Climate-smart agriculture as a guiding principle for agricultural transformation

Extreme weather and other events associated with climate change represent additional challenges to the agricultural sector in developing countries and global food security. To address these issues, the agriculture sector will need to undergo significant transformation. Science has a pivotal role to play here in providing evidence of claims, trade-offs and synergies (Neufeldt 2013) to underpin appropriate policy and planning responses, and to identify innovations that can scale up to help make the transition to a climate-smart agriculture. For this to work successfully, however, it also means working at different levels (i.e., global, regional and national) with a wide range of stakeholders.

What is climate-smart agriculture and how can it help transform the agriculture sector and increase food security? Climate-smart agriculture (CSA) is concerned with moving the agriculture sector forward in order to achieve sustainable development (economic, social and environmental), while at the same time addressing food security and climate challenges. It is built on three main pillars (FAO 2013):

1. sustainably increasing agricultural productivity and incomes;
2. adapting and building resilience to climate change;
3. reducing and/or removing greenhouse gases emissions (GHGs), where possible.

Integrating climate change considerations into agricultural development planning provides a good entry point for the CSA approach. CSA is not based on a single technology or practice, rather, it requires site-specific assessments to be able to identify suitable agricultural technologies and practices (FAO 2013). For example, identifying climate-inclusive agricultural policies aimed at sustainable development with low vulnerability to climate change and low carbon emissions is part of what CSA is all about. It involves linking these priorities and stresses the importance of climate change as a driver of change for agriculture and at the same time acknowledging the role of agriculture as a driver of climate change (Verhagen 2014).

Not surprisingly, the word 'smart' in CSA refers to evidence-based agricultural development processes for short- and longer-term planning. To illustrate the role that CSA can play in increasing production in the face of climate-related challenges, a case study on growing potatoes in Ethiopia is presented.

Making agriculture more climate smart

Farmers are central to the attainment of CSA goals, so it is important to link and integrate these goals with farm-level activities. The enabling environment in which farmers operate is not limited to local conditions but can extend to regional, national governance, institutional arrangements, access to finance, technology and knowledge. The identification of local, national and regional barriers to adoption is critical, as they will determine the success of the options used.

In a short study focusing on farm-level intervention for CSA in potato production systems, a simple four-step framework was used (Figure 1). The first step of the framework aims at understanding the current situation including the development priorities; the second step focuses on the identification of management options that serve CSA goals. The next two steps of the framework address higher-level barriers and the strategies needed to overcome them. These last two steps require a good understanding of the socio-economic, institutional and political environment in which farmers operate. It is only when the barriers are addressed through appropriate strategies that the earlier identified management options may become available to farmers.

Case study on growing potato in Ethiopia

Potato is an important global food crop, with a large untapped potential for improving nutrition security. The production of potato has increased dramatically in developing countries in the past two decades, and has now overtaken that in the developed world (Birch et al., 2012). In a recent study, researchers from Wageningen UR looked at specific potato growing areas in three countries with different environmental and socio economic conditions: South Africa, Ethiopia and the Netherlands. For farmers, the key objective was to be able to earn a living from the production of potatoes, so their main priority was to increase productivity regardless of the challenging climatic conditions.

Despite uncertainties in climate change scenarios, the anticipated impacts of climate change in Ethiopia are expected to be a shorter and drier growing season. This change will require adaptations in the current farming system in the Rift Valley (Ethiopia), such as the introduction of irrigation. This adaptation will result in a fundamental change in the potato production system as this will allow potatoes to be produced during the dry season. If water resources are available and used with care, such a transformation

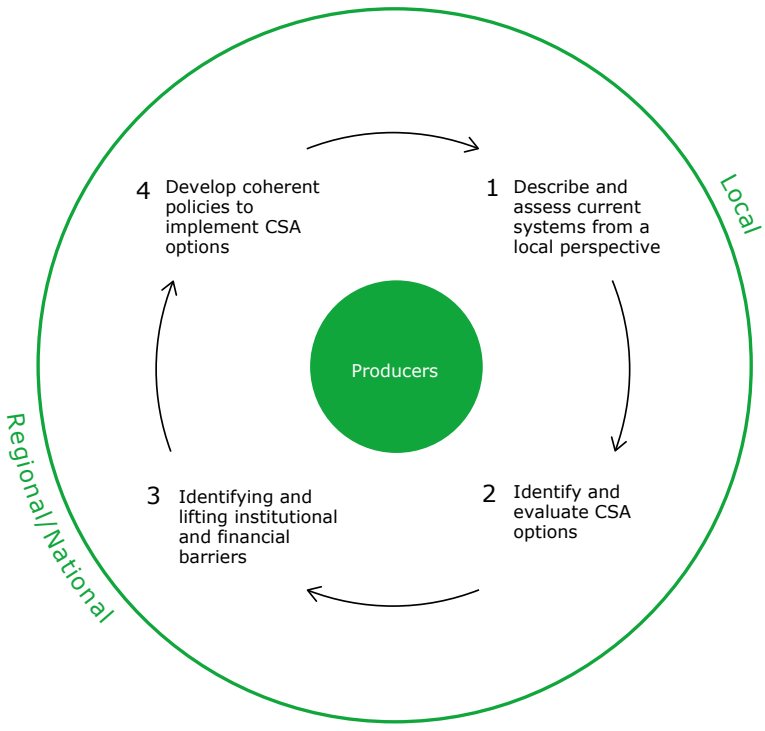

Figure 1 Simple 4-step CSA framework

of the potato production system could potentially create synergy. For example, less pests during the dry season could result in higher potato yields than in the wet season. However, there are also potential trade-offs such as the increased use of scarce water during the dry season and increased energy needed for irrigation.

Further, the potential of potato production to contribute to mitigating climate change is not expected to be significant. This can be attributed, in part, to the roughly 80% biomass harvested (for cereals this is about 50%), as well as due to the fact that the soil is loosened during the planting and harvesting of the tuber, making the accumulation of carbon in the soil difficult.

There are big yield gaps in the Rift Valley and attempts to reduce these will inevitably result in trade-offs among CSA attributes. To increase potato productivity in the Rift Valley, considerably more (fossil) energy-demanding inputs will be required such as (nitrogen) fertilisers, pesticides, energy, which will increase GHG emissions per unit of land. The challenge, therefore, will be how to achieve higher potato yields in combination with lower GHG emissions per unit of produce.

Many farmers just do not have the 'know-how' to improve their agricultural practices and are too poor to invest in irrigation schemes and crop breeding and to get access to the inputs they need. The adoption of the identified CSA options requires an enabling environment that includes institutional, technical and financial support from government and the private sector. The main contribution of CSA is that long-term thinking on productivity, adaptation and mitigation goals becomes an explicit and integrated component of sustainable intensification of agriculture which allows for higher scale interventions that help farmers to move forward.

References and further reading materials

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