CLIMATE CHANGE AND AGRICULTURE

CAMBODIA HUMAN DEVELOPMENT REPORT 2011

Ministry of Environment
Cambodia

UNDP
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Climate Change and Agriculture in Cambodia

1. Introduction

More than 70 percent of a population of 13.5 million, or about 9.5 million people, are engaged in agriculture to some extent (FAO/MoP 2010). The vast majority are smallholder farmers.

Rural livelihoods in Cambodia are diverse and dynamic. Along with farming rice, households juggle a range of activities. Critically, this includes rearing livestock, harvesting fish and other aquatic animals, and harvesting non-timber forest products. Increasingly, rural households are involved in off-farm employment, with some members migrating to find employment in the larger towns and cities of Cambodia, as well as in neighbouring countries. Migration can be an important component of wider household livelihood strategies and an important strategy for coping with shocks and crises, but also creates its own risks and vulnerabilities.

Livestock rearing is a key part of rural livelihoods, providing a means for savings in the case of larger livestock and sources of income and food with regard to pigs and poultry (Tong 2009). Production remains primarily small-scale, and its contribution to total agricultural production remains largely static, providing only 15.3 percent of total agricultural product, equivalent

Agriculture – and in particular rice farming – continues to play a critical role in rural livelihoods and in the cultural imaginations of rural people in Cambodia.

to 4.32 million head in 2009 (MAFF 2010). Livestock (cattle, buffalo and pigs) has great potential, but is largely constrained by limited extension and veterinary services as well as weak marketing channels throughout rural areas. Poor livestock health is a major factor in household income security (Tong 2009).

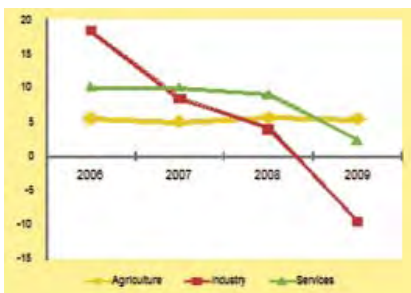
At the same time, Cambodia's freshwater capture fisheries are among the most productive in the world (Baran et al 2006). Fishing has been central to rural livelihoods in Cambodia at least since the times of the Angkor Empire; along with rice farming, it holds a central place in rural livelihoods strategies and cultural practices, involving 2-4 million rural people (Baran et al 2006), largely in small and medium scale fishing activities. Fish and other living aquatic resources are enormously important for food security and nutrition, contributing up to three-fourths of animal protein in rural diets (Hortle et al 2007).

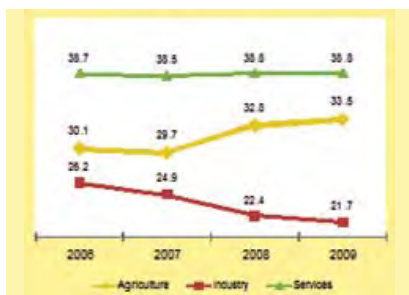
In 2009, fisheries contributed 25.2 percent to agricultural sector activities and therefore are a significant economic activity (MAFF 2010). Its production is estimated using catch records and is stated as being between 280,000 tonnes and 400,000 tonnes per year of fish (MRC 2004). These figures may overlook small rice field and floodplain fisheries. Recent studies suggest that total production levels are in the region of 524,000 to 616,000 tonnes per year (Hortle 2007). The natural production of aquatic animals in rice fields is estimated as worth at least US$100 per hectare (Hortle 2007), compared with the value of rice production at US$150 per hectare.

Overall, agriculture production in Cambodia is closely related to climatic conditions. Cambodian agriculture depends on weather and rainfall, with over 80 percent rain-fed agriculture, while dry season rice cultivation is done with irrigation and natural recession of water at the end of the flooding season (MAFF 2010, SWC 2006).

Many factors contribute to low production levels and limited economic returns. Soil fertility

GDP growth by sector before and during the global financial crisis and contributions of sectors to GDP before and during the crisis (% of total GDP)





Source: MEF, Medium-Term Macroeconomic Framework, March 2010 Update

is generally extremely low, with much of the country characterised by sandy soils (Johnston et al 2009). Access to irrigation is limited, and questions persist with regard to the viability of irrigation for such soil conditions.

Farmers' access to productive assets, primarily land, also is extremely limited. Farmers do not have secure tenure over their land, and landholdings are typically less than 1 hectare. However, studies suggest that gaining secure tenure is the most important factor in improving agricultural yields (Kala, Boret and Kurukulasuriya 2011).

Weak access to support services and agricultural inputs for smallholders, as well as limited in-country agricultural processing and poor access to markets, further limit the realisation of economic benefits and present substantial constraints to future development. Reliable market and crop information and weather forecasting are not available.

2. Policy priorities

The global food crisis is argued to have provided a *"warning against the historical neglect of the agriculture sector"* (Jalilian 2010).

While agriculture's share of GDP has declined over the last 20 years as the services and industry sectors have grown, it still remains important. During the last four years of global economic, food and fuel crises, for example, the agriculture sector has continued to grow, accounting for at least a third of GDP (MEF 2010); in the same period, the services and industry sectors have declined. A recent review of Cambodia's economic competitiveness argues that the *"only sector which will provide any meaningful cushion as a short-term crisis buffer and a medium-term recovery and growth engine is agriculture"* (UNDP 2009).

The future of rice export

In the 1960s Cambodia was one of the main rice exporters in Asia, but production declined dramatically during the civil war. Cambodia reached rice self-sufficiency in 1995 (Nesbitt 1997), although it has only recently re-entered the world market as a rice-exporting nation.

In the wake of the global food crisis of 2008, Cambodia hopes to replicate the successes of Thailand and Viet Nam in exporting rice (Radey and Bandary 2009, USDA 2010), bringing 'white gold' even more prominently into national development policies (RGC 2010). A recent policy paper on the promotion of paddy rice production and export of milled rice prioritises the following:

1. Infrastructure building and enhancement
2. Improved provision of extension services and agricultural inputs
3. Land management reform
4. Finance and marketing
5. Expanded farmer organisations, and institutional building and coordination

By 2015, the country hopes to achieve a rice surplus of 4 million tonnes, of which 1 million would be exported (RGC 2010). These ambitious plans have not yet fully addressed the challenges of either human development or of climate change.

Water for agriculture

The lack of access to irrigation – almost universally identified as the major constraint to improving rice production in Cambodia – is also widely identified as a major factor in farmers' vulnerability to climate change. All climate change adaptation recommendations for the country refer to the need for expansion of irrigation, yet the case for irrigation is not clear cut.

The efficiency of existing irrigation systems is also questionable. Major factors are related to weak institutional capacity of farmer groups and low incentives for collective action, as well as poor design of the schemes themselves. Ultimately, most irrigation schemes have been found to simply not be economically viable (CEDAC 2009). This kind of assessment clearly indicates the kinds of challenges faced in making irrigation work, particularly for small- and medium-scale farmers (CEDAC 2009). However, such small- and medium-scale irrigation systems may also face their own limitations, particularly in regard to the need for collective action of farmers, and economic efficiencies for meeting export-oriented production.

In considering the future development of irrigation, it is therefore important to consider the design of irrigation schemes, ensuring that soils are suitable and that irrigation investments are economically viable. Meeting irrigation needs of farmers is perhaps more likely to be realised through smaller and medium-scale systems, developed according to local needs and circumstances (Hoanh et al 2009, Facon 2005).

For Cambodia, climate change is inescapably a development challenge. With huge numbers of people in the rural economy making a large contribution to national development, the question at the heart of this challenge is rural livelihoods.

3. Projected climate change impact on agriculture and its implications

Cambodian agriculture is extremely vulnerable to climate change (Mainuddin et al 2010, CISRO 2008, ACIAR 2009, MoE 2010). The specific threats of climate change for agriculture include:

- Changes in rainfall patterns. Predictions suggest that wet seasons will be shorter, but with higher levels of rainfall, while dry seasons will be longer and drier. This will result in shifts in the distribution of rainfall between areas. The changes to the length of seasons, combined with the delayed onset of the wet season after a longer dry season, will affect traditional cropping practices.

- Floods and droughts are major influences on rice production in Cambodia. MoE (2010) records areas of rice crop that have been affected by floods and drought in various years (see table below). Such events happen with some regularity, and floods and droughts can occur in the same year (for example, 1996 and 2002). The period 2000-2002 also saw three consecutive years of significant flooding.

Floods		Drought	
Year	Area (ha)	Year	Area (ha)
1984	400,000	1991	200,000
1995	150,000	1994	250,000
1996	450,000	1996	400,000
2000	400,000	1997	430,000
2001	200,000	2002	150,000
2002	100,000	2004	300,000

Other impacts will include:

- Climate change will have significant impacts on poorer rural households, as well as the capacity to meet Government targets for increased rice production and export.

- A recent economic analysis suggests that with a 1 °C rise in temperature, annual mean net revenue falls. The study also points out the main factor in agricultural productivity as being security of land tenure (Kala, Boret and Kurukulasuriya 2011, Johnston et al 2009, Peng et al 2004). Impact on rice yield is predicted to be significant. MoE (2010) shows rice yields will decrease under both high and low emission scenarios, and will continue to decrease within a range of 20-70 percent of current production based on different seasons and scenarios.

- Current agricultural techniques may not be able to cope with increased salinity that is predicted for coastal areas.

- Increased incidence of livestock disease, largely associated with lack of water and grazing land and the long distance to water sources for livestock. Because larger livestock are an important investment and means of savings for farmers, these kinds of impacts can have serious consequences. They push people into debt and reduce their financial safety nets, which exposes them to an inability to access cash when faced with other crises.

- Increased incidence of pests and disease. Changes in temperature, rainfall, seasonal patterns and changing length of the growing season (and ecological systems)

have the potential to increase the threat to agriculture of pests and disease. Temperature increases may speed up growth rates of crop pathogens and increase reproductive generations per crop cycle, making the crop more vulnerable. Increased CO_2 levels could enhance the competitiveness of some weed species.

- Cambodian capture fisheries are especially vulnerable to the changes in temperature and hydrological flows that are associated with climate change. Such changes could have significant impacts on migration, breeding and spawning patterns while also adding pressure to critical fisheries habitats – flooded forests in the Tonle Sap, floodplains and deep pools in the major river systems.

4. Actions for building resilient agricultural livelihoods

Building resilient agricultural livelihoods will require addressing both governance and institutional dimensions, and promoting appropriate technological solutions.

The threat of climate change may require a review of current policies and practices regarding land use, water demand and management, extension practices and issues surrounding access to land and natural resource management. It is essential that farmers, both men and women, are able to engage fully in these critical debates on policy and management.

Policy options

There is an urgent need to address some of the outstanding issues in the agriculture sector related to insecure access to land, as well as a more comprehensive approach to integrated management of land and water resources to ensure soil conservation and water efficiency. Key policy priorities include:

- Improving land titling and tenure for farmers.
- Improving extension services, access to inputs and markets. Government agencies struggle to meet farmer demand and face their own limitations in terms of capacity and funding. Non-governmental organisations and the private sector already play an influential role in providing extension services and inputs. Innovative models – such as Farmer Business Advisors – also have considerable potential.
- Strengthening existing community-based adaptation (CBA), through existing agricultural groups, such as farmers' organisations, farmer water user committees, trade associations, Community Fisheries and Community Forestry.
- Increased cultivated areas and cultivation seasons

Low-carbon agriculture

Building climate-resilient agriculture means both reducing the vulnerability of farmers and the sector as a whole, while also promoting low-carbon agriculture. Such low-carbon agriculture hinges on techniques that can reduce farm emissions; conserve and improve soil fertility and reduce the need for tillage; give preference to locally available organic inputs

over imported chemical inputs; promote efficient management and use of water resources; reduce energy and fuel demand, for example, for pumping irrigation water and for transport; and integrate crop and animal farming systems.

Low-carbon agriculture methods include:

- Small- and medium-scale irrigation and improved local water access/use (e.g. drip irrigation)
- Use of climate-resilient crop varieties
- System of Rice Intensification and integrated farming systems
- Crop insurance and weather forecasting
- Improved access to quality inputs such as fertiliser to increase productivity, techniques and seed

5. Summary

Given the central importance of agriculture, particularly rice, for rural livelihoods in Cambodia and national economic development, any impacts on production will have far-reaching implications, most notably for the poor. Even with rising levels of production and rice exports (RGC 2010), the number of people considered food-insecure remains high. In this regard, climate change will have a huge impact on rural livelihoods. To cope with climate change, farmers' ability to make decisions and their confidence need to be strengthened through provision of appropriate technology, skills and information support and strengthening of their access to key assets, most critically, land and water. Ultimately, this also requires a more effective, participatory mechanism for planning and management of land and water resources.

In the wake of the global food crisis of 2008, Cambodia hopes to replicate the successes of Thailand and Viet Nam in exporting rice bringing 'white gold' even more prominently into national development policies.