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TEC Brief #4

Technology Executive Committee

Technologies for Adaptation in the Agriculture Sector

Photo: C. Schubert (CCAFS) - Edward Ouko's climate-smart farm site in Western Kenya.

Why this TEC Brief?

Agriculture represents the single most important sector in the economy of many low-income countries, and 75 per cent of the world's population is engaged in related activities (UNFCCC, 2006). In acknowledgement of the sector's vulnerability to climatic impacts (IPCC, 2014), countries have prioritised agriculture as a critical focus for climate change adaptation. Technologies are often highlighted as a crucial resource for ensuring effective adaptation in agriculture. Their role has been emphasised in the Fifth Assessment Report of Working Group Two of the Intergovernmental Panel on Climate Change (IPCC WGII AR5) (IPCC, 2014), and the agriculture sector has been prioritised by 84 per cent of Parties in their Technology Needs Assessments (TNAs) (UNFCCC, 2013).

The Technology Executive Committee (TEC) has recognised the need for appropriate policies to support countries in applying adaptation technologies to meet the objectives of the United Nations Framework Convention on Climate Change (UNFCCC). This brief has primarily been developed for policy makers within national and local government institutions. It draws upon lessons learned from various relevant experiences and provides recommendations for policy makers, incorporating consideration of the principles of effective adaptation (outlined in Section C-1 of the Technical Summary of the IPCC WGII AR5) and TNA recommendations for practitioners and policy makers (highlighted in the United Nations Environnent Programme's TNA Guidebook on Technologies for Climate Change Adaptation in the Agricultural Sector). Similarly, the water sector has been prioritised as a focus for policy development and a separate policy brief for this sector can be referred to for further understanding of the symmetries, co-benefits and integration between the two sectors.

Executive Summary

- This policy brief is intended for policy makers in national and local government institutions
- The brief addresses the application of adaptation technologies in the context of agriculture, highlighting lessons learned, identifying examples of agricultural technologies and their suitability, enablers and barriers, outlining the roles of stakeholders and offering recommendations for policy formulation.
- The contribution of agriculture to local and national economies, food security and sustainable livelihoods, requires successful and sustainable adaptation supported by appropriate technologies.
- Technologies in agriculture enhance resilience to climate change and can offer co-benefits of adaptation and mitigation.
- Experience has highlighted the need for collaboration, communication, and contextual appreciation to ensure that the technologies introduced are appropriate.
- Appropriate policies at multiple scales are needed to sensitise planners to consciously factor in climate change mainstreaming to ascertain that future agricultural practices sustainably support the growing global population in the face of a rapidly changing climate.

1 Technologies for Adaptation

The UNFCCC (2005) defines technologies for adaptation as “the application of technology in order to reduce the vulnerability, or enhance the resilience, of a natural or human system to the impacts of climate change”. Applying technologies for adaptation is a complex process that requires the integration of multiple issues, stakeholders and scales. The appropriate application of technologies demands consideration of the particular political, economic, social and ecological context. This process may include consideration of approaches, through which to link multiple factors, which could include: accounting for diversity and maximising co-benefits; promoting the employment, development and transfer of hard and soft technologies, including knowledge; and developing platforms for knowledge and sharing of experiences (UNFCCC, 2014d). In the context of technologies for adaptation in agriculture, it may involve identification and assessment of agricultural practices and technologies that enhance productivity, food security and resilience in specific agro-ecological zones and farming systems (UNFCCC, 2014a).

On the other hand, it has been also noted that poor planning, alongside failure to consider long-term outcomes, potential climatic change and adaptation limits can result in maladaptation or, “an adaptation that does not succeed in reducing vulnerability but increases it instead” (IPCC, 2001: 378).

In less developed countries, technological application is supported by various processes and institutional arrangements. Support on technology include Technology Needs Assessments (TNAs), which identify, prioritise and highlight technology needs, and Technology Action Plans (TAPs), which are developed on the basis of TNAs to address specific barriers, and identify targets, strategies, budgets and responsible stakeholders for prioritised technologies (UNFCCC, 2013). Examples of TAPs that specifically address agricultural technologies in-clude those of Cote D’Ivoire, whose TAP supports the increase of water-tolerant plantain and cassava varieties; Kenya, which prioritises the development of drought-tolerant sorghum varieties; and Sri Lanka, where the focus is on the diversification of crops and site-specific crop management. Global support in financing include financial provisions accessed from the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF), which prioritise the agricultural sector each allocating it over a quarter of their budgets (UN-FCCC, 2014c). These supports are strengthened through the work of the UNFCCC's Adaptation Committee, Technology Mechanism (including the TEC and the Climate Technology Centre and Network) and other bodies under the Convention.

In applying technologies for adaptation, the significant synergies, trade-offs and co-benefits with mitigation should also be considered. In the context of agricultural adaptation, co-benefits are exemplified through health benefits from improved energy use, reduced urban energy and water consumption achieved via greening and recycling activities, sustainable agriculture, and the protection of ecosystems and, consequently, the benefits derived from these ecosystems (IPCC, 2014). Such an example can be seen from the introduction of manually-operated pressure irrigation pumps in Africa, which raise living standards, support adaptation, and reduce greenhouse gas emissions, in comparison with use of fossil fuel-operated pumps (UNFCCC, 2014c). Another example comes from Bangladesh, where waste-to-compost projects aid adaptation by improving soil in drought-prone areas, whilst also contributing to mitigation through the reduction of methane emissions (IPCC, 2014).

Box 1. Complementarity of hard-, soft-, and org- ware

Technologies are often classified into three types: hardware, software, and orgware. In considering adaptation, it is important to understand the differences between these technology types, as well as their synergies and complementarities. Hard technologies, or hardware, refer to physical tools; soft technologies, or software, refer to the processes, knowledge and skills required using the technology; and organisational technologies or orgware, refers to the ownership and institutional arrangements pertaining to a technology (Christiansen et al., 2011, UNFCCC, 2014b). In the agricultural context, hardware is exemplified by different crop varieties, software by farming practices or research on new farming varieties, and orgware, by local institutions that support the use of agricultural adaptation technologies.

Whilst hard and soft technologies are often introduced in isolation, it has been recognised that their simultaneous integration with orgware is necessary for success in adaptation (Christiansen et al., 2011; UNFCCC, 2013; UNFCCC, 2014b). An example of technological innovation that includes all three types of technology can be found in the adoption of water harvesting technologies in the Sahel. In the early 1980s, farmers here developed methods of rehabilitating degraded land by improving soils in their traditional planting pits, known as zaï, which consist of hoeing small holes into the soil, into which farmers put small amounts of manure and plant sorghum and millet (Ouedraogo and Sawadogo, 2005). The pits concentrate water and nutrients precisely to where they are needed, and retain water for a long time, allowing plants to better survive dry spells and thus help to rehabilitate degraded land. The seeds or trees grown in the pits can be considered hardware, the practices around creating the pits and improving the fertility of their soil are software, and the farmer-to-farmer field schools used to share the information with thousands of farmers across the region represent orgware. Though all three technology types are necessary, there is a concern that hard technologies are currently prioritised and often employed in isolation (Christiansen et al., 2011; UNFCCC, 2014b). Countries require encouragement and assistance in implementing all three technology types in a mutually supportive manner, in order to ensure sustainable and effective application of technologies for adaptation in the agriculture sector.

2 Lessons Learned

Experiences gained from employing technologies in support of agricultural adaptation have illuminated some key lessons that can be drawn upon to enhance successful and sustainable implementation of technologies, and decrease the risk of maladaptation.

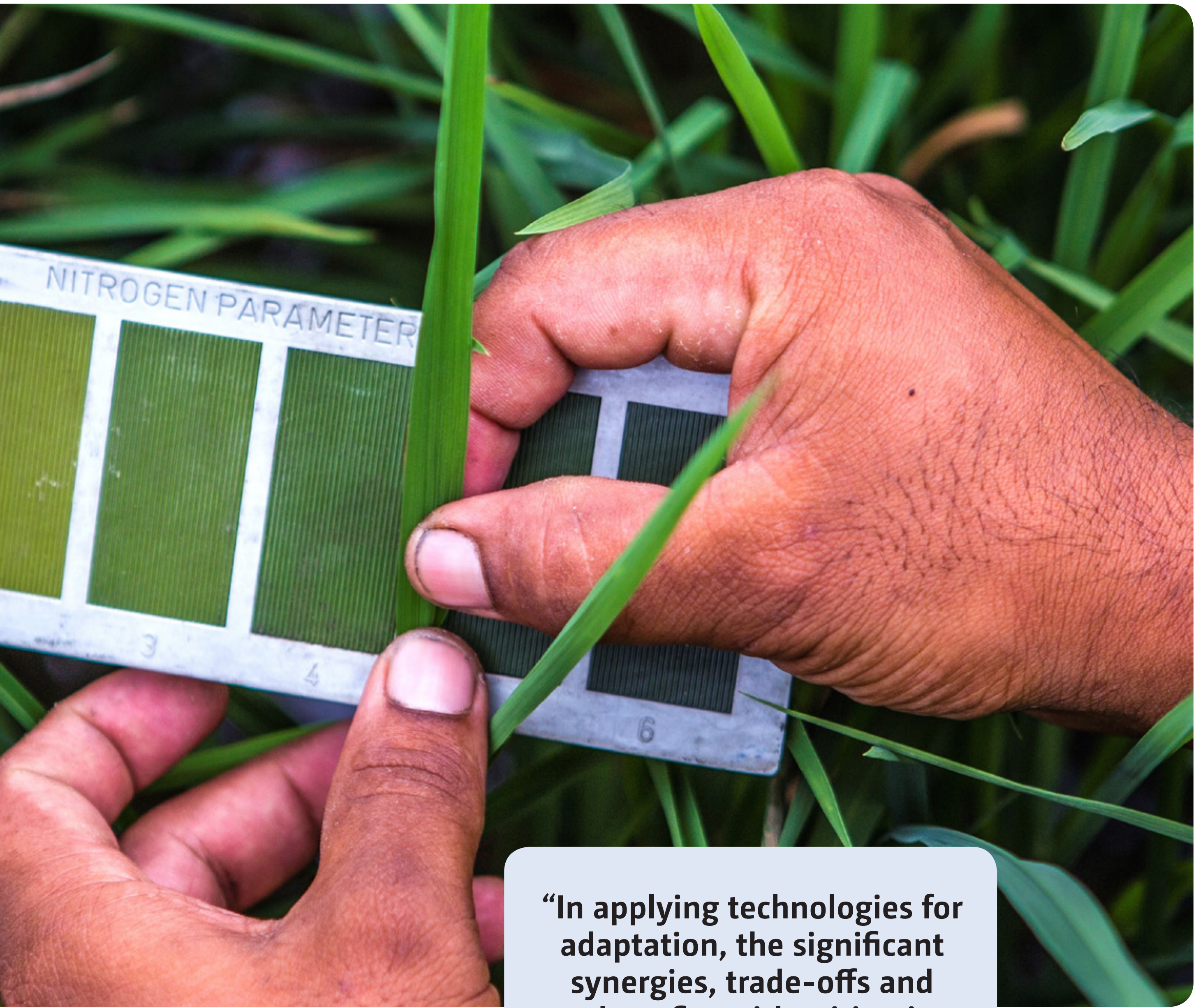
THERE IS A NEED TO MANAGE AGRICULTURAL RESOURCES WITH AN UNDERSTANDING OF ECO-SYSTEMS AND THE HUMAN COMMUNITIES THAT ARE PART OF THOSE ECOSYSTEMS.

Irrigation has been vital in transforming agricultural production, improving food security and reducing reliance on timely rainfall. Yet, the mismanagement of ecological systems in the context of irrigation can have severe consequences. An example of this comes from the extraction of water resources from the Aral Sea to support cotton irrigation (Glantz et al., 1993, Micklin, 2007). Here, mismanagement in the form of immense water diversions, poor irrigation construction and maintenance, and a disregard for longer-term outcomes, led to major over-extraction. Devastating economic, health and ecological impacts resulted, including restricted crop growth due to intense drying and salinity, destruction of fishery resources, pollution of water resources and critical health problems (Glantz et al., 1993, Micklin, 2007). Consequently, in implementing technologies, the multiple elements of the host ecosystem must be considered to identify ecologically and socially sustainable approaches. A good example of this is pastoralism in the case of drylands (Behnke and Kerven, 2013).

Photo: CGIAR - Climate Smart Villages in Karnal India.

BOTTOM-UP AND PARTICIPATORY APPROACHES CAN ENABLE THE REPLICATION OF LOCAL INNOVATIONS, ENSURING SUSTAINABILITY AND SUITABILITY TO LOCAL CONTEXTS.

Practices that employ bottom-up and participatory approaches, such as Community-Based Adaptation (see Box 2), enable user ownership of technologies and enhance stakeholder understanding. These outcomes contribute to sustainability and reduce the chance of mala-daptation. Participatory approaches encompassing different organisations allow in-situ testing of technologies to ensure contextual adaptation, validation and adoption by end users. An example of this approach comes from the consortium, Innova, who partnered with farmers in Bolivia to pilot new crop varieties. The group applied these varieties at different altitudes and subsequently adjusted seed use and cropping techniques, in order to ensure suitability to each context (Bentley and Thiel, 2008). They altered planting schedules and locations, and integrated traditional agricultural methods of irrigation and bed raising, to maximise yields and ensure sustainable approaches. This example indicates that by collaborating with the final users of a technology via flexible and continuous processes, the suitability, sustainability, and, subsequently, effectiveness of technologies, can be enhanced.



“In applying technologies for adaptation, the significant synergies, trade-offs and co-benefits with mitigation should also be considered.“

CONTEXTUALLY SENSITIVE MARKETING APPROACHES CAN ENCOURAGE THE USE OF NEW TECHNOLOGIES BY FINAL USERS.

Experiences have highlighted the need to secure user investment in agricultural adaptation technologies, which is often guided by the cultural perspectives and priorities of society and individuals. For example, the introduction of manually-operated water pumps for irrigation in East Africa was initially met with a lack of enthusiasm from the target farmers, who do not prioritise responses to climate change in their activities. Effective promotion, encompassing an understanding of the market and sensitivity to customer dynamics, achieved user engagement and eventual adoption of the water pumps (UNFCCC, 2014c). It is also apparent that less risk-averse users are more likely to adopt a technology and become ‘opinion leaders’ who ultimately encourage the wider community to adopt the technology as well (UN-FCCC, 2014b). The adoption of agricultural adaptation technologies can, therefore, be strengthened by strategic marketing approaches that are based on the values and priorities of the target audience.

Photo: CGIAR - Climate Smart Villages in Karnal India.

APPROPRIATE AND EFFECTIVE COMMUNICATION BETWEEN STAKEHOLDERS IS CRUCIAL FOR ENSURING THE SUCCESSFUL ADAPTATION, ADOPTION AND USE OF TECHNOLOGIES BY END USERS.

Effective communication between stakeholders is not only required in the development and introduction of technologies, but also throughout the ongoing use of a technology. In Lesotho, workshops, radio announcements and agricultural extension services are employed to transfer information from the Lesotho Meteorological Services to local-level farmers and institutions. Here, under-attendance at the workshop, limited radio announcements and agricultural extension officers' lack of knowledge about the forecast, meant that farmers received little of the original information and were therefore less able to respond (Ziervogel, 2004). As such, continuous assessment and improvement of communication methods should be undertaken. In addition, ongoing support for the end users should be provided to ensure informed and progressive problem-solving and, understanding, which may contribute to the sustainability of a technology.

KNOWLEDGE MANAGEMENT IS NECESSARY TO ENHANCE ACCESS TO NECESSARY INFORMATION AND KNOW-HOW INCLUDING THAT ON TECHNOLOGIES WORTH SCALING-UP.

Networks between stakeholders at various scales are often employed to ensure collaboration in collating, sharing and strengthening appropriate knowledge. The Climate Change Technology Transfer Centres in Europe and Latin America (CELA) focus on engaging the academic community, in order to improve quality in higher education institutions and to strengthen the capacity of these institutions to contribute to sustainable development and social cohesion, through research,

education, and technology transfer (see www.cela-project.net). The role of South-South transfer of technologies, including knowledge and know-how, is also crucial (UNFCCC, 2014b). Reflecting this need, international networks such as CANSA – Climate Action Network for South Asia: www.cansouthasia.net, often have a regional focus. Yet barriers to South-South knowledge transfer still are observed in areas such as data availability, information sharing and communication. There appears to be a lack of quality documentation and information sharing platforms, alongside political barriers, which hinder comprehensive communication. Opportunities for the incubation and practical application of technologies to address climate change exist with the emerging Climate Innovation Centres (CICs) in developing countries and, in particular, the CIC in Nairobi. In this context, it is necessary that knowledge management approaches for technology diffusion and transfer ensure equal access to information by all stakeholders, including those beyond the knowledge networks and CICs.

Box 2. Community-Based Adaptation

Community-Based Adaptation (CBA) aims to integrate consideration of local-level knowledge, barriers and enablers into the adaptation process through the identification of local knowledge, including technological innovations, and improvement and replication to ensure contextual suitability and local acceptance. Spreading local innovations requires coordination and collaboration between many different stakeholders, including governments, farmer groups, NGOs and local leaders. CBA is an ever evolving process, and whilst many projects have now been established, particularly in Asia and Africa, comprehensive monitoring and evaluation processes now need to be developed and applied to assess how effective attempts have been to date. An example of a successful technological innovation replicated through CBA processes comes from the development and replication of floating gardens in Bangladesh (see Table 1). This experience has highlighted the importance of engaging local government, including the extension system, to promote the technique and ensure access to the necessary water resources. Though the replication of this innovation has largely been considered a success, further research is required to investigate its long-term sustainability and health impacts. In many cases, factors, such as financial, cultural, natural or institutional barriers, or lack of information, limit the adoption of new and innovative approaches. As a long-term, adaptive and reflective process, CBA allows such barriers to be addressed in consideration of the specific contexts within which they are experienced.

Adaptation Technologies for Agriculture

The table below provides examples of some existing agricultural adaptation technologies, briefly highlighting their suitability, the enablers and barriers to their implementation and use, and an example of where the technology is being researched, developed or applied. Context-specific, cost-benefit analyses for these technologies are useful for considering their suitability, though there is much variation in the range of costs for each technology, which is determined by the diverse locations and, political, economic and social contexts of their application.

Table 1: **Enablers, barriers and examples of adaptation technologies for agriculture**

Adaptation Technology	Seasonal Forecasts	Water-Saving Irrigation	Resilient Crop Varieties	Farmer-led Sustainable Agriculture
Suitability of the Technology	For supporting agricultural and relevant planning decisions and early warning for preparedness	For tackling farmer vulnerability to the effects of drought and variable rainfall patterns	For enhancing crop resistance to a variety of stresses such as water and heat stress, salinity and new pests; for food security	For ensuring farmer ownership and sustainability of agricultural techniques in context
Enablers	Effective stakeholder collaboration; access to information and comprehensive communication approaches that engage all stakeholders and target audience	Context-aware planning, management and governance; multi-stakeholder collaboration; application in areas that rely on rain-fed agriculture; accessible and ongoing troubleshooting support	Institutional engagement in policy dialogue to speed up process and access; in-situ testing with flexible, bottom-up cropping methods; affordability for intended users	Comprehensive farmer engagement; use of locally available resources; local applicability; policy support to encourage diffusion; CBA to ensure ownership of technologies
Barriers	Communication barriers including channels used, language and literacy issues; understanding and awareness of technology	Availability of water resources; soil type; top-down site governance and management; opportunity costs & cost effectiveness of irrigation; perceptions of resource use by final stakeholders	Perceptions of and access to markets and new varieties; expense of resistant varieties	Local-level financial, cultural, natural and institutional barriers; lack of information; climate change impacts on effectiveness and efficiency of implementation
Examples	ClimAfrica project brings together 18 institutions to improve understanding of climate change and impacts in Africa: www.climafrica.net	Kenya Rainwater Association use water saving drip irrigation in a number of rainwater harvesting and management projects: www.gharainwater.org/kenya-projects	The International Rice Research Institute develop rice varieties to withstand changing climates: www.irri.org/our-work/research/better-rice-varieties/climate-change-ready-rice	Practical Action have developed and replicated floating gardens with farmers in Bangladesh: www.practicalaction.org/climatechange_floatinggardens

3 Stakeholder Involvement and Collaboration

Multi-stakeholder co-operation and co-ordination across scales can serve to maximise the effectiveness of a technology within its specific context. One example of such collaboration in the agricultural sector comes from the use of citizen science to scale-up participatory crop research in India (UNFCCC, 2014c). Here, a network of farmer groups works closely with NGOs and researchers to test the use of appropriate technologies for agricultural adaptation in context. The engagement of various stakeholders in the application of adaptation technologies is summarised below, yet each stakeholder role should be considered as part of a larger, integral and collaborative process.

- **Communities develop, adopt and use technologies,** and, as the final stakeholders, should be central to considerations in any adaptation technology efforts (see lessons learned).
- **Researchers and research institutions devise and test new technologies.** More recently, efforts are shifting from isolated testing to on-farm testing (see lessons learned).
- **Local governments can support users by assisting the scaling-up of small-scale or community-led technologies, or contributing towards an enabling environment for appropriate technologies.** In Africa, the huge success of introducing and diversifying varieties of drought-tolerant maize was enabled by engagement with the government, whose involvement fast-tracked user access to quality, affordable seeds through ensuring efficiency in the release of varieties and access to seed markets (DTMA, 2013).
- **National governments are responsible for devising necessary policies** to promote the scaling-up of successful technologies and to ensure maladaptation is avoided.
- **Non-governmental organisations (NGOs) have various roles in researching, implementing, facilitating, monitoring, evaluating and financing technologies for adaptation.** They can act as a vehicle for communication, particularly from and to the final stakeholders, endorsing successful collaboration with respective custodians of policies and advocating for the alignment with and creation of effective policies for technological application.
- **Private sector stakeholders can contribute by securing and effectively employing financial and non-financial resources.** Insurance schemes provide an entry point for the private sector. They can encourage the adoption of adaptation technologies by linking them to a reduction in premium payments, and can also establish connections between developing countries and experts that specialise in risk assessment, data collection and management, modeling and other insurance-related fields. Public-Private Partnerships (PPPs) are also a way forward for integrating the private sector.
- **International stakeholders can support adaptation technologies for agriculture by providing financial resources and increasing connections.** Multi-lateral banks can play a role in financing adaptation technologies, and further support can be provided by intergovernmental agencies. For example, the Food and Agriculture Organization of the United Nations (FAO) have developed a programme to address adaptation to climate change, named FAO-Adapt, which recognises the application of technologies as one of their central themes.Through this programme, the FAO seek to build the capacity of member countries to access the finances that allow them to develop and disseminate technology for agricultural adaptation (FAO, 2011).

Photo: Stephanie Andre - Seed varieties BRRI.

4 Policy Formulation

As many of the underlying principles of adaptation are applicable at local, regional, national and international levels, policies can ensure that the factors that enable success are replicated at different scales. Lessons learned from previous experiences in the use of technologies for agricultural adaptation point to a number of specific needs for relevant policies and policy recommendations, to support the successful application of technologies for agricultural adaptation to climate change:

- The **integration of hard-, soft-, org-ware** and the **targeting of specific barriers** in the technology cycle can be encouraged by policies aiming to strengthen or preserve agro-biodiversity and to reduce food price volatility (Montpellier Panel, 2012).
- Policies for the **strengthening of relevant institutions and infrastructure** to include market infrastructure and financial services can include the strengthening of meteorological services for climate information and the reduction of market barriers for seed access.
- Addressing **political will and political capacity barriers for scaling-up finance** for technologies is a crucial point for attention. In developing countries, financial support is needed for the implementation of TNAs and TAPs. Supportive actions could include private sector encouragement and promotion of foreign direct investment.
- Policy makers need to address potential **iterative risk management approaches** that seek to approach adaptation as a long-term process of risk assessment, monitoring the effectiveness of past decisions, and applying lessons to future plans. In the context of agricultural adaptation technologies, approaches include the adaptation of cropping for food security or sustainable livelihoods, and crop micro-insurance schemes (IPCC, 2014).
- Policies to strengthen **collaborative Research and Development** of technologies in situ are needed. This includes on-farm testing of technologies and research networks for investigating new seed varieties.
- **Comprehensive Monitoring and Evaluation of technologies** is needed to illuminate how technologies contribute to building adaptive capacity and resilience (Clements et al., 2011).
- **Comprehensive participatory frameworks** integrating an awareness of all involved stakeholders, from farmers, farmer groups and NGOs, to government services, such as agricultural extension networks, and private sector organisations, should be defined and communicated at the initial stages. These must integrate effective knowledge management strategies, incorporating the producer's knowledge and responding to the user's needs (Clements et al., 2011). They should enable stakeholders from public and private spheres to align and coordinate their priorities and policies.
- The **mainstreaming and integration of local needs with national development plannin**g by scaling-up can help to ensure that national-level processes respond to pressures experienced on the ground. Social safety networks, disaster risk reduction approaches or extension services can be employed as vehicles for this.
- **Planning for national level adaptive processes** can include policy-based appropriate land-use planning.
- **International and regional cooperation via cross-cutting policies** can help to overcome legal or trade barriers represented by, for example, import tariffs, subsidies or restrictive patents (Mba et al., 2012).

Reference

- Bentley, J.W. and Thiel, G. 2008. On the Road to Change: Writing the history of technologies in Bolivia. Participatory Learning and Action 58 (1): 113-120.
- Behnke, R., and Kerven, C. 2013.Counting the costs: replacing pastoralism with irrigated agriculture in the Awash valley, north-eastern Ethiopia. IIED, Climate change working paper No. 4, March 2013.
- Christiansen, L., Olhoff, A., and Trærup, S., 2011. (eds.): Technologies for Adaptation: Perspectives and Practical Experiences, UNEP Risø Centre, Roskilde, 2011
- Clements, R., J. Haggar, A. Quezada, and J. Torres, 2011. Technologies for Climate Change Adaptation – Agriculture Sector. X. Zhu (Ed.). UNEP Risø Centre, Roskilde, 2011
- DTMA, 2013. DTMA Brief 2012, Available at: http://dtma.cimmyt.org/index.php/press-room/dtma briefs/cat_view/121-dtma-briefs
- FAO, 2011. FAO-Adapt: Framework Programme on Climate Change Adaptation. Food and Agriculture Organisation of the United Nations, Rome.
- IPCC, 2001. IPCC Third Assessment Report (TAR). Glossary.
- IPCC, 2007. Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report.
- IPCC, 2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability. IPCC Working Group II Contribution to AR5.
- IRRI, n.d. Are private companies involved in the Golden Rice project? International Rice Research institute. Website accessed from: http://irri.org/golden-rice/faqs/are-private-companies-involved-in-the-golden-rice-project [19 October 2014].
- Mba, C., Guimaraes, E.P., Ghosh, K., 2012. Re-orienting crop improvement for the changing climatic conditions of the 21st century. Agriculture and Food Security Vol 1:7, doi:10.1186/2048-7010-1-7.
- Montpellier Panel, 2012. Growth with resilience: opportunities in African Agriculture. London: Agriculture for Impact.
- Ouedraogo, A., & Sawadogo, H., 2005. Indigenous innovation in farmer-to-farmer extension in Burkina Faso. Reij, Ch., & Waters-Baer, A. (Eds.). IK Notes, WB, No. 77. The World Bank. Retrieved from http://www.worldbank.org/afr/ik/iknt77.pdf
- UNFCCC, 2005. Report on the seminar on the development and transfer of technologies for adaptation to climate change. FCCC/SBSTA/2005/8
- UNFCCC, 2006. Application of environmentally sound technologies for adaptation to climate change. Technical Paper FCCC/TP/2006/2
- UNFCCC, 2013. Third synthesis report on technology needs identified by Parties not included in Annex I to the Convention. Document FCCC/SBSTA/2013/Inf.7. Subsidiary Body for Scientific and Technological Advice, Thirty-ninth Session, Warsaw, 11–16 November 2013.
- UNFCCC, 2014a. Issues related to agriculture. Subsidiary Body for Scientific and Technological Advice. Fortieth session. Bonn, 4–15 June 2014. FCCC/SBSTA/2014/L.14.
- UNFCCC, 2014b. Report of the workshop on technologies for adaptation. Langer Eugen, Bonn, Germany, 4 March 2014. Available from: http://unfccc.int/ttclear/pages/ttclear/pages/ttclear/pages/ttclear/pages/ttclear/templates/render_cms_page?s=events_workshops_adaptationtechs [Accessed 21 May 2014]
- UNFCCC, 2014c. Presentations from the workshop on technologies for adaptation. Available from: http://unfccc.int/ttclear/pages/ttclear/pages/ttclear/pages/ttclear/pages/ttclear/templates/render_cms_page?s=events_workshops_adaptationtechs [Accessed 21 May 2014]
- UNFCCC, 2014d. Report on the workshop on the current state of scientific knowledge on how to enhance the adaptation of agriculture to climate change impacts while promoting rural development, sustainable development and productivity of agricultural systems and food security in all countries, particularly in developing countries, taking into account the diversity of the agricultural systems and the differences in scale as well as possible adaptation co-benefits. Subsidiary Body for Scientific and Technological Advice. Fortieth session. Bonn, 4–15 June 2014. FCCC/SBSTA/2014/INF.2.
- Ziervogel, G., 2004. Targeting seasonal climate forecasts for integration into household level decisions: the case of smallholder farmers in Lesotho. The Geographical Journal Vol 170, No 1, March 2004.

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Photo: Helena Wright - Testing seed varieties BRRI.

Contact Details

The Technology Executive Committee may be contacted through the United Nations Climate Change Secretariat (UNFCCC):

Platz der Vereinten Nationen 1, 53113 Bonn, Germany
Telephone +49. 228. 815 10 00 /Telefax +49. 228. 815 19 99
E-mail: TEC@unfccc.int / www.ttclear.unfccc.int

About The Technology Executive Committee

The Technology Executive Committee (TEC) is the policy component of the Technology Mechanism established by the Conference of the Parties (COP) in 2010 by decision 1/CP.16 to facilitate the implementation of enhanced action on technology development and transfer to support action on mitigation and adaptation. Along with the other component of the Technology Mechanism, the Climate Technology Centre and Network, the TEC is mandated to facilitate the effective implementation of the Technology Mechanism.