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TRANSFORMING LIVES AND LANDSCAPES
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Policybrief

Making climate-smart agriculture work for the poor

This brief focuses on the challenges in making climate-smart agricultural production work for the poor, who will be the most vulnerable to climate impacts. It offers recommendations to overcome constraints, as even small management changes can have significant income and livelihood benefits.


Photo ©Michael Goldwater

What is climate-smart agriculture?

Agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes greenhouse gases (mitigation), and enhances achievement of national food security and development goals.

Food and Agriculture Organization of the United Nations

Constraints	Recommendations
Food insecure farmers find it hard to innovate and invest in better management systems when they are fully occupied finding sufficient food to survive.	Development and climate finance programs must focus on improving livelihoods and income so that there is incentive for smallholder farmers to invest in climate-smart agriculture.
Many climate-smart agricultural practices incur establishment and maintenance costs and it can take considerable time before farmers benefit from them.	Combining practices that deliver short-term benefits with those that give longer-term benefits can help reduce opportunity costs and provide greater incentives to invest in better management practices.
Access to markets and capital are key constraints for resource-poor farmers, and limit their ability to innovate and raise their income.	National agriculture development plans with appropriate institutions at national to local levels, provision of infrastructure, access to information and training and stakeholder participation and, last but not least, improvement of tenure arrangements are necessary for long-term transformation towards sustainable intensification and management of resources.

The need to transform agriculture

By 2050 approximately 70% more food will have to be produced to feed growing populations, particularly in developing countries [1, 2]. Agriculture is already causing increased conversion of lands and placing greater pressure on biological diversity and natural resource functions than ever before [3, 4]. As climate change causes temperatures to rise and precipitation patterns to change, more weather extremes will potentially reduce global food production [5, 6].

Agriculture is rapidly evolving to address these drivers of change, for instance through irrigation, fertilizers and the provision of better germplasm for higher productivity and improved products [7]. In many less developed parts of the world, increased production has occurred through the expansion of agricultural lands rather than through intensification [8]. At a global scale, both intensification and extensification are currently having a significant negative effect on the environment; depleting the natural resource base upon which we rely [3, 4]. The need to reduce the environmental impacts while increasing productivity requires a significant change in the way agriculture currently operates [7, 9].

'Climate-smart agriculture' has the potential to increase sustainable productivity, increase the resilience of farming systems to climate impacts and mitigate climate change through greenhouse gas emission reductions and carbon sequestration [10].

It's all about scale

Climate-smart agriculture can have very different meanings depending upon the scale at which it is being applied. For example, at the local scale, it may provide opportunities for higher production through improved management techniques such as more targeted use of fertilizers. At the national scale it could mean providing a framework that incentivizes sustainable management practices. And at the global scale it could equate to setting rules for the global trade of biofuels. It is not clear how actions at one scale may affect the others.

For smallholder farmers in developing countries, the opportunities for greater food security and increased income together with greater resilience will be more important to adopting climate-smart agriculture than mitigation opportunities. For intensive mechanized agricultural operations, the opportunities to reduce emissions will be of greater interest.

Opportunities for climate-smart agriculture to mitigate climate change, improve resilience to climate impacts and increase food security/ livelihoods

Table 1 shows just some of a range of practices that are consistent with climate-smart agriculture in smallholder systems as well as in line with the AU-NEPAD Agriculture Climate Change Adaptation-Mitigation Framework [11]. While most of these are applicable to all regions and climates of the tropics and subtropics, some practices are more appropriate to humid conditions (e.g. rice management), to drylands (e.g. grassland restoration, drip irrigation or to slopes (e.g. terraces, contour planting).

All the practices shown in Table 1 address food security and lead to higher productivity, but their ability to address adaptation and mitigation varies. In most cases food security improvements will also raise the adaptive capacity of farmers, but there can be trade-offs between adaptation and mitigation goals. For example, if not carefully planned, the production of biofuels could lead to competition with crop production and negatively affect adaptation and food security [12].

Constraints

Many climate-smart agricultural practices can be integrated into a single farming system and will provide multiple benefits that can improve livelihoods and incomes. However, there are practices that cannot be integrated because they impact upon other elements of the farming system. For example: the timing of a practice may lead to labour constraints; high investment or maintenance costs may exceed the capacity of asset poor farmers; and competition for crop residues may restrict the availability of feed for livestock and biogas production. Identifying these constraints is important to developing economically attractive and environmentally sustainable management practices that have adaptation and mitigation benefits.

Photo ©P. Charlie Pye-Smith

.'A farmer in Kenya using an improved feed strategy known as 'cut n carry

Table 1. Climate-smart practices useful in smallholder agricultural production

Crop management	Livestock management	Soil and water management	Agroforestry	Integrated food energy systems
• Intercropping with legumes • Crop rotations • New crop varieties (e.g. drought resistant) • Improved storage and processing techniques • Greater crop diversity	• Improved feeding strategies (e.g. cut 'n carry) • Rotational grazing • Fodder crops • Grassland restoration and conservation • Manure treatment • Improved livestock health • Animal husbandry improvements	• Conservation agriculture (e.g. minimum tillage) • Contour planting • Terraces and bunds • Planting pits • Water storage (e.g. water pans) • Alternate wetting and drying (rice) • Dams, pits, ridges • Improved irrigation (e.g. drip)	• Boundary trees and hedgerows • Nitrogen-fixing trees on farms • Multipurpose trees • Improved fallow with fertilizer shrubs • Woodlots • Fruit orchards	• Biogas • Production of energy plants • Improved stoves

Innovation and food security

There is a distinct negative relationship between the number of food deficit months and the innovativeness of small farmers [13]. Food security and innovation can both be seen as broad proxies for farmers' abilities to cope with climate-related shocks, input constraints, access to assets and markets, and changes to their lifestyles.

Whether more innovative farmers are more food secure, or whether food insecure farmers simply cannot invest in new technologies was analysed in a 2011 study of 700 randomly chosen farm households across five sites in Ethiopia, Kenya, Tanzania and Uganda. Despite the wide range of livelihoods, climate and institutional settings across these sites, the findings show that both innovation and food security significantly influence each other.

The policy implications for each situation differ. If food security is dependent to some extent on the ability or willingness to innovate, it makes sense to look at the innovations that are already being made and identify the institutional arrangements and technical, management, capital, financing and market-relevant factors which allow for successful up-scaling [14]. If food insecure farmers are unable to innovate then safety nets such as cash, credits, insurance products or other goods, will be essential before they can make significant changes to their farming practices. This latter argument is supported by poverty dynamics research in the region [15, 16, 17].

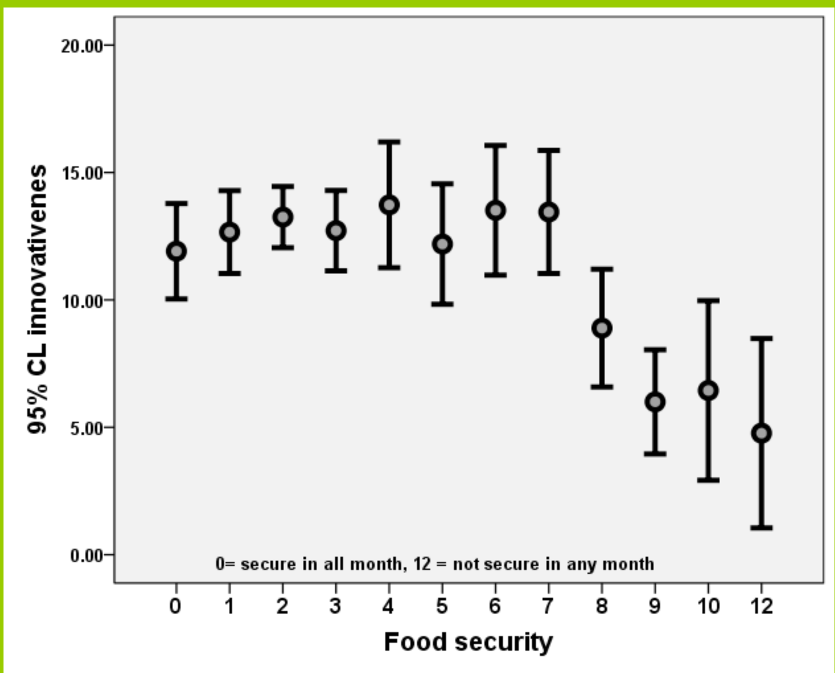

Figure 1. Relationship between innovativeness (number of farming system changes) and household food security (number of food deficit months). Error bars indicate the 95% .confidence interval of the mean

Case study: farmer climate coping strategies

In her work, Thorlakson[17] identified that smallholder farmers in western Kenya are aware that their climate coping strategies are not sustainable because they are forced to rely on actions that have negative long-term repercussions. These include eating seeds reserved for planting, selling assets (livestock, tree poles etc.) at below market value, or building up debt in order to survive (Table 2).

Farmers in the study believe the most effective way to adapt to climate-related shocks is through improving their general standard of living. Interviews with food insecure and food secure farmers showed that poorer farmers were not investing in agroforestry or other improved management practices because they were entirely focused on activities related to improving their household's food supply. Food secure farmers, however, discussed goals related to children's education, expansion of land holdings and other long-term investments.

Similar results for China show that the opportunity costs for land are much higher for smallholder farmers than those with larger areas of land. Large-scale farmers took only 1 year after introducing improved grazing management practices to achieve net positive incomes. In contrast, small-scale farmers took 10 years to achieve similar results [18].

Table 2. Climate coping strategies in Lower and Middle Nyando during 2009 drought and 2010 flooding. Middle Nyando farmers are on the whole more food secure than their Lower Nyando counterparts.

	Consume seeds	Reduce meal quantity or quality	Sell assets or livestock	Borrow money	Help from Gov., NGO, church	Community or family support	Casual labor	Children attend school less
Lower Nyando	72%	85%	72%	32%	42%	30%	28%	38%
Middle Nyando	61%	38%	40%	37%	18%	23%	25%	13%

Photo ©P. Valter Ziantoni

A woman cooks on a traditional wood stove. Improved stoves can significantly reduce the demand for fuel wood.

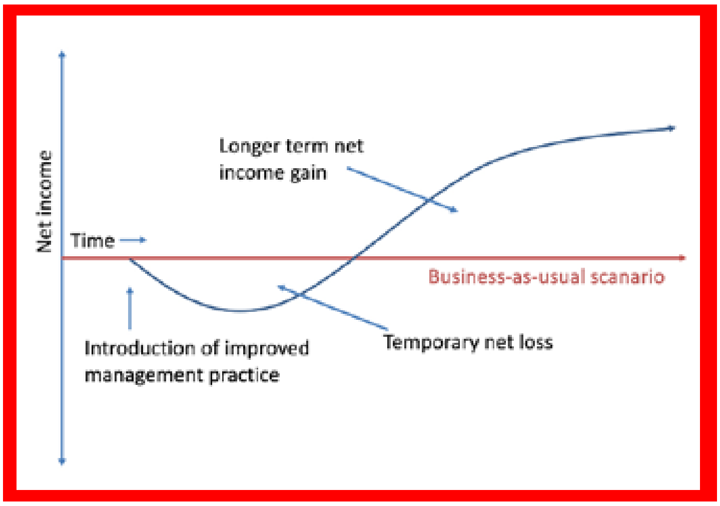

Figure 2: Short term income losses often inhibit smallholders from investing in management practices that provide long term benefits. (Schematic not drawn to scale.)

What should be done to overcome the challenges to introducing climate-smart agriculture?

Provide an enabling legal and political environment with an overarching national plan, appropriate institutions and effective and transparent governance structures that coordinate between sectoral responsibilities and across national to local institutions [4, 7, 10, 19].

Improve market accessibility to enhance income-generating opportunities provided by agroforestry. This can be done through improving infrastructure or more locally through establishing cooperatives that pool resources to access markets. As shown above, one of the most effective ways to reduce a farmer's vulnerability to climate change is through improving their income. In comparing benefits derived from agroforestry in Kenya, Thorlakson [17] found that market access played a key role in improving household incomes.

Involve farmers in the project-planning process. Farmers' input should be used to ensure development projects target what is most relevant to local communities and be designed to accomplish agreed goals in the most effective way within the local context.

Improve access to knowledge and training. This has been shown to significantly improve farmers' willingness to plant more trees for multiple purposes [20]. Kiptot [21] showed that farmer to farmer dissemination provides a potential alternative mechanism for the spread of agricultural technologies and Thorlakson [17] demonstrated that educational farm visits to successful management practices can increase adoption rates.

Introduce more secure tenure. This can have a significant effect on farmers' willingness to invest in their land and improve productivity. Norton-Griffiths [22] showed that among smallholder farmers in Kenya, net returns on adjudicated land was approximately three times higher than on unadjudicated land where tenure is less secure. Investments in crop diversity, improved livestock and fodder crops, agroforestry and soil conservation were all substantially higher on more securely tenured land.

Overcome the barriers of high opportunity costs to land so that smallholder farmers can improve their management systems. This is a key requirement for successful implementation of climate-smart agriculture in developing countries and to-date it has been given little attention. Many improved management practices provide benefits to farmers only after considerable periods of time. This can be inhibitive to poor households because investing in new practices requires labour and incurs costs that must be borne before the benefits can be reaped (Figure 2). Pairing short-term with longer-term practices may overcome some of the timing constraints.

Improve access to farm implements and capital. Payments for carbon sequestration may be an appropriate way of covering the time lag between investing in climate-smart practices and obtaining the environmental and economic benefits. Currently only Plan Vivo provide activity-based ex-ante payments for terrestrial carbon sequestration [23]. Other financial instruments, such as microcredits or index insurances, could provide the necessary funds or minimize risk to overcome these investment gaps.

Photo ©Charlie Pye-Smith

Cattle grazing - CPS Tanzania

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