

# Financing Sustainable Agriculture Under Climate Change

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## Abstract

Agriculture is facing great challenge in meeting global food security and is expected to face even greater challenge under climate change. The overall goal of this paper is to examine how finance can be used to achieve the joint objectives of development, mitigation of and adaptation to climate change in agriculture in developing world based on literature review. The results show that agriculture is much under invested and foreign aid also has not increased appropriately to assist developing countries to maintain sustainable agriculture under climate change. There are a wide range of areas in mitigation of and adaptation to climate change that need substantial investment. Major areas and successful cases mitigation of and adaptation to climate change in agriculture that have worked in developing countries are examined. A list of areas that have worked, could work and be scaled up or transferred is identified and discussed. This study concludes that mainstreaming agricultural mitigation and adaptation into agricultural development programs, enhancing local capacity, and considering different stakeholders' needs are major experiences for successfully financing sustainable agriculture under climate change.

**Key words:** finance, climate change, agriculture, developing countries

## INTRODUCTION

Hundreds of millions of people have been suffering from food insecurity and hunger. The total number of undernourished people in the world reached 925 million in 2010 (FAO 2010b). Most of the world's hungry live in developing countries. Moreover, the global food security is likely facing even greater challenges in the coming decades. According to FAO's estimates, the global food production must increase by 70% in the first half of this century to meet the growing food demands of a world population that is expected to surpass 9 billion in 2050 (FAO 2009). However, the growth of agricultural productivity has

been falling. For example, average annual growth rate of cereal yield has decreased from about 2-3% in the 1970s and 1980s to 1-2% in recent decade (World Bank 2007).

Agriculture and food security may even face more challenges under climate change. By 2050, it is projected that developing countries may experience a decline of between 9 and 21% in overall potential agricultural productivity as a result of global warming (FAO 2009). In addition to the long term change of climate, global and regional weather conditions are also expected to become more variable than at present, with increases in the frequency and severity of extreme events (IPCC 2012). Such long term climate change and extreme weather events will bring greater

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fluctuations in crop yields and local food supplies and higher risks of food insecurity (FAO 2009; IPCC 2012), particularly in developing countries such as China (Holst *et al.* 2013; Wang *et al.* 2013).

To what extent the impacts of climate change on agriculture will highly depend on whether such impacts can be countered by investments in agriculture. Even ignoring climate change, the required amount of investment in agriculture in developing countries will be tremendous and must be greatly increased to address the food insecurity issues (FAO 2009). Considering climate change, it is expected that much more additional efforts are needed in the coming decades.

However, investment in agriculture is not promising. It is estimated that the current investment and commitment to invest fall far short of the requirements which are necessary to meet the growing needs, especially in the developing world (Islam 2011). In addition, there has been a decline in the share of the agricultural sector in the foreign aid. For example, while the share of aid to agriculture in total aid increased from 13.0% in 1973-1975 to 23% in 1979-1981, it has started to decline continuously since mid-1980s (Table 1).

The international community has called for incorporating climate change adaptation into national development plans (World Bank 2010a). In the food and agriculture sector, IPCC (2012) and FAO (2007) has highlighted some practices for adaption to climate change. However, all those adaptations need large amount of investment to implement in developing countries on the ground.

While agriculture is the most sensitive and vulnerable sector to climate change, it is also one of major contributors of greenhouse gas (GHGs)

emissions (IPCC 2007b). Projections indicate that these emissions will increase if agricultural development will be continued under a 'business-as-usual' model. According to the data released by IPCC, agriculture accounted for 13.5% of global GHGs in 2004 (IPCC 2007b).

Mitigation and adaptation, however, obviously need investment. Recently, with rising awareness of consequence of climate change, while climate change is likely to approach international and national action plans, the design and implementation of effective mitigation and adaptation strategies in agriculture is still at its infancy. The measures to implement the plans and actions are not clear. A series of questions need to investigate. How agricultural mitigation and adaptation plans could be funded (including both domestic finance and foreign aid)? What kind of financing in agricultural mitigation of and adaptation to climate change has been shown to be worked well in real world? What are the programs that have not work well but could work with appropriate improvement? And what finance practices are scalable (be scaled up in the same region) and transferable (be successfully transferred from one region to other regions)?

The overall goal of this paper is to examine how finance can be used to achieve the joint objectives of development, mitigation and adaptation in agriculture in developing world. The analysis is based on a literature review of overall finance and successful finance practices. As a review paper, the primary limitation to this approach is that the financial mechanism and the effects and scales of finance programs can not be explicitly examined because there is little information related to these issues in the literatures. The paper is organized as follows. The next section provides overview of financing

**Table 1** Average annual bilateral and multilateral agricultural and total aid<sup>1)</sup>

Aid	1973-1975	1979-1981	1991-1993	2000-2002	2003-2005	2006-2008
In US\$ billion (constant 2007 price)						
Bilateral agriculture commitments	3.4	6.7	5.4	3.0	4.0	3.4
Multilateral agriculture commitments	2.1	4.7	2.4	2.0	2.3	2.1
Bilateral plus multilateral agriculture commitments	5.5	11.4	7.8	5.1	6.3	5.5
Total aid to all sectors	42.5	50.5	69.7	92.9	104.8	42.5
In percentage (%)						
Bilateral agriculture commitments	7.9	13.2	7.8	5.4	3.3	3.8
Multilateral agriculture commitments	5.0	9.3	3.4	2.8	2.2	2.2
Bilateral plus multilateral agriculture commitments	12.9	22.5	11.2	8.1	5.4	6.0
Total aid to all sectors	100	100	100	100	100	100

<sup>1)</sup>Sources: OECD/DAC and OECD/CRS, various years. Cited from Islam (2011).

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