rather than aggravating the problems? The same could be said for those production systems that are extremely fossil-fuel dependent and inefficient from the energetic point of view, but at the same time are reinforced through mitigation strategies under climate change policies.

The challenges for agricultural and food systems introduce new problems for policy-makers across the world. Developing countries, which are more likely to suffer more severely the impacts of climate change and where the highest rates of food insecurity exist, will also need to look at the problem and develop proper policies. In this context of uncertainty, shocks and policy improvisations, do agricultural policies regain a strengthened production focus? With increased focus on producing more food, there is a risk of reinforcement of intensive agricultural production in rich and poor countries in spite of the social and environmental effects being known. This time around, however, a science-based second green revolution is proposed as a solution to these problems. Thus, will climate change favour the appearance of a new food regime?

A potential global shortage of food introduces a moral dilemma: should farmers and politicians be more concerned about protecting the environment, landscapes, and animal welfare (as in 'post-productivism'), or should their first priority be the maximum production of food to prevent starvation in poorer countries because of climate changes (under 'neo-productivism')? If policy is readjusted and food production encouraged, how can we ensure that the environmental damage caused by intensive agriculture is not reinforced? What responses and changes can be identified in the wake of this potential neo-productivism? And what impacts do mitigation and adaptation strategies have on agriculture and farmers? Who decides the schemes to be applied in different contexts? Should other more environmentally and social-friendly systems be promoted and improved in order to produce more food? What is the role of farmers as primary actors in the food chain? Will climate change policy-making affect the governance of agricultural policies? Will climate change be an opportunity for local peasant-focused food regimes, which are resilient to future environmental and market shocks and are more socially sustainable?

More specifically, in response to this shift from stable rural development premised on post-productivism in Europe to a global food economy increasingly influenced by shocks and surprise events, will the recent respite in productivist approaches turn out to be a temporary shift? If not, will a neo-productivist regime emerge where aims of food production regain the main focus on behalf of multifunctional aims, like we have seen in many countries in the latter decades? Do these changes amount to the advent of a new 'bio-economy'?

With regard to the peak oil scenario: can farmers make a living growing feedstock for industrial or energy production? Is this moral in a context of millions of people suffering from hunger? Are we seeing a new technological imperative in agriculture? How do responses differ between countries and between different agricultural policy regimes? What are the consequences for rural, environmental, and socio-cultural sustainability? What are the implications for rural diversification strategies and for the inclusion of previously excluded social groups, such as women and peasants? Is there a decisive shift in the balance of power in rural areas between

production, consumption, and environmental interests? And does the new focus on climate, food, and energy production challenge conceptualizations and theoretical approaches within rural studies?

One may also ask if we have seen the beginning of the time of food uprisings, with climate change as a promoting factor that adds to a global uncertain food system. During the 2006–2008 food price increase, the FAO real food price index rose to 184.7 points above the 2002–2004 average of 100 (FAO, 2011). As a consequence, more than 40 countries experienced food rebellions: in March 2009, President Marc Ravalomanana of Madagascar had to step down in the midst of an economic crisis. The opposition claimed that his regime had opened up too much to foreign investments, particularly in mining and agricultural land. In November 2008, South Korea's transnational company Daewoo signed a 99-year lease for half of Madagascar's arable land, the firm expecting to pay 'nothing' for the lease (Blas, 2008). The deal would have turned over 1.3 million hectares to produce corn and palm oil for export at a time when one-third of the country's children were malnourished. Daewoo officials said later they were already putting plans together to switch their investment to more receptive countries in the region. Recently, the 2008 food price peak has been surpassed, and at present the real food export price index of 55 commodities has risen to 205.7 (FAO, 2011), an all-time high.

In some Arab countries that have recently experienced insurgencies, protests against food price hikes were lighting the blaze and giving intensity to the political revolts. And the appearance of recent anti-government protest movements of 'indignants' in European countries such as Spain, Italy and Greece, lent arguments to an analysis saying that the present systems are neither sustainable nor resilient. Thus, climate change is an element that adds more uncertainty to an already uncertain food system. It poses a challenge to policy-makers, who will have to address the issue of food–feed–fuel under this changing political and economic climate. Food insecurity and food price instability seems to have been a permanent feature of the twenty-first century. Future climate change and other shocks such as volcano eruptions and political upheavals and protests may even increase food insecurity, both in the global South and North.

The focus of the papers in this issue of IJSF is on 'agriculture and climate change'. Agriculture may be seen in a climate change perspective as both a cause and a solution. Being part of the solution offers agriculture and agricultural industries an opportunity to regain positive attention on the value of secure productive land and resources. In the new bio-economy vision of the European Union, agriculture can, through sustainable intensification land management and forestry, make a major contribution to minimizing GHG emissions due to carbon storage. Countries in need of supporting national productions view this as a good justification, together with arguments for national food security and for further protection of agriculture-dependent rural areas. Visions for sustainable intensification of agriculture and forestry, which can be named an emerging neo-productivist regime, call for innovation, knowledge, technology, and funding. We should be aware that success of grand ideas and visions depend on the uptake of new technology and practises, not only on the willingness to pay for its products in the market.

Other visions would argue that agriculture, as part of the solution, means a focus towards small-peasant agriculture. Which form of new food regime this would raise is not yet known, but peasants all over the world claim they can cool the planet and feed the world.

The compilation of articles in this issue address these awareness's from different angles.

The Articles in this Issue

Lawrence Busch, in his article, deals with the heated debate about possible reasons behind climate change and analyses how the development of scientific measurement standards define problems in ways that are not easily transparent and understandable. Yet, standards must be developed to identify the phenomena of concern to both climate scientists and the public. Standards must be identified to stabilize the phenomena of interest, turning them into something that can be acted upon. In addition, standards must point the way forward and measure progress toward the amelioration of the problem(s). In short, standards simultaneously perform, measure and point toward the transformation of 'the climate.' Yet, even as standards are necessary, they may actually lead us astray. Drawing on Foucault and recent science studies, Busch argues that grappling with climate change will require changing the political and even epistemological climate, re-enacting the sciences as well as agriculture and food.

Alan Renwick and Anita Wreford claim that climate change is likely to be a major factor influencing agriculture over the next century, both directly and indirectly. Taking Scotland into consideration, Renwick and Wreford state that the direct effects of climate change on Scottish agriculture are likely to be relatively benign, if not positive, with the exception of extreme weather events. However, the obligation to address climate change through the reduction of greenhouse gases from all sectors, including agriculture, may have a more important impact on the agricultural sector in Scotland. The commitments to reducing emissions and to the development of a land-use strategy raise profound questions for Scottish agriculture. In one sense, this relates to its ability to maintain and increase production in light of possible increases in food demand. In another sense, it relates to the balance of power between the state and the farming sector in determining the use of land in Scotland and the roles and responsibilities of both.

Ruth Beilin, Serenity Hill and Tamara Sysak have analysed Victorian (Australia) farmers responses to climate change and peak oil, considering international, national and regional policy recommendations for adaptation and mitigation. The policy recommendations are found to lack coherence and integration across scales. The farmers' ability to adapt is therefore found to be limited at farm level. Instead of adapting future-oriented farming practices to de facto effects of climate change and new resources when fossil oil sources are exhausted, short-term mitigation strategies are employed. For instance, in periods of severe drought farmers are found to apply maladaptive responses that rely on scarce resources and a continuation of 'business as usual'.

In a second article analysing the Australian situation, Chris Evans, Christine Storer and Angela Wardell-Johnson show that the majority of farmers disagreed that climate change was occurring. Adding information that farmers do not trust science or government, a huge barrier is hindering information to diffuse between these groups. Evans et al. suggest that climate change information should be framed within the local socio-cultural, economic, and biophysical environment of the people it is intended to influence, before expecting great changes in farming behaviour to occur.

Jostein Brobakk and Reidar Almås have analysed the causes of rising food prices in 2008. From a climate change perspective, one could expect that perceptions of uncertainties regarding production of food in an unstable natural environment would cause increasing prices. Brobakk and Almås argue, however, that it is first and foremost deregulation of the financial sector that should take the blame for the rapid increase in food prices. Long-term control of production (into less surplus food), globalization of trade, low national food and grain stocks, and increased bio-fuel production on agricultural land have resulted in a food market more vulnerable to external shocks.

Elisabeth Abergel explores whether climate change can force the changes towards a new food policy regime. She analyses the relationship between climate change and the potential for transition to a new food regime through the development of climate-ready crops, a widely proposed and supported adaptation strategy that aims to ensure food security in a changing climate context. She theorizes the practical limitations of this adaptation strategy from a bio-capitalist perspective (Rajan, 2003), and considers how global climate change exposes the weakness of biotechnological solutions. In contrast to supporting the emergence of a neo-productivist regime, Abergel suggests that new regimes of food production are needed that aim at working within the complexity of ecosystems.

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