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Implications of
climate change
for sustainable agricultural
production systems
in ACP countries

Getting information and communication strategies right



EXECUTIVE

SUMMARY

**UNDERSTANDING AND
CONFRONTING CLIMATE CHANGE:
WHAT CAN BE DONE?**

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UNDERSTANDING AND CONFRONTING CLIMATE CHANGE: WHAT CAN BE DONE?

1. Objectives

The objective of the CTA Seminar 2008 - 'Implications of climate change for sustainable agricultural production systems in ACP countries: getting information and communication strategies right' was to raise the awareness of policy-makers and rural communities concerning the way climate change is affecting agriculture and rural development. It also aimed to identify the information needed to develop strategies to secure local livelihoods and ensure global food supplies.

2. Generating and exchanging information

Prior to the seminar, information was generated by an e-discussion - with 550 participants - that focused on four key farming systems, and a competition that encouraged 25 journalists to write about local experiences of climate change. Web-based sources of information on climate change were also identified for the seminar website.

During the seminar, more than 225 experts, including scientists, policy-makers, development workers, donors and journalists, presented evidence of climate change and discussed the technical options for adaptation and mitigation in multidisciplinary working sessions. Field trips made during the seminar showed how communities were using agro-sylvo-pastoral techniques, forestry technologies and anti-erosion strategies to deal with increasing desertification.

Specially commissioned, short TV documentary studies of climate change - Initiative Africa (www.initiative-africa.com) - were shown during the seminar and later broadcast on more than 40 national television channels in ACP countries. CTA is also disseminating seminar results via its website and in specially targeted publications. A special issue of *Spore* on climate change has also been produced and disseminated widely in ACP countries.

3. Seminar results

The impact of climate change on the agricultural sectors of ACP countries was discussed in terms of its effects on the productivity of cropping and agro-pastoral systems, and its impacts on the biophysical and socio-economic structures of rural life. In this context, recommendations were made about information strategies that could effectively support policy-making and communal action. Estimates suggest climate change will cause a serious fall in agricultural productivity - some estimates suggest between 9 and 21% - leading to conflict over resources and a movement out of agro-pastoral activities. Adaptation and mitigation strategies should therefore include the following.

3.1. Adaptation and mitigation strategies

Agro-pastoral systems

The need to provide feed crops or find pasture and forage is a critical factor in maintaining the productivity of livestock within the food chain. Henning Steinfeld et al., in the book *Livestock's Long Shadow* (FAO, 2006), concluded that livestock's contribution to climate change has become a major policy issue. However, changes in livestock management practices can contribute to mitigating the effects of climate change, and legislative and institutional interventions can be used to avert conflicts over water and grazing land. The principal impacts of climate change on agro-pastoral systems are:

- inconsistent productivity due to variability in pastoral and water resources;
- reduction in pastoral land as a result of desertification and agricultural activities;
- spread of disease due to changes in the environment and ecosystem imbalances;
- increasing conflicts between pastoralists and farmers.

Adaptation and mitigation strategies should therefore include:

- identifying climate change hotspots and sketching new and evolving risk scenarios;
- establishing weather and climate early-warning systems at regional, national and district levels to support farm management decisions and enable disaster risk management;
- strengthening animal and plant health services and investing in the application of science and technology to ensure early control, detection and rapid response systems as the risks to human, animal and plant health increase with the growing complexity of market chains;
- encouraging new fodder resource-management systems to check the impact of climate change - exacerbated by overgrazing - on pasture and rangeland biodiversity;
- intensifying genetic improvement and cross-breeding to increase livestock resilience;
- developing livestock management systems that produce less anthropogenic greenhouse gas emissions, but are capable of responding to the rapidly growing demand for livestock products - these new systems should take into consideration the cultural, social and risk management roles livestock play in agro-pastoral systems;
- implementing moderate grazing intensities to avoid the problems associated with overgrazing and to facilitate carbon sequestration;
- monitoring livestock behaviour and movements using participatory techniques to provide data for resource mapping, establishing secure migration routes and developing emergency contingency plans;
- stimulating funding for integrated research and maintaining donor commitment to supporting projects based on IPM, catchment rehabilitation and the documentation of best practices;
- developing systems to monitor and evaluate policies and interventions to mitigate the effects of climate change, with special reference to bottom-up approaches.



Fisheries and aquaculture

There is increasing emphasis on the need to focus on the impact of climate change on fisheries ecosystems and the food and nutritional security and livelihoods of fish-dependent communities. In ACP countries, fishing communities in general are impoverished and ill-prepared to adapt to the negative impacts of climate change. These include shifts in the geographical distribution and quality of fish that, in turn, affect prices and production costs.

The principal impacts of climate change on fisheries and aquaculture are:

- disturbances in fish fertility cycles;
- increased mortality among young fish due to rising water temperatures, particularly in lagoons and rivers;
- effects of strong salinity in these surroundings exacerbated by the penetration of sea water that seriously affects fishery resources and already fragile ecologies;
- frequent fish migration into deep water.

Adaptation and mitigation strategies should therefore include:

- initiating studies into the socio-economic resilience and capacity for adaptation of fish-dependent communities, given rising seas levels, storms, changing thermal structures and changes in the hydrological cycles of lakes, rivers and lagoons;
- compiling data that support policies to ensure appropriate livelihood diversification, natural resource management and technical innovation, as well as securing the financial, legal and aquatic property rights of communities dependent on fishing and aquaculture;
- increasing the coherence of national policy for climate-proofing fishery development initiatives;
- developing policies to respond to the risk of flooding in coastal areas and facilitate coastal erosion control.

Cropping systems

High temperatures, droughts and flooding cause an absolute reduction in food and vegetative biomass. Plant species are being lost, and increasing amounts of expensive pesticide are needed to deal with the growing incidence of crop pests and diseases - costs that are passed on to the consumer as food prices continue to rise. In addition, the increased use of inorganic fertiliser to support production under these changing conditions has led to contaminated water systems, causing polluted drinking water, fish kill and negative effects on the environment.

The principal impacts of climate change on cropping systems include:

- reduced production due to changing rainfall patterns;
- emerging diseases, pests and vectors;
- spatial redistribution of pests;
- erratic rainfall patterns.

Adaptation and mitigation strategies should therefore include:

- collecting robust data on the impact of climate change on croplands and potential yields;
- introducing technical and sustainable management measures to increase water-use efficiency in rainfed and irrigated agriculture and encouraging research into water-efficient species;
- studying indications of climate change, including the opportunities as well as the risks of rising temperatures and irregular precipitation to crop productivity;
- introducing strategies to preserve seed production on-farm, including farm-level and community seed banks;
- stimulating technologies such as conservation farming, staggered cropping, water harvesting and water catchment restoration to enable farmers to maintain adequate levels of food security;
- providing guidelines for the production of biofuels from crops, including land-use legislation, the standardisation of production, emission controls and auditing tools to assess the impacts of biofuel production on food security and greenhouse gas emissions - an inter-governmental, private sector and civil society results-orientated dialogue is needed to deal with the issue of food security and bio-energy;
- rejuvenating traditional food crops adapted to local niches and documenting indigenous knowledge about their cultivation and use to offset dependence on exotic varieties - traditional crops can provide a basis for future crops if this knowledge is not lost through neglect.

Biophysical impacts

Climate change has led to changing land-use patterns as farmers seek more productive land in forest and pastoral areas. This type of movement leads to soil degradation and the reduction of natural pastures, and has negative effects on water resources. There is a need to develop land and water resources that can support the demand for improved land and water access and ensure an adequate water supply for agriculture. Feasible remedial strategies and adaptation options must be developed and implemented.

Land and water resources and biodiversity are the biophysical resources most affected by climate change. These impacts are manifested as:

- increased conflict over the use of water resources, especially in arid and semi-arid areas;
- intense rainfall, floods and soil erosion;
- the filling of watercourses and lakes as a result of the use of banks and slopes for agricultural activities;
- losses of biodiversity and plant genetic resources as agricultural activities expand uncontrolled into forest areas.

A hidden relationship: forests, agro-forestry and climate change

Unabated deforestation, propelled by increased exploitation by forest-dependent communities, marks an important transition in man-forest relationships. In addition, population pressure combined with the impacts of climate change has contributed to undermining the regenerative capacity of forest areas in many ACP countries.

Trees - as well as other vegetative matter - play an important role in carbon sequestration. Rural communities can benefit from the carbon market and derive important livelihood products from non-timber forest and on-farm tree resources through conservation and agro-forestry.

The vast majority of developing countries, however, are excluded from carbon markets, because both the Kyoto Protocol and the EU Emissions Trading Scheme do not recognise forest and land-use credits, despite the fact that most of the developing world depends on farming and forest products. ACP policy-makers and those involved in climate change negotiations need information that will enable them to extend the provisions of the CDM and simplify accreditation procedures so that



smallholders can derive financial benefits from the carbon offset programmes that also contribute to the stabilisation of greenhouse gases.

In the short term, regional, inter-governmental and international organisations have an important role to play in ensuring support services are in place to help rural producers overcome the problems caused by the complexity and high transaction costs of current procedures governing carbon credits.

Interventions that stress capacity-building, and structural interventions such as setting up country desks with links to industrialised countries wishing to get credits from CDM or voluntary carbon offset projects, can make a significant contribution.

Adaptation and mitigation strategies should therefore include:

- increasing the resilience to climate change of present food production systems by developing the capacity for better land and resource management;
- integrating agricultural water management in national development plans and increasing investment in sustainable land-use practices;
- conserving biodiversity for food and agriculture in the wild and in the field to mitigate the threats of declining agrobiodiversity to global food security;
- intensifying the coordination, harmonisation and enforcement of environmental policies;
- instigating programmes to stimulate afforestation, forest and range management and the delineation of protected areas;
- increasing awareness of the importance of agro-forestry in food security diversification and the provision of a wide range of household products;
- accurately assessing hazards and critical mitigation points, and establishing monitoring and preventive measures - an integrated approach to mapping hazards enables efficient and effective management;
- developing vulnerability identification matrices to evaluate the impact of climate change on the biophysical environment and households.

Bio-energy: sustainable sources that do not conflict with food production

There are serious concerns that the growing demand for biofuel will lead to food insecurity as land is converted from food crop to bio-energy crop production. Problems with potentially invasive species such as *Jatropha curcus* have also been identified. Legislation and interventions are needed that address energy needs but also ensure adequate levels of food production.

Encouraging energy-use efficiency and alternative sources of energy, including solar and wind energy and the possibility of generating energy from organic waste, algae and biomass that would otherwise go to waste, can contribute to meeting energy needs without endangering food production.

Where crops are grown for biofuel production, legislation and guidelines are needed to ensure sustainable production and to protect the land rights and market returns of smallholder farmers.

By replacing fossil fuels and encouraging vegetative cover, biofuel crops can have an impact on climate change if their development is monitored in a context that includes natural resource management, livelihood security and communication for awareness.

Socio-economic implications

Policy strategies and programmes are needed to address the escalating levels of food insecurity. Climate change has led to a reduction in livelihood options in many ACP countries. Demographic shifts within rural society, as a response to the impact of climate change on the productivity of local resources, have left many households without young, able-bodied labour. Low levels of education and poorly developed communication and market infrastructures further complicate the task of developing location-specific responses that effectively address the impacts of climate change.

The main socio-economic implications of climate change include:

- reduced capacity of natural resources to support productive agriculture;
- food scarcity, resulting in extreme hunger and malnutrition;
- rising food prices that make it increasingly difficult to access food;
- weakening of the power and equity position of the most vulnerable.

Adaptation and mitigation strategies should therefore include:

- developing policies to ensure domestic food production is sufficient for local needs and to address the soaring price of resources needed to produce and buy food;
- focusing attention on the particular vulnerability of African countries to the socio-economic impacts of climate change, given the increasing frequency of climate extremes, institutional and policy weakness, poor infrastructure and the slow uptake and transfer of technology;
- planning to anticipate social tensions and conflicts - the consequence of declining economic growth - climate change will affect power, governance and equity relations and disadvantage the vulnerable;
- developing models for vulnerability assessment;
- stimulating investment in agribusiness and rural development from public and private sources to ensure food security and welfare, with emphasis on the importance of applying cost-benefit analysis to structural mitigation measures;
- developing financial mechanisms - including credit and savings schemes - and climate insurance appropriate for rural communities;
- studying the livelihood advantages of soil carbon sequestration and negotiating ways to reduce the costs - in time and money - of obtaining certification and administrative approval - the lack of clarity surrounding CDM rules and procedures needs to be addressed and the negotiating capacities of those responsible for national climate policies upgraded;
- ensuring gender issues are taken into account in assessing the impact of climate change - for example, male farmers who are heads of households in mixed systems and rural women in pastoral communities are particularly vulnerable to the effects of climate change on their livelihood options;
- increasing and far-reaching regional and international cooperation to deal with the impacts of climate change on communities that have no viable, feasible or sustainable future options - many coastal communities in the Pacific Island States fall into this category;
- fulfilling commitments to the Climate Investment Fund so that funds become available to support adaptation and mitigation initiatives.



3.2. Information needs and effective strategies

The seminar aimed to contribute to the creation of a knowledge-rich environment strong enough to support the development and implementation of effective climate change policies. The impact of climate change on the agrarian sector directly affects the work of two categories of stakeholder: rural communities and policy-makers from political as well as scientific and development sectors.

Much needs to be done to assess and communicate the effects of climate change. For some agricultural systems these changes offer new opportunities, for others - already trapped in poverty - sensitive, participatory and knowledge-rich approaches are needed to ensure livelihoods and welfare. Strategies must be developed that encourage the integration of national, regional and international efforts to stimulate adaptation and mitigation. This requires strong political will.

3.2.1. Information and communication strategies for policy-makers

To develop policies that contribute to a sustainable mitigation of the effects of climate change, policy-makers at international, regional and local levels need well targeted information delivered through appropriate media, including the following.

- Improved internet access, improved funding for research and resource materials, and affordable and reliable communication infrastructure to ensure access to accurate, up-to-date information on climate change. Open-access and integrated web-based literature search tools such as CIRAD's Scientific and Technical Information System (SIST) need to be developed further.
- The results of informed and inclusive debates on the impacts of climate change that include the poor and marginalised. Stimulating investigative environmental journalism is an effective way of ensuring this type of information becomes available.
- Participatory methodologies including participatory rural appraisal, participatory video and oral testimonies are among the approaches that should be encouraged in order to mobilise the local and scientific knowledge of all actors involved in the value chain, including small-scale farmers, scientists, urban consumers, extension workers and farmers' organisations. These documentation procedures deliver data essential for effective policy-making.

- Markets and trading frameworks need to be accurately assessed and information disseminated so policies can be formulated that respond to market conditions.

Cropping systems

To increase the capacity of cropping systems to adapt to climate change, policy-makers need the following:

- To encourage national agencies and development partners to give more priority to local knowledge and indigenous solutions so bridges can be built between traditional knowledge and current technologies, enabling the development of cropping patterns that ensure food security;
- Information on farmers' perceptions of climate change and their capacity to adapt and mitigate its effects. Farmers' cultural and spiritual interpretations of climate change need to be understood so that education and information on climate change can be adapted to facilitate farm-level decision-making and planning;
- Information on yield forecasts based on long-term rainfall data to enable national and regional planning to alleviate food crises;
- Facts and figures from researchers to justify investing in strategies of adaptation, such as the promotion of agro-forestry among small-scale farmers, which farmers - especially those with low incomes - may be reluctant to adopt because of the time lag between adoption and the realisation of benefits;
- To ensure extension services have information on the impacts of climate change to demonstrate how farmers can achieve an ecological balance on their farms and offset the impacts of changing climate regimes.

Agro-pastoral systems

To strengthen the productive capacity of agro-pastoral systems threatened by climate change, policy-makers need the following:

- Information to develop technical policy and institutional options aimed at adapting livestock management to food security and climate change. The findings of veterinary research and monitoring the movement of plant and animal disease can provide essential information;
- To share information and draw lessons from existing and proposed institutional strategies on animal production so institutional partnerships and continent and region-wide initiatives can be undertaken. Information

on promising policy options, projects and experiences derived from international cooperation are important inputs.

Fisheries and aquaculture

Policy-makers dealing with the climate change-related problems of fish-dependent communities need the following:

- Data sets, interactive models and communication links with communities to enable the development of adaptation and mitigation strategies;
- Information on the response of marine and inland ecosystems and fish populations, including changes in productivity and migratory patterns, so interventions can be developed.

Biophysical impacts

In order to address the biophysical consequences of climate change, policy-makers need the following:

- Data derived from biodiversity mapping to develop risk analysis scenarios;
- Information on the implications of climate change treaties and protocols to enable them to take part effectively in regional and international climate change negotiations;
- Information to enable them adequately to review policies and strategies developed to mitigate the impacts of climate change, such as desertification, salinisation and inappropriate adaptations including overgrazing and slope cultivation;
- Information on climate and weather-related events from key websites, from networking with key agencies and from governments. Collaboration with communities, researchers and decision-makers is also needed. To be effective, information exchange requires the establishment of verification procedures, documentation and record-keeping formats;
- To ensure development partners have the information they need to enable them to integrate climate change into relevant planning processes and development initiatives. Websites, RSS feeds, specific databases, online documents, information systems and open archives are important sources for this type of information;
- To organise national and regional workshops to enable metrological service departments to share information and update agricultural officers on seasonal forecasts.

Socio-economic implications

Policy-makers concerned with alleviating the impacts of climate on rural communities need the following:

- Information on how households and systems respond socially and economically to climate change, and what livelihood options are available to them;
- Information to develop and adapt Poverty Reduction Strategy Papers (PRSPs) and National Adaptation Programmes of Action (NAPAs);
- Information on the state of preparedness of local institutions and agricultural systems so scientific interventions can be effectively targeted;
- Information from in-depth studies to provide a basis for biofuel policies that are sustainable and maintain global food security. Specific information is needed to enable monitoring at national and local levels to ensure benefits are well distributed.

3.2.2. Information and communication strategies for rural communities

Rural communities differ widely in the types of information they need to enable them to adapt to changing climatic conditions. There is also considerable difference in the capacity of communication infrastructures and media between countries and rural locations. However, radio - and listening clubs, mobile phones, and Web 2.0, for example - are becoming increasingly common channels of communication within rural societies. Focus groups and guided interviews are also important ways of generating and disseminating farm-level information. Song, dance and drama, as well as participatory video, are particularly effective ways of giving a voice to local responses to climate change.

These channels of communication are important for increasing awareness and understanding of climate change at the community level because they:

- stimulate broader discussion and social networking and complement trusted sources of information such as extension services and radio broadcasts;
- enable rural communities to access information about the processes and impacts of climate change;
- provide the information that communities need to become involved in shaping external adaptive support programmes to their needs;
- enable communities to build an agreed common body of best practice on which sound policies can be based.

Cropping systems

Farmers whose crop systems have been affected by climate change need the following:

- Information about on-farm tree projects so they can participate in carbon trading;
- Information generated by meteorological services and weather scenario techniques that enable them to plan the selection of varieties, acreages to be sown and the type of inputs to be applied;
- Information to facilitate the introduction of new crops. Well analysed data are needed before experiences can be transferred successfully.

Agro-pastoral systems and fisheries

Agro-pastoral communities affected by climate change need the following:

- Information to help understand how their resources can be used to move towards less extensive forms of animal production in an attempt to reduce greenhouse gas emissions. The strategic use of electronic agricultural extension delivery systems can contribute to information dissemination.

Fish-dependent communities need the following:

- High-quality, well targeted information on climate change to enhance adaptive capacity. Short messaging service (SMS), radio and community information kiosks have proved useful;
- Information to enable the diversification of livelihood activities and ensure adequate nutrition.

Biophysical systems

In order to mitigate the impacts of climate change at the biophysical level, efforts are needed to generate and disseminate specific types of information.

- Extensionists need to monitor, collect and disseminate farm-level data because macro-level analysis of the impacts of climate change can obscure poverty and vulnerability at the local level.
- Rural communities need information on carbon market options so they can benefit from the CDM or voluntary carbon offset projects. They also need training to enable them to comply with the provisions and calculate the benefits of participating in this exchange.

- Timely and accurate information is needed to develop databases capable of supporting sustainable development. Geographic information systems (GIS), data sets, raster data and remote sensing data, combined with information derived from field surveys, can play a strategic role in delivering this timely information.

Socio-economic systems

Communication strategies should focus on providing insight into the impact of climate change on socio-economic systems and developing the adaptive capacities of often extremely vulnerable communities. Therefore information is needed to achieve the following:

- To guide investment in low-cost alternative (renewable) energy sources. In many communities this is a first step to combating deforestation;
- To increase the awareness of young people and those in vocational education about the impacts of climate change and the need to develop and implement innovative climate change interventions;
- To target radio and extension services messages to specific groups so they can relate to the implications. The timing frequency of information delivery and content are important. Information strategies need to be designed for specific socio-economic environments and take into account the educational level of the household head;
- To enable farmers to produce successfully for local and national markets, add value to their products, access credit to enable them to diversify varieties offered, and encourage them to use and publicise indigenous farm products;
- To improve media knowledge and skills in environmental communication. Currently climate change reporting is limited and of poor quality in all major media. This is partly a reflection of a resource-poor environment where little is invested in the capacity of media professionals to report on environmental issues;
- To encourage the concept of diversity as an asset and a challenge. Biodiversity, diversity of production systems, differentiated markets and diversified diet are essential elements of food security.



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The Technical Centre for Agricultural and Rural Cooperation (CTA) was established in 1983 under the Lomé Convention between the ACP (African, Caribbean and Pacific) Group of States and the European Union member states. Since 2000, it has operated within the framework of the ACP-EC Cotonou Agreement.

CTA's tasks are to develop and provide services that improve access to information for agricultural and rural development, and to strengthen the capacity of ACP countries to produce, acquire, exchange and utilise information in this area. CTA's programmes are designed to: provide a wide range of information products and services and enhance awareness of relevant information sources; promote the integrated use of appropriate communication channels and intensify contacts and information exchange (particularly intra-ACP); and develop ACP capacity to generate and manage agricultural information and to formulate ICM strategies, including those relevant to science and technology. CTA's work incorporates new developments in methodologies and cross-cutting issues such as gender and social capital.

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- DVD on Climate Change
- Compilation Document on the Seminar
- Website: <http://ctaseminar2008.cta.int>

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