Leveraging climate-smart agriculture
to address climate risk in Africa

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Africa has been identified as the region most at risk of climate change
due to its high dependence on natural resources and rainfed agriculture.
Current climate-related stressors such as drought, floods, rainfall
variability, coupled with low adaptive capacity, make African countries
highly vulnerable to future climate change.

In addition to climate change, other global forces
(or megatrends) currently underway will exacerbate
the challenges African countries face in transforming
their economies. These megatrends include
demographics, urbanisation and technology and
innovation. **Demographic trends will double Africa’s
current population to 2.4 billion by 2050**, putting
pressure on the supply of natural resources such as
food, water, energy and ecosystems. While these
megatrends will present formidable challenges to
African transformation, they also offer opportunities
that could be leveraged to achieve sustainable and
inclusive growth. For example, concepts such as
climate-smart agriculture could be used to help
smallholder farmers adapt to climate change and
at the same time mitigate greenhouse gas (GHG)
emissions.

**What is climate-smart agriculture?**

Climate-smart agriculture (CSA) is a new approach
to farming that aims to achieve three goals
simultaneously, referred to by the FAO as the **‘triple win’**. These are: (i) sustainably increasing agricultural
productivity and incomes; (ii) adapting and building resilience to climate change; and (iii) reducing and/
or removing greenhouse gas emissions in order to
meet national food security and development goals.
CSA builds on earlier paradigms such as **sustainable intensification** (SI). SI was introduced to address the
shortage of arable land by increasing agricultural yields
without adverse environmental impact and without the
conversion of additional non-agricultural land.

An important feature of CSA is the use of technology
and improved agronomic practices to increase
productivity on farms. Examples of this include the
use of new crop varieties that are tolerant to heat and
salinity and resistant to floods and drought. Another
example is the use of crop diversification strategies
and effective management techniques to improve
water and soil quality. CSA also allows for science-based
technology transfers, such as precision agriculture, to developing countries. Finally, CSA
goes behind agricultural practices and technology to
include enabling policies, institutions and financing
mechanisms to facilitate its uptake.

The third objective of CSA mentioned above
acknowledges that agriculture and land use change
are significant contributors to greenhouse gas (GHG)
emissions. For example, agriculture, forestry and
other land use contribute **24% of total anthropogenic
GHG emissions**, second only to the energy sector;
and African agriculture contributes about **15% of
global agricultural GHG emissions**, compared to
**13% for Europe and 25%** for the Americas.

**What challenges do African farmers face in adopting CSA?**

African smallholder farmers face numerous
constraints in trying to adopt CSA. Key amongst
them are the high costs and access to credit, access
to technology, technical know-how, temporary
trade-offs, risk and acceptability. Many CSA
interventions require upfront infrastructural or
technical investments such as fencing material and
irrigation equipment. With little access to credit,
most smallholder farmers cannot afford to implement
CSA options. Adoption of CSA by smallholders may also be constrained by lack of or poor access to CSA technology. In most cases, this is in the form of limited physical access to seeds of improved crop varieties. Implementation of some CSA practices demand relatively high levels of technical knowledge, which may be a powerful deterrent to adoption, given that smallholder farmers tend to have low levels of educational attainment and lack access to adequate extension services.

Some CSA investments may require trade-offs to be made in the short term in order to achieve medium- or longer-term benefits. An example is losing access to a piece of land while waiting for certain cash crops to produce harvestable yield. In light of financial pressures, some farmers may be unable to forgo income while waiting for the benefits to materialise. Another example of a trade-off is crop residue management, which competes with livestock forage. In areas with high rainfall variability, farmers may be unwilling to invest in CSA technology (e.g. improved seed varieties) due to the risk of economic losses if rain is delayed or the level is inadequate. Finally, cultural norms and practices may make some forms of CSA not acceptable to local communities. Examples include practices that may affect communal grazing governance or the existence of weak land tenure arrangements.

One of the biggest constraints to the adoption of CSA, especially with respect to the mitigation function, is the public goods nature of climate change. CSA requires smallholders, who generally have a small carbon footprint, to undertake climate mitigation actions at some cost while the full benefits will not accrue to them. Therefore, there may be a financial disincentive to implement some CSA options. This public goods argument is a justification for providing government subsidies to smallholders to purchase inputs for CSA and to improve access to insurance.

How can the challenges be addressed?

Modern information and communications technology could be leveraged to enhance the adoption of CSA practices. As discussed earlier, poor access to credit is one of the main factors that deter farmers from adopting CSA. Several reasons have been advanced to explain why the supply of credit to the smallholder agriculture sector falls far short of the demand. However, the main challenge for banks has been the high transaction costs of financing smallholder farmers by mobilising savings from numerous micro-investors. With the advent of internet and mobile technology, crowd-funding and mobile-based finance have the potential not only to mobilise funds from a wider creditor base, but also to provide financial services at cheaper prices to numerous smallholder farmers. In this area, African governments can partner with the private sector to provide financial services to farmers.

As indicated above, climate risk is a major deterrent to the adoption of CSA in Africa. Therefore, improving smallholder access to affordable insurance products would assist with CSA uptake. This is an area where technological innovation offers a number of opportunities. For example, recent advances in satellite and data analysis can be used to design viable insurance products for smallholder farmers. Recently, insurance products based on an index such as rainfall or vegetation that is closely related to agricultural production loss, have been developed. These products avoid the need to carry out field visits following climate shocks and concomitantly reduce the transaction cost of providing insurance services. Such products are relatively new and in need of further refinements to make them more effective. Further advances in satellite and data analysis would help to design index-based insurance products that are very closely related to agricultural production losses. This would also help to increase credit supply to smallholder farmers by lowering the perceived default risk.

Mobile technology can also be used to provide realtime data on markets and climate to help farmers make better production and marketing decisions. Such digital innovation can also facilitate the use of CSA options such as precision agriculture, to improve irrigation and chemical fertilizer efficiency.

New business models such as carbon markets and impact investing also present opportunities to promote CSA. Carbon markets, which were introduced following the passage of the Kyoto Protocol, allow participants to trade emissions under cap-and-trade schemes or with credits that pay for or offset GHG reductions. These markets provide a more efficient way of managing climate change than other instruments such as taxes and subsidies. Carbon markets can allow a company in Europe, for instance, to buy carbon credits from African smallholder farmers practising CSA if the company finds it cheaper to buy carbon credits than to reduce its carbon emissions. Access to finance from carbon markets could give smallholder farmers additional incentives to undertake CSA.

Similarly, impact investing—a business approach to achieve social and environmental objectives—could be leveraged to promote CSA. In recent years, non-
governmental organisations (NGOs), empowered by a growing number of philanthropists, have emerged as key players in addressing societal problems that appear to lie beyond the reach of governments and the private sector. Given the public goods nature of climate mitigation, there is an opportunity to source philanthropic funds from impact investors to support the adoption of CSA.

What is needed to promote the diffusion of CSA?

CSA recognises heterogeneity among farmers and regions in terms of socioeconomic and agro-ecologic conditions, which calls for application of a wide range of differentiated strategies, rather than uniform prescriptions. However, at present, there is a serious knowledge gap about the suitability of various CSA interventions. To promote CSA, there is need for location-specific research to determine which interventions are profitable, feasible and culturally acceptable, among other things. Such information would not only help to overcome the key adoption barriers in particular places, but also help to prioritise investments in CSA. Despite the knowledge gaps, appropriate information is already available for some CSA interventions that already fit in well within current farming systems and which for example, do not significantly increase labour demands and household risk.

In order to scale up CSA, there is a need to build new kinds of engagements and partnerships amongst smallholder farmers, the private sector and governments. The private sector can play a critical role in supporting risk-reduction and reducing the vulnerability of smallholder farmers. There is a need for massive investments in ICT to improve the availability and accessibility of climate information and help farmers integrate this information into planned production. Appropriate information products and technologies would also help bridge the gap between meteorological services that produce this information, farmers’ own knowledge and farmer needs. This would support smallholder farmers to respond to climate change and variability more effectively and in a timely manner. In addition to offering the opportunity to disseminate and collect information on a large scale, ICT also provides the infrastructure for developing and utilising the new partnerships (e.g. with the private sector). It can also be used to build farmers’ capacity through the learning and sharing of ideas and to introduce them to innovative approaches to support farm-level decision making.

The way forward

CSA has the potential to increase the resilience of African farmers to climate change, while contributing to increased productivity and climate change mitigation. For CSA to be successfully scaled up, there is a need for government initiatives to develop human capital and increase financial capital. The capacity of agricultural extension officers needs to be built up to enable them improve smallholder farmers’ training and skills in CSA. Given the public goods nature of climate mitigation, there is a strong case for governments to consider subsidies to purchase CSA inputs and for index-based insurance to manage climate risk.

However, such schemes need to be planned carefully in order to better target the beneficiaries and to reduce corruption and inefficiencies. African governments can increase financial capital through targeted resource mobilisation drives to promote CSA for sustainable development. Finally, political will on the part of African leaders is critically essential to the success of CSA, especially when it comes to needed institutional reform regarding legislation and resource mobilisation strategies.

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