

Integrating climate change into agricultural research for development in Africa

African agriculture is already struggling to keep up with population growth. Climate change, which will alter agroecological conditions and looks set to arrest and decrease agricultural yields on the continent, will make it even harder to achieve food security. Boosting agricultural productivity in Africa, especially in the face of climate change, cannot be achieved without the benefits of cutting edge science. Advances in technology development and transfer, capacity building and policy research must be harnessed by developing and disseminating relevant strategies and technologies, and improving policy environments. The European Initiative for Agricultural Research for Development (EIARD), which facilitates and coordinates European policy and support for agricultural research for development, must integrate climate change into its activities and ensure that agricultural research for development and climate change adaptation are not disjointed. This demands a more strategic and coordinated approach from the initiative — one that reflects African realities, responds to African priorities for adaptation and development, and makes the best use of limited resources.

Policy pointers

- **African agriculture faces** the dual challenge of being vulnerable to climate change and largely underfunded.
- **Agricultural research for development (ARD) in Africa** must consider the synergies and trade-offs in both adapting to and mitigating climate change, while boosting food security.
- **External funders of ARD** in Africa must ensure their efforts reflect national and sub-regional priorities, build on existing local initiatives and facilitate joint working on the continent.
- **Integrating climate change** into ARD in practice requires context-specific research that looks beyond technical fixes to consider socioeconomic factors.

A dual challenge for African agriculture

Climate change poses a major challenge to African agriculture. The vast majority of the continent's agriculture is rainfed, making it particularly vulnerable to changes in rainfall. According to the Intergovernmental Panel on Climate Change, land area suitable for agriculture, length of crop growing seasons, and yield potential — particularly along the margins of semi-arid and arid areas — are all expected to decrease.¹ These effects and others mean that national agricultural yields are likely to fall over the next 70 years (see Figure 1).

The second challenge to African agriculture is that agricultural research for development (ARD) receives little support from within the continent and elsewhere. Added to a growing number of people — Africa's population is expected to rise from one billion today to 2.1 billion by 2050 — under-investment in agriculture is sure to undermine the continent's impressive economic growth.

Agriculture supports more African people than any other sector, yet agricultural research is not prioritised by African governments. In the latter half of last century, investment in agricultural research across the continent fell, with annual growth rates in spending declining from two per cent in the 1970s to just 0.8 per cent in the 1990s. Excluding Nigeria and South Africa, total public ARD spending in Africa actually fell by 0.3 per cent each year in the 1990s. Spending per scientist has also declined considerably over the past three decades.²

In 2003, African leaders agreed, under the Comprehensive Africa Agricultural Development Programme (CAADP), to increase agricultural GDP by six per cent a year. But most countries have failed to reach that target, with annual growth rates remaining at less than three per cent.

This lack of investment in research for the development of Africa's agriculture means that the continent remains largely dependent on outside funding. In 2009, at a summit in L'Aquila, Italy, the G8 pledged US\$22.5 billion to support African agriculture, including US\$3.8

Boosting agricultural productivity in Africa cannot be achieved without cutting edge science.

billion from the European Commission and significant commitments from several other European donors.

To be effective, this money should target the sub-sector with the greatest potential to increase food security.³ This means investing in public good research to improve the livelihoods of African small-scale producers. Integrating climate change is essential because

smallholders are among the most vulnerable to its impacts.

Integrating climate change into African ARD

A first step in integrating climate change into African ARD is to improve our understanding of the changes in store. Although we know that climate change will have significant impacts on African agriculture, these remain poorly specified, with predictions varying in consistency, coherence and implications across the continent. For example, wheat yields are projected to increase in East Africa but decrease in Southern and Central Africa. We need to strengthen and better incorporate context-specific knowledge and information and move away from generic predictions based on models, which cannot, for example, consider the decision-making capabilities of farmers.⁴

African agriculture is vital to food security. In terms of the climate change context the central question is how can we adapt agriculture to cope with the changes ahead?

Agriculture's contribution to greenhouse gas emissions — 10–12 per cent globally — is gaining greater recognition, and its role in mitigating climate change is becoming more pronounced. As a result, processes to address agriculture in the wider context of climate change are emerging from international forums such as the Agriculture and Rural Development Days at UN climate conventions over the past two years.⁵

The truth is that both mitigation and adaptation are necessary to fully address climate change. These are closely related in agriculture, creating synergies as well as trade-offs between them and also with food security.

For example, there are links between agriculture, food security and reducing emissions from deforestation and degradation (REDD+) — especially in Africa, where deforestation enhances food production by opening up new land for cultivation.

Other agricultural mitigation options — such as better soil, livestock or manure management and improved rice cultivation — can also impact food production. For example, switching to organic fertilisers not only helps reduce carbon emissions but can also improve soils and thereby crop yields⁴.

A key question facing researchers, donors, policymakers and farmers alike is how the achievement of agricultural adaptation, mitigation and food security can be optimised in Africa. Research is needed to establish the best ways to combine adaptation, mitigation and food security objectives and outcomes.

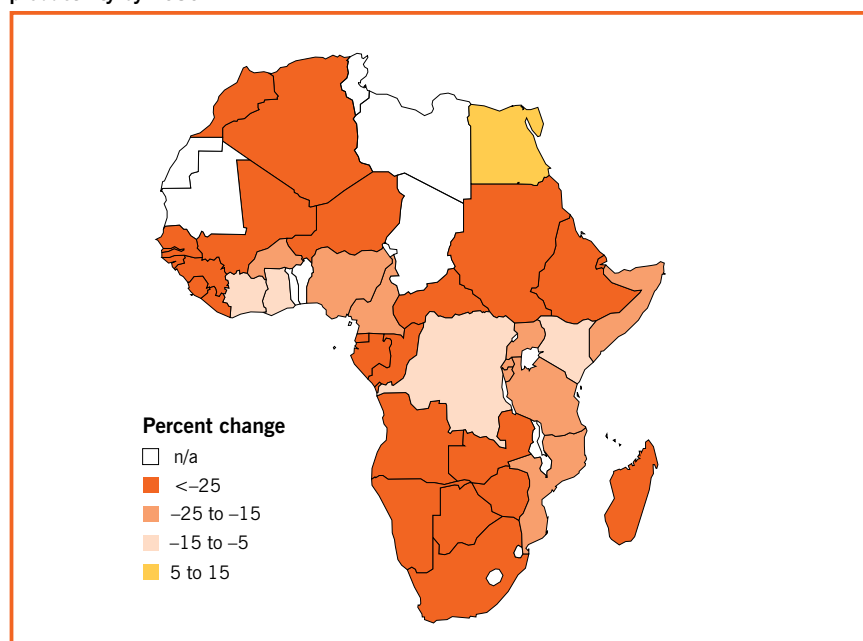
A harmonised approach

The funding shortage facing African national agricultural research and extension services (NARES) means they are forced to be priority 'takers' rather than 'makers'. The NARES more often respond to external funding opportunities than generating their own agendas. This makes it hard to establish coherent research policies and leads to a fragmented, and less effective, approach to integrating climate change into agricultural research.

To effectively support ARD that integrates climate change, EIARD must align its efforts with the relevant institutions, priorities and processes in Africa. This will help ensure that EIARD support addresses real needs on the ground and stimulates, or adds value to, existing agricultural research on the continent.

There are plenty of good entry points for building this harmonised approach, including many national research institutes, farmer organisations and others who are already looking at climate change and impact. Key organisations include CAADP, the Forum for Agriculture Research in Africa, the West and Central African Council for Agricultural Research and Development, the Association for Strengthening Agricultural Research in Eastern and Central Africa, and the Food, Agriculture

Figure 1. Impact of climate change (without carbon fertilisation effects) on African agricultural productivity by 2080.



Adapted from: Cline, W. R. *Global warming and agriculture: new country estimates show developing countries face declines in agriculture productivity.* Center for Global Development (www.cgdev.org).

and Natural Resources directorate of the Southern African Development Community.

Another good place to look when aligning external support with local priorities is the National Adaptation Programme of Action (NAPA). Twenty-two least developed countries in Africa have surveyed their own adaptation needs and collated them in a NAPA for submission to the UN Framework Convention on Climate Change.

These NAPAs provide insights into urgent investment needs and local adaptation priorities of the most vulnerable countries including agricultural adaptation and development support. Most of them identify 'knowledge sharing' as a key component of adaptation. Analysing the programmes can help identify the types of agricultural research that will be most relevant and useful.

The need to collaborate

Improving African agriculture for development is not a task for a single researcher, organisation or government. It will take the combined efforts of agricultural and climate change stakeholders. Implementing the agricultural components of NAPAs, and representing both supply and demand perspectives, requires similar collaboration.

EIARD — whose objectives include 'effective ARD collaboration between Southern organisations' — is well placed to join up efforts among agricultural organisations in Africa, but also to promote collaboration between agricultural and climate change organisations.

Indeed, given budget constraints in several EIARD countries, collaboration will be essential to increase effectiveness with limited resources. From pooling knowledge to joint monitoring and evaluation, there are many ways that EIARD members can collaborate.

And there's another reason for EIARD members to adopt collaborative approaches: to help the initiative achieve its goal to coordinate European positions on ARD through national agricultural research systems and regional and sub-regional research organisations.

Addressing climate change in practice

In the international arena, several organisations and conferences offer advice on what integrating climate change and ARD means in practice. The 2010 Hague conference on agriculture, food security and climate change — where the chair emphasised the need for close links between research, education and extension — is just one example. Among the conference's recommendations for achieving 'climate smart agriculture' on the ground were:

- linking indigenous knowledge with modern technologies;

- sharing experiences and innovative technologies;
- cooperating in training and developing human and technical capacities; and
- building multidisciplinary networks among research and knowledge institutions so that good practices can spread around the globe.

Another example of international efforts to integrate climate change and ARD is the research agenda of the Consultative Group on International Agricultural Research (CGIAR), which EIARD members have committed to support. This agenda includes a research programme on climate change, agriculture and food security, which aims to:

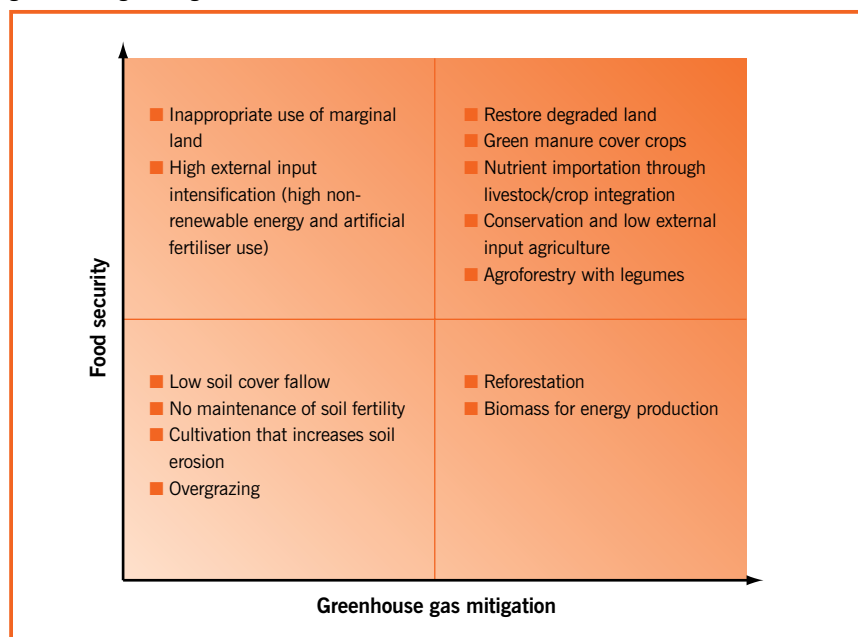
- identify and test pro-poor adaptation and mitigation practices, technologies and policies to improve food systems, adaptive capacity and rural livelihoods; and
- support, at all levels, the inclusion of agriculture in climate change policies — and of climate issues in agricultural policies — in a way that benefits the rural poor.

In 2011, the programme began activities in West Africa, East Africa and the Indo-Gangetic Plains.

Key to making these recommendations and aims work over the long term is the need to consider not only how climate change will affect agriculture but also how Africa is likely to develop over the coming decades, including rapid urbanisation and population pressure.

This implies that it is not enough for research to focus on finding technical fixes that can increase

Figure 2. Synergies and trade-offs of different agricultural practices for food security and greenhouse gas mitigation.



Adapted from: Food and Agriculture Organization of the United Nations. 2009. *Food Security and Agricultural Mitigation in Developing Countries: Options for Capturing Synergies*. Draft document for UNFCCC COP 15.

yields, control pests or secure water. It must also take into account the socioeconomic developments that will affect agricultural enterprises 30 to 50 years from now.

Similarly, research must consider the future of climate change. Will drought-tolerant crop varieties still tolerate the climate of 2050? We cannot afford 'maladaptation': whatever intervention we make today must not increase vulnerability in the future.

Perhaps most importantly, ARD must acknowledge the importance of changing contexts when it comes to climate change, agriculture and food security. The way climate change is addressed in agriculture will impact the potential of agricultural systems to improve food security and sequester carbon.

It is true that general synergies and trade-offs exist (see Figure 2). But it is also true that these depend on local context and will often vary by region and country. Integrating climate change into ARD requires support for context-specific research in regions and countries to answer questions such as how feasible sustainable intensification is within individual farms; that is, to investigate how we can meet food security goals while simultaneously adapting to climate change and reducing, or keeping stable, emissions.

Recommendations

African national agricultural research systems and other groups should:

- Identify national priorities for climate change and ARD investments, collating evidence from previous prioritisation exercises and assessments of climate

change effects on national development policy objectives.

- Determine the trade-offs and synergies associated with different mitigation and adaptation strategies and socioeconomic factors.
- Define the relative importance of ARD investments in climate change and food security, and the mitigation potential of agriculture.
- Test the effectiveness of technical approaches to 'climate-smart agriculture' across the diverse African agricultural systems.
- Identify the costs of, and limits to, adaptation within African agricultural systems.
- Support knowledge sharing and collaboration between farmers and research organisations, and the development of joint innovation for adaptation and mitigation.

EIARD members should:

- Invest in harmonising funding programmes and in joint evaluation and lesson learning on climate change and ARD in Africa to avoid the risks of fragmented and less effective research initiatives.
- Support African NARES to carry out the recommendations above.

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This briefing was commissioned by the European Initiative for Agricultural Research for Development (EIARD). EIARD promotes and implements coherent European policies at international, regional and sub-regional levels to increase the impact of agricultural research and development on poverty reduction, food security and sustainable management of natural resources in developing countries.

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- ¹ Thornton, P.K. *et al.* 2008. Climate change and poverty in Africa: Mapping hotspots of vulnerability. *African Journal of Agricultural Research and Extension*. 2 (1). ■ ² Beintema, N. M., Stads, G. J. 2004. Sub-Saharan African agricultural research: Recent investment trends. *Outlook on Agriculture* 33 (4) 239–246. ■ ³ IAASTD. 2009. *Agriculture at a Crossroads*. Synthesis Report. See www.agassessment.org/reports/IAASTD/EN/Agriculture%20at%20a%20Crossroads_Synthesis%20Report%20%28English%29.pdf ■ ⁴ Rosegrant, M.W. *et al.* 2008. *Climate Change and Agriculture: Threats and Opportunities*. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH Climate Protection Programme for Developing Countries, Germany ■ ⁵ See www.agricultureday.org/2010-12-05_ARDD2010_Summary-statement.pdf