
IFAP Policy Statement

**Mitigation and adaptation to climate change effects:
the role of farmers**

Background

I. INTRODUCTION

The reality of global warming has gained scientific consensus, which has led to an international awareness on the impact of human activities on the climate. Also, climate change has become a top priority for governments worldwide.

The International Panel on Climate Change (IPCC) has estimated that the global mean temperature of the earth's surface has increased by 0.3 to 0.6 °C over the past 100 years. This panel predicts an average global temperature rise between 1.4 and 5.8 degrees by 2100, larger than any change over the last 10 000 years. This increase, thought to be a result of human activities, will unleash a series of other changes around the globe, as a result of human generated greenhouse gases (80% due to fossil fuels utilization and 20% deforestation), leading to a dramatic climate change. Predictions state that climate zones will migrate polewards, causing plant, animal and disease invasion.

A United Nations' framework Convention on Climate Change (UNFCCC)), the forerunner to the Kyoto protocol was adopted in 1992 aiming at stabilizing concentrations of greenhouse gases in the atmosphere at a neutral level for the climate. The UNFCCC marks the international community's awareness on the risks related to climate change. It embodies a general framework for intergovernmental actions against global warming.

The Kyoto protocol, adopted in 1997 and entered into force in February 2005, sets quantitative objectives of reducing emissions of greenhouse gases (-5.2% in average between 2008 and 2012, compared to 1990).

Agriculture and climate change issues are inextricably linked. Agriculture is at the forefront of the impacts and solutions to climate change.. Indeed, it is a sector which experiences climate change effects and at the same time, agriculture worldwide has a huge potential in providing answers to mitigating and adapting to climate change consequences.

Farmers around the world already bear the consequences of climate change – some crops will not be resistant to the changes brought about by climate change; and harvests will wane. Costs associated with climate change mitigation and adaptation already represent an added burden for farmers. However, they cannot alone bear the burden. Thus, all stakeholders need to be involved and play their part. Climate change is everybody's concern.

Therefore, it is crucial for an activity so dependant of climate conditions such as agriculture, to clearly identify these changes and to find out how to tackle them. The role of agriculture in combating climate change is important and must be recognized as such.

Therefore, this should lead to a change in the relationship the agricultural sector and community have with governments, society and the environment. Agriculture around the world already affects the management of land, the environment and climate. It already provides sustainable produce with low food miles while protecting the environment. Agriculture is already responding positively to climate change mitigation through substitution of fossil fuels, continued energy efficiency and carbon sequestration.

Indeed, despite the difficulties they face, farmers are doing a lot to adapt to climate change and also to mitigate its effects. However, their actions are not enough put forward and documented properly. Agriculture and farmers have the potential to continue to contribute even more to reversing this trend and meeting the Kyoto targets.

The main issue for farmers is to highlight key areas of action to support them in their achievements to adapt to and also to mitigate climate change. They also need support to seek for international, regional, national as well as local responses in order to facilitate their efforts in mitigating this plague.

II. BARRIERS TO CLIMATE CHANGE MITIGATION AND ADAPTATION

Agriculture covers approximately one third of the world land surface and farmers are the largest group of ecosystem managers. Therefore, farmers will be an integral part of ecosystem management in order to handle the burden brought on by climate change, and any reductions that can be made by farmers and for them is important.

II. 1- Sources of greenhouse gases

Of the six greenhouse gases the Kyoto protocol identifies, carbon dioxide and methane, both carbon compounds, are the two gases that contribute most to the greenhouse effect. Agricultural soils are currently a net source of atmospheric carbon dioxide. Process, transportation and distribution of agricultural goods, as well as use of farm machinery that operate on the use of fossil fuels, contribute to atmospheric carbon dioxide. Agricultural methane emissions, on the other hand, are largely generated from biological decomposition; livestock digestion, anaerobic decomposition of agricultural wastes and anaerobic activity in irrigated rice cultivation. Certain fertilizers and other agricultural chemical inputs are also known for their ability to contribute to the greenhouse effect.

Although the activities described above emit greenhouse gases, most of them are necessary, and unavoidable. The key is for policy makers to remove barriers and provide incentives for farmers to adopt alternatives. This would facilitate farmers' efforts to minimize greenhouse gas emissions.

II. 2- Barriers: Lack of resources

Increased research and investigation has led to the development of more climate-friendly farming practices. Unfortunately, lack of financial resources and policy regulation make adoption of these practices difficult to implement.

II.2.1 Deteriorated Resource Base

- Farmers rely on natural resources to carry out their activities.

Grasslands for example cover about 40 % of the earth's non ice-bound terrestrial surface and provide essential ecosystem services required to support human life and well being. These services broadly include food (grain), forage, livestock, water and nutrient cycling, soil stabilization, carbon storage, and energy supply. Despite (and often because of) their value, grasslands across the world are one of the biomes most impacted on by humans and their activities.

Soil erosion, water logging and salinity, predicted to increase with the onset of climate change, all contribute to land degradation and desertification, leading to over exploitation of the land. Greenhouse gases are released from certain fertilizers and pesticide inputs and from clearing and converting non-agricultural lands.

- Diminished biodiversity, due to habitat encroachment, fragmentation, can also lead farmers to rely on greenhouse gas generating chemical inputs to increase their yields. Because decreased biodiversity results in less resistant crops and loss of ecosystem services, pest infestations and weather variability increase agricultural stresses.

Producing substantial crop yields without greenhouse gas generation from chemical inputs or intensive fossil fuel use is a great challenge.

- Pressure on water resources due to increased crop intensity brings about increased water resource competition in areas where water resources are scarce. Therefore this situation may lead to conflicts. Unfortunately, the decreased natural resource base is a reality that cannot be reversed overnight. Without access to fertile land, uncontaminated water and a healthy biological ecosystem, farmers' livelihood are in danger.

II.2.2 Local knowledge generation and dissemination

- Given the lack of guidance on climate change adaptation such as detailed regional information for climate change impacts and lack of capital, specific predictions and adaptations are difficult to put in place. Modeling error and lack of specificity mean that even the most sophisticated models may not allow farmers and growers to adapt to the future changes.

- In particular, there is a lack of communication between researchers' and farming communities. In fact, researchers fail to address the full scope of challenges farmers face and therefore do not bring adequate solutions that would meet the farmers' needs.

Besides, farmers' needs and concerns often vary from one country to the other and even from one region to another. Indeed, often research developments for increasing yields apply only for specific conditions, or require a high degree of knowledge transfer for farmers to recreate the yield gains in practice. Poor rural frameworks hamper the knowledge dissemination needed for farmers to benefit from research developments. These failed attempts may discourage them from adopting new methods in the future.

- There is a lack of pro-poor farming research. Because poor farmers lack financial resources to commission research projects and access to research institutions, many of their needs remain unheard or unattended. These needs include research on farming systems that do

not require purchased inputs or advanced technology but which would make efficient use of existing technologies, local knowledge and traditional practices.

II.2.3 Insufficient policy frameworks and Regulation

- At the national level, two requirements that are often not met must be addressed. First, **policy frameworks** for addressing climate change impacts and adaptation measures are often incomplete, and second, **government policy frameworks and regulation objectives are often inconsistent with climate change adaptation and mitigation goals.**
- Appropriate policies and regulations needed to create incentives and remove barriers for climate change adaptation and mitigation, should be implemented so that markets can guide farmers' choices concerning farm management and energy, agricultural input and natural resource use.

II.2.4 Insufficient Infrastructure and Services

- In many rural areas, deteriorating and outdated infrastructure has lost its resilience to climate related extreme events such as hurricanes, droughts. Also, there is a general lack of services, hindering knowledge access. Without sufficient infrastructure, roads, storage facilities and irrigation services will be susceptible to physical damage from climate-related events and farmers will become increasingly vulnerable.
- The need to develop climate-related codes for infrastructure design and prepare for the onset of specific climate events will also require sufficient services for early warning so that farmers may make appropriate decisions concerning their harvests and livestock. In developing countries, many of these required services are insufficient. This could result in food distribution and access problems for farmers. Because suggested adaptation methods to climate change require specific knowledge, not being able to access it hinders its adoption.

II.2.5 Lack of appropriate weather insurance and financial capital

- Climate change brings widespread weather events that affect whole communities at the same time. Traditional insurance markets and informal insurance arrangements between farmers and community members in developing countries are inadequate in preparing for climate change. Farmers who try to self-insure themselves by asset accumulation, savings and access to credit may have just as much trouble at the onset of a crisis as these are often insufficient and may be easily damaged. For example, at the onset of a flood, physical assets such as property and land may be damaged, while community financial aid will be stressed as a result of the widespread effects.
- Farmers living in areas where food security and resources are scarce, lack financial capital and often cannot afford investing in new sustainable practices that require a large initial investment so as to prepare for climate change. For example, switching from traditional till agriculture a more climate-friendly agriculture practice such as conservation agriculture, may result in decreased crop yields for the first few seasons while farmers perfect their techniques. However, in the long run, the gains due to climate change mitigation will pay off. Extreme events, such as droughts, floods, and hurricanes will be less extreme and less frequent with successful mitigation. Unfortunately, there is often a conflict between long-term investment against climate change and short term food security.

II.2.6 Productivity and Consumption Pressures

Farmers have to deal with increased pressures to provide food with rapidly growing populations. In rapidly developing nations, demand for foods whose production is energy-intensive, is growing, increasing the total amount of fossil fuels used. The challenge for farmers is to achieve food demands while protecting the environment through minimizing the use of fossil fuels as well as other factors that could impact on the climate.

III. IMPACTS OF CLIMATE CHANGE ON AGRICULTURE

Primary and secondary impacts on agriculture brought about by climate change have been identified. Primary impacts will directly affect the physical and biological environment, while secondary impacts will be felt in the economic livelihood of farmers and their families.

Generally speaking, there is a general lack of detailed, regional information for climate change impacts. Impacts will vary across sectors and regions, making specific predictions difficult and in turn, specific adaptations.

III.1 Primary Impacts

- Primary impacts on agriculture will be a direct result of increased global temperatures. Actual temperature increases will vary with location. Changes in the equator to pole temperature gradient and evapotranspiration rates will affect the hydrologic cycle. Precipitation patterns will change, cause floods, drought, and increase frequency and intensity of other extreme weather events. Climate zones will expand or fragment, the majority of these shifting pole-wards hindering crop growth, or necessitating changes in crops or harvesting techniques. Stress caused by climate change on biological systems will threaten biodiversity. As the largest group of ecosystem managers, farmers are engaged in preserving and managing biodiversity.
- The impacts of temperature rise on agriculture and agricultural conditions in a given region or county depend on the interplay of the set of dynamic factors specific to each area. Though the consequences can be severe in Northern Hemisphere, the impacts are likely to be even more severe in tropical or sub-tropical areas. In these areas a smallest rise in temperature can easily aggravate the problems caused by heat and draught causing desertification, lack of water and finally exacerbating food production. The consequences of this warming will first hit poor farmers.
- Faster climate change means less time for farmers to change or adapt and perfect sowing and harvesting patterns as well as management practices. In addition, rapid climate change increases stress on plant and animal species, some of which may not be able to adapt quickly enough to survive. The loss of these species may be detrimental to agriculture for the role they play in pollination, pest management, water purification and other services, or because of their crucial role within the ecosystem.

III. 2 Secondary impacts: Effects on farmers and their families

Secondary climate change impacts are likely to be just as devastating, if not more so, than the primary impacts. Climate change influences a number of socio-economic factors endangering

food security. Because of the numerous relationships between secondary impacts, the final outcome is difficult to assess.

III.2.1 Climate change is a gender issue

- Women in rural areas play an important part in the economic livelihood of their families and communities. In Africa and many other developing countries, women are the main food providers and custodians of natural resources.

As climate change endangers food security in developing countries, rural women will feel the negative impacts more harshly as they are more vulnerable.

- In communities where women are not involved in community based disaster planning, women make up the largest proportion of victims of the disasters. Therefore, they have a key role to play in implementing change for combating climate change, to ensure both their livelihoods as well as their communities’.

III.2.2 Climate change and its consequences on natural resources

Unmitigated climate change due to increasing greenhouse gases would have global consequences such as adverse impacts on possible crops species, yields and water resources, international food insecurity triggered by drought, flooding of lands caused by sea-level rise, and migration of peoples due to environmental changes.

- Climate change is expected to increase the rate of land degradation and desertification. Increased sea levels will result in salination, inundation and loss of land by salt water intrusion, as well as erosion along coasts. Climate change may also accelerate desertification with the onset of droughts.

- Farmers who are unable to satisfy the needs of their communities are forced to migrate when droughts strike, deserting their lands in the hopes of accessing more fertile soils. Many tropical forests, rich in biodiversity, are cleared and intensely cultivated for their fertile soils, expanding soil degradation. The distribution and composition of forests will also be affected by climate change. It is likely to influence also the forest health and growth as well as the forest flora and fauna.

- Competition for natural resources will increase as they become scarce and desertification spreads, which already leads to conflicts in some regions of the world, threatening political stability in many regions of the world.

III.2.3 Climate change is an economic issue

- Developed countries are primarily responsible for the current greenhouse gas effects. In fact, in 2002, 80 percent of greenhouse gas emissions originated from only 22 countries, which represented 80 percent of the global gross domestic product. Countries in the developing world often lack the social, political and financial means to cope with the economic burden of climate change adaptation and mitigation. They will be the worst hit by climate change. Efforts in these countries to address climate change will require a greater proportion of their countries GDP than required from developed countries, and climate change will therefore carry a heavier burden. Besides, the past road to economic development has

been energy intense, and has been the main reason for generated emissions from developed countries. The obvious solution to capping emissions would be to change patterns of economic growth. This however, further complicates the worlds' efforts in combating climate change.

- The relationship between gender, health, land and economic issues are complex, and the impact of climate change on one will cause a ripple of feedbacks among others. Farmers can expect deterioration of their natural, financial, social and physical capital, which will result in lower farm productivity and will endanger food security. Climate change will contribute to the impoverishment of farmers.

IV. FARMERS AND AGRICULTURE AS KEY TO MITIGATE AND ADAPT TO CLIMATE CHANGE

Greenhouse gas concentrations in the atmosphere have increased over the past century, which commits us to future global warming.

Farmer initiatives to mitigate and adapt to climate change exist. However, they need to be better recognized. They also need to be better documented and encouraged and must be supported by national policies and international agreements. To preserve the livelihoods of farmers and support the world population, adaptation and mitigation measures are both essential responses in planning for climate change.

IV.1 National Policies and Governance: Decouple economic development from environmental degradation

Policy makers and international organizations should meet farmers' efforts by creating enabling environments, in order to decouple their economic development from greenhouse gas generation.

IV.1.1 Policy reforms: Mainstream climate change

Policies that would discourage mitigation or adaptation practices constitute a barrier for farmers. For this reason, governments should reform and mainstream agricultural and climate change policies into broader frameworks and other planning sectors to ensure that existing policies reinforce sustainable farming techniques, eliminating counterproductive policies and ensuring consistency with other government sector legislation.

- Governments should ensure that carbon credits created by a change of agricultural practices should be attributed and paid to the farmer. This would provide farmers with an alternative source of income while promoting good agricultural practices.
- **Supportive regulatory and legal frameworks** need to be established to **allow alternative energy sources** to compete with or to replace fossil fuels in the long run, such as tax subsidies or benefits for use of renewable fuel sources.
- **Tax benefits and stewardship programs** could equally stimulate farmer initiatives to adopt more sustainable farming practices. Regulations for product and service labeling would help farmers make appropriate climate-friendly consumer decisions.

- Ultimately, **costs of adoption to and mitigation of climate change will need to be shared by stakeholders** including, farmers, consumers, the private sector and government.
- Given the increasing threat generated by climate change related consequences, there is a need for a dedicated government minister to coordinate climate change review and energy policy, to seek for better mainstreaming of both issues.

IV.1.2 Internalize climate vulnerability into agriculture policies

By internalizing climate vulnerability into agricultural policies and planning, governments will be able to minimize economic losses and damages resulting from climate change.

- A **clear national strategy** is required to deal with emergency climatic events that will impact agriculture and in turn a country's food security. **Governments should budget for predicted financial losses incurred by climate change disasters.** This way, they will be prepared to address farmers' needs and help them recover from these events. Including losses due to climate-related disaster in the budget will pose less financial strain in times of need. **Foresight into farmers' needs at the onset** of these calamities will also facilitate the launch of remedial programs.
- Clear goals for **developing appropriate replacement technology** and practices where none exist should be set, followed by an implementation stage. **Consultation with farmers** for feedback after an initial trial period has come to term will provide insight into weaknesses of the policies, so as to correct them if necessary. Appropriate performance measures should be developed. Reporting what may be required on farmers' practices should not hinder farm operations through time and financial burdens.
- Governments should ensure that climate change is fully considered and reflected in the four elements of agricultural early warning systems, including; prior risk knowledge; monitoring and warning services; dissemination of warnings/information; and response capacity

IV.1.3 Address the needs of rural areas in particular in developing countries

A number of strategies that can address rural needs are as follows:

- Create **enabling environments** for decentralized cooperative initiatives, strengthen rural institutions, promote regional specific strategies and apply and document indigenous knowledge. Decentralized cooperatives and rural institutions play a key role in formulation and implementation of policies, regulations and legal frameworks that are region specific.
- Governments should also promote **frameworks that link rural and agricultural development with natural resource management** to ensure the two are compatible.
- Finally, it is crucial that governments **promote gender equality as women are the engine of agricultural growth**, in particular in developing countries. They are key players that ensure sustainable practices are adopted to prepare and adapt to climate change.

- In order to financially safeguard farmers in developing countries from climate induced catastrophes, **farmers need to diversify their insurance sources**. Traditional risk-sharing mechanisms in developing countries may not be sufficient as they tend to rely on asset-pooling (registering the community as an agricultural organization, in order to use combined assets as collateral for financial loans, etc.), which will be insufficient due to the geographic spread of climate events, affecting whole communities at the same time.
- **International catastrophe bonds and weather insurance contracts** could serve as useful insurance mechanisms as their risk is not linked with other financial investments, making them attractive to international investments. However, funding mechanisms will have to be put in place to help farmers from developing countries benefits from these insurance contracts.
- Crop insurance guarantee fund schemes must be put in place by national governments to help farmers recover from eventual losses and stabilize their incomes in a situation of increasing “climate vulnerability”.

IV.1.4 Involving farmers’ organisations in decision making processes through the creation of follow up commissions on climate change

- It is important to recognize the important role of farmers and growers both as representing one of the most affected sectors by climate change but also as a sector with a huge potential in the design of instruments and tool to fight this plague. Participation of farmers is vital through representative professional organizations which must play an essential **role in decision making, design and implementation of actions** related to climate change strategies.
- It is of utmost importance to identify climate change issues and problems to be able to design appropriate instruments and tools to mitigate their effects. The establishment of a **follow up commission** which would be in charge of implementing and monitoring strategies aimed at fighting climate change is needed. In this regard, farmers and rural communities must be involved in this commission along with other stakeholders including relevant public authorities and non state actors at large.

IV.1.5 Supporting climate-friendly initiatives and technologies

For farmers to work on combating climate change effectively, they need to stay up-to-date and be informed on the most appropriate sustainable farming technologies and practices and take measure to adopt them. Farmers should look beyond their own farms, and support other efforts to mitigate climate change. For example, those engaged in commercial agriculture can choose to extend business partnerships with companies committed to sustainable operations. For those farmers who do not have the means to do so, they should benefit from support incentives from the governments. The role of the international community in terms of resource mobilization is also very important in this regard.

IV.2 Farmers Driven Initiatives

In the context of economic development and a growing world population, farmers are already making efforts to mitigate climate change consequences by increasing the efficiency of their

farming practices, reducing emissions, and incorporating carbon sequestering practices onto their farms.

IV.2.1 Farmers' organizations supporting individual farmers in adaptation and mitigation initiatives

Being aware of climate change as a threat to the farming sector and community, some apex farmers' organisations throughout the world that already promote alternative carbohydrate-based renewable energy policies, support agricultural initiatives aimed at mitigating and adapting to its adverse effects.

IV.2.2 Sustainable Farm Management practices and Conservation Agriculture generate carbon storage

Farm management techniques regarding tillage, crop management, water management and chemical inputs are already used by farmers as means to optimize productivity while reducing greenhouse gas emissions.

- Through conservation agriculture practices, farmers contribute to reduce emissions while combating land degradation. Conservation agriculture promises economic and environmental benefits. Leaving crop residues on the soil changes the surface characteristics. It increases rainfall efficiency, as water gets caught by and then percolates through the residues and soil. Generated runoff is less erosive and polluting as crop residues reduce sediment transport into river waters. No-till or minimum tillage agriculture is also less labor intensive as it reduces wear on machinery and fuel consumption. These lands stock twice as much carbon as other lands. Besides, well managed forests constitute net Carbon sinks.

Therefore, adopting conservation agriculture contributes to change farmlands from net carbon sources to net sinks. Besides, adoption of sustainable agriculture practices helps reduce food miles.

- Farmers also adopt other crop management strategies to mitigate climate change impacts. These include crop rotation, increased crop diversity, and introducing integrated pest management systems.

- Appropriate management of fertilizer and pesticide use can increase farm yields. While some chemical inputs generate greenhouse gases, some farmers choose alternatives, or specially treated inputs to reduce their emissions. They also use techniques such as precision use and timing of fertilizer application to meet crop needs, use of advanced control-release fertilizers and systems delivering fertilizers to plant roots through leaves. These can reduce total chemical inputs, and at the same time help farmers maintain or increase yields. Other examples include use of additives in cattle feed to increase the milk production or growth rate and decrease methane production per unit beef.

- As climate change becomes a reality and world population continues to grow, dwindling water resources are under increased stress. There is a need, heightened by climate change, to use water more efficiently, to optimize water conservation technologies such as tillage practices, mulching and water harvesting, under rain fed and irrigation conditions. In agriculture, this means optimizing yields in other words, using "more crops per drop".

- Methane emissions from agriculture are a source of greenhouse gas. Their reduction can be achieved through feed changes in livestock farming, such as the digestibility of forage. Farmers support any innovation in feed for methane reduction in ruminants provided that these changes benefit the economic income of farmers.

IV.2.3 Reduction of greenhouse gas emissions through renewable sources of energy, non food production and carbon storage

- ***Renewable sources of energy***

Biofuels represent a key tool in the fight against climate warming as their production process contributes to less greenhouse gases emissions. They offer significant savings on their fossil fuel equivalents.

Farmers are in favor of giving higher priority to renewable energy production. They are willing and able to produce biofuels and in many countries, have the potential to produce much more than what they are already doing.

Besides, it is more efficient to reward energy conservation rather than simply penalise energy use.

Some apex farmers' organisations throughout the world already promote an alternative carbohydrate-based renewable energy policy. Adaptation measures should be focused on efficiency and conservation.

Biomass

The development of local sustainable energy networks based on biomass production should play an important role, through locally based combined heat and power plants.

In brief, combination of biofuel and biomass technologies offer greater environmental benefits and complement each other.

- ***Renewable material production and non food crops***

The production of non-food crops contribute to greenhouse gas reduction by substituting fossil-based materials. For example, wood is a renewable material used for construction. For this, farmers' organisations should be further supported and encouraged by governments to further develop the production of non food crops.

- ***Sustainable management of forests: carbon sequestration***

Forests contain just over half of the carbon residing in terrestrial vegetation and soil. The carbon stored in the soil and litter of forest ecosystems also makes up a significant proportion of the total carbon pool. Carbon is stored in living biomass, including standing timber, branches, foliage and roots; and in dead biomass, including litter, woody debris, soil organic matter and forest products.

The management of forest carbon can be done by increasing the carbon accumulation by creating or enhancing carbon sinks (afforestation, reforestation, through silvicultural practices); or by preventing or reducing the rate of release of carbon already fixed in existing carbon sinks (preventing deforestation, through silvicultural practices).

The carbon emissions can be reduced through replacing the demand for fossil fuels by the use of wood, either for durable wood products or for biofuel. The role of forests and forestry by replacing fossil energy is growing. The use of wood products in place of materials that are

associated with the release of large volumes of carbon dioxide could lead to significant net reductions in CO₂ emissions.

However, forestry measures alone will not be enough to halt the increase in atmospheric CO₂ concentrations though they can complement efforts in reducing carbon emissions. One of the primary measures to be taken in order to address climate change is through reduction of the utilisation of fossil fuels and through combating desertification.

When addressing climate change through forestry measures, other aspects - including economical, social and ecological-, of sustainable forest management should be taken into consideration. Cross-sectoral dialogue and co-operation are needed to achieve best practices to combat climate change as well as co-ordination and integration of sector policies having an impact on climate change.

IV.2.4 Develop participatory frameworks

A key strategy for farmers to combat climate change is to develop farmer participatory frameworks. These frameworks would contribute **to educating and raising awareness** of farmers, citizens and consumers on the challenges posed by climate change, as well as will be an integral part in the **development of region-specific solution strategies**.

They can also serve **as a platform for knowledge sharing and lobbying** by existing farmer organizations, increasing their capacity to address agricultural and climate change issues at the farm, regional and government level.

As ecosystem managers, **farmers are a storehouse of knowledge**. They are familiar with their environments, and possess an abundance of indigenous knowledge. Farmer organizations should be used as a platform to communicate this knowledge to other farmers and to scientific and government bodies. By properly **documenting farmers' knowledge** and problems, needs will become clearer, and will serve as a base for creating partnerships with other stakeholders such as the public sector, the private sector and the research community.

IV.3 Partnerships: Research, development and funding

IV.3.1 Partnerships between farmers and the research community

Partnerships with the scientific community and other non state actors, are important to achieve greenhouse gas reduction targets effectively.

- There is a need to develop more sophisticated models for regional studies, researching for future change. In particular, the **potential impacts of climate change on agriculture need further research**. Indeed, time is needed to adapt to anticipated change. In other words, there is a need to adapt to possible changes such as new crops and diseases or increased competition for scarce water resources.
- There is an urgent need for the research community to develop new technologies to face climate change and anticipate climate variability, in particular, related to early warning systems.
- There is also a need to develop links from research communities to farming communities

to allow information to trickle down and reach them in a farmer-friendly format. There is a vital need for better **focused farm-specific climate change information**.

- The scientific community should be involved in **the collection and dissemination of traditional knowledge**, projects promoting technology transfer, and farmer training programs and education to identify and scale up good management practices. As stewards of the land, farmers are a resource in small scale variations of the land and the impacts these have on farming practices and management. They are a source of indigenous knowledge that should be documented and appropriately disseminated.

Establishing partnerships between farmers and the scientific community can help identify and develop sustainable farming practices. These will need to be identified and scaled-up so that others may adopt these methods.

- A number of areas **for research and development should be addressed** and their execution planned for, **through farmer and scientific community partnerships**. These include research projects addressing energy harnessing techniques on the farm, the application of renewable energies to farm activities, and region-specific impacts of climate change on agriculture, taking into account diversity of the physical and socio-economic environments. Biotechnology research to decrease emissions by increasing efficiency of nitrogen use in plants, boosting crop productivity and increasing efficiency in livestock digestive systems should be developed.

IV.3.2 Innovative Public and Private Partnerships

Public and private sectors have each a specific role to play in partnerships for developing sustainable farming technologies.

The public sector has to remain responsible for funding research that deals with knowledge and technology whose use and benefits cannot be limited to paying customers and which are also strategic to the country. Besides, public research should be ‘pro-poor’ and benefit those unable to pay for research or agricultural inputs.

The private sector should concentrate on funding research considered more lucrative that can be protected and/or profitable.

Private-public partnerships should generate high tech ‘agricultural solutions’ and benefit commercial farms that can afford the cost of this technology.

IV.4. the important role of International Agreements

IV.4.1 Ratification of the Kyoto Protocol

- Ratifying the protocol is essential for international solidarity and to ensure that emission reductions by signatories are not counteracted by industries in non-ratifying countries. Current Kyoto reduction targets are only a stepping stone on the way to serious global warming mitigation; in order to minimize climate change, further steps must be taken. The Kyoto Protocol is only the beginning. Farmers support more ambitious goals for a second, longer commitment period, in order to fully address the threats of climate change.

- In order to reach the objectives set by the Kyoto Protocol, actions on reducing greenhouse gases emissions alone will not be sufficient. Indeed, the system of emissions quotas market will not alone meet international commitments. In particular, this system is limited to the industrial sector and therefore does not include the agricultural sector. And yet,

the project mechanism system represents a possible answer to fill in this gap. Indeed, an agricultural project which reduces greenhouse gases emissions could generate carbon credits, bought out by investors, in the framework of the project approach (clean development mechanism and joint implementation). At the global level, these investments represent about 1.5 billion euro, in emission reduction projects via project mechanisms.

IV.4.2 The UNFCCC and the need for synergies with the two other multilateral environmental conventions

- The UNFCCC (United Nations Framework on Combating Climate Change) sets the framework for action for “stabilizing greenhouse gas concentrations at a level that will prevent ‘human-induced’ actions to lead to dangerous interference in the climate system”. Similar environmental conventions have been signed in 1992 at the Earth Rio Summit the CBD (Convention on Biodiversity), and in 1994 the UNCCD (United Nations Convention for Combating Desertification).
- Developing synergies with these three Multilateral Environmental Agreements will maximize efficiency in the use of financial, social and physical resources, as well as in educating and disseminating information. All three conventions aim at preserving the environment and achieving sustainable development at the same time. Therefore, initiatives benefiting to one convention often mutually benefit to the others. Synergies with these agreements in capacity building, information exchange, technology transfer and carbon emission reporting should get particular attention.

IV.4.3 Climate Change and Achieving the Millennium Development Goals

How to mitigate and adapt to Climate change represents a major challenge in achieving the Millennium Development Goals. Climate change will increase the rate of biodiversity loss and desertification, spread disease, and challenge health, gender equality and sustainable development.

Climate change is a major threat primarily because funds originally allocated to relieve poverty and achieve the MDGs will have to compete with the need for funds to adapting to extreme events resulting from climate change. Therefore, it is important that climate change loss and adaptation be **integrated into development agencies financial agendas and activities**. This will certainly help to better prepare for adverse effects resulting from climate related events.

Besides, in order to achieve the MDGs, governments will have to honor their ODA commitments on the one hand and incorporate climate changes issues in poverty reduction strategies and development projects on the other.

IV.4.4 International action and mobilizing financial resources

- There must be international consistency in climate change reduction goals by partnerships and trade agreements that minimize carbon leakage and spill over effects, carbon emissions reduced in one country cannot increase emissions elsewhere.
- Financial mechanism include international funds directly allotted for action against climate change through the UNFCCC, which include the Least Developed Countries Fund, the Special Climate Change Fund, the Special Fund for Technology Transfer, *and the United Nations Development Programme - Global Environment Fund (UNDP-GEF)*. The Kyoto

Protocol's Adaptation Fund is another source. Although the creation of these funds is encouraging, there are a number of issues that need to be addressed.

First, there is a risk associated with securing funds for the Adaptation Fund. This is a result of the fact that the Adaptation Fund is financed by 2% of the proceeds of Certified Emission Reductions produced by Clean Development Mechanism projects. It is therefore solely dependant upon the success of these CDM projects.

Secondly, the Least Developed Countries Fund operates on a voluntary contribution basis. It would be in the interest of governments to contribute to this fund, so that it might be used as a finance mechanism for adaptation by farmers to climate change.

Thirdly, only Parties to the Convention can access the UNFCCC funds, and therefore national level farmers' organizations will have to collaborate closely with their state governments on developing projects in order to access these funds. Farmer organizations need direct access to these funds.

The World Bank has also established a number of funds for emission reduction projects. These include the Prototype Carbon Fund (PCF), the Community Development Carbon Fund (CDCF) and the BioCarbon Fund.

Finally, although not part of the direct funding scheme for Climate Change, funds for the other Multilateral Environmental Agreements could serve to benefit climate change adaptation and mitigation efforts. This would be done mainly by integrating climate change concerns and goals into projects whose main outcome is to combat related environmental concerns.

APPENDIX

The Kyoto Protocol

- On November 18, 2004, the final signatory ratified the Kyoto protocol. The latter entered into force ninety days later, on February 16th, 2005. The protocol targets a 5% reduction of greenhouse gas emissions from 1990 levels in developed countries and countries with economies in transition through 2008-2012. These unified efforts to combat climate change, marks an international achievement and gateway for future actions. Ratification of the Kyoto protocol by all developed nations as well as development of a post-2012 strategy that engages developing countries to make targeted commitments would benefit the agricultural sector.

It is worth noting that the objectives set by the Kyoto Protocol are legally strainful for ratifying parties.

Besides, the Kyoto protocol gives leeway to country parties on the choice of implementing measures to reduce these emissions. Flexibility mechanisms are in place to help them achieve their endeavor. First, the international exchange system of greenhouse gases emission quotas, will enter into force in 2008. Second, project mechanisms allow certain projects which reduce greenhouse gases emissions to convert these emissions into credit emissions (or carbon credits).

RECOMMENDATIONS

CLIMATE CHANGE: AN INCREASING CONCERN FOR THE INTERNATIONAL COMMUNITY

- Global warming has gained scientific consensus and has become a top priority for governments worldwide.
- According to the International Panel on Climate Change (IPCC) estimations, there was an increase by 0.3 to 0.6°C over the past 100.
- The UNFCCC (United Nations' Framework Convention on Climate Change), the forerunner of the Kyoto Protocol, adopted in 1992, marks the international community's awareness on the risks related to climate change. It embodies a general framework for intergovernmental actions against global warming.
- The Kyoto Protocol was ratified in November 2004 and entered into force in February 2005. This protocol sets quantitative objectives of reducing emissions of greenhouse gases (-5.2% in average between 2008 and 2012, compared to 1990).

Agriculture and climate change: THE COST OF CLIMATE CHANGE FOR FARMERS

- Agriculture is at the heart of climate change issues. It is both a sector which experiences the effects of climate change and also has a huge potential in providing answers to mitigating and adapting to its effects. The role of agriculture is important and must thus be recognized as such.
- Costs associated with climate change adaptation and mitigation already represent an added burden for farmers. These costs need to be shared by all stakeholders who need to bear their responsibilities because climate change is everybody's concern.
- The challenge for farmers is to document their actions and to highlight key areas of action to support them in mitigating and adapting to climate change.

MAIN BARRIERS TO CLIMATE CHANGE MITIGATION AND ADAPTATION

The lack of resources to mitigate and adapt to climate change is embodied by:

- A deteriorated resource base (soil erosion, water logging, salinisation, land degradation, desertification, increased water use competition, diminished biodiversity) which leads to a pressure on natural resources. Therefore, farmers' livelihoods are in danger.
- Given lack of local knowledge generation and dissemination on climate change impacts, specific predictions and adaptation are difficult. Lack of guidance on climate change adaptation and lack of capital to put necessary adaptations into place as well as the lack of pro-poor farming research are a reality.

- Incomplete policy frameworks to address climate change impacts and adaptation measures. Government policy frameworks and regulation objective are inconsistent with climate change adaptation and mitigation goals.
- Insufficient infrastructure and services lead to a lack of resilience of rural areas to climate related extreme events. Besides, lack of services (e.g early warning systems), hinders knowledge access to adaptation methods and prevent farmers from taking appropriate decisions concerning their harvests and livestock. Therefore, farmers' vulnerability is increased.
- The lack of managing risk related to weather damage. Indeed traditional insurance markets and informal insurance arrangements between farmers and community members in developing countries are inadequate in preparing for climate change.
- There is often a conflict between long-term investment in new sustainable agricultural practices, against climate change, and short term food security.

Impacts of climate change on agriculture

- Primary impacts, affecting physical and biological environments will vary with location. The shifting pole-wards will hinder crop growth necessitating changes in crops or harvesting patterns and management practices. The consequences of global warming will first hit the poor.
- Secondary impacts, affect economic livelihoods of farmers communities and thus endanger food security. The relationship between gender, health, land and economic issues are complex, and the impact of climate change on one will cause a ripple of feedbacks among others. These include:
 - Women, as custodians of the natural resources, will feel the negative impacts of climate change more harshly because of their vulnerability. And yet, they are often not involved in community based disaster planning.
 - Land degradation and desertification will be exacerbated. This has a double consequence: rural exodus and increased competition for natural resources leading to conflicts.
 - Mitigation and adaptation to climate change have an economic cost. Efforts in these countries to address climate change will require a greater proportion of their countries' GDP than required from developed countries. The main challenge for these countries is to change patterns of economic growth.

NATIONAL POLICIES AND GOVERNANCE: DECOUPLING ECONOMIC DEVELOPMENT FROM ENVIRONMENTAL DEGRADATION

There is an urgent need from national governments **for policy reform and mainstreaming of climate change issues by:**

- Creating enabling environments to meet farmers' efforts to decouple economic development from greenhouse gas generation.

- Ensuring that the creation of carbon credits established by a change of agricultural practices be attributed and paid to the farmer. This would provide the farmers with an alternative source of income while promoting good agricultural practices.
- Mainstreaming agricultural and climate change policies into broader frameworks and other planning sectors to ensure that existing policies reinforce sustainable farming techniques, eliminating counterproductive policies and ensuring consistency with other government sector legislation.
- Establishing supportive regulatory and legal frameworks to allow alternative energy sources (e.g subsidies or benefits for use of renewable fuel sources).
- Introducing tax benefits and stewardship programs to stimulate farmers' initiatives to adopt more sustainable farming practices.
- Creating a dedicated government minister to coordinate climate change review and energy policy, to seek for better mainstreaming.

There is an urgent need **to internalize climate vulnerability into agricultural policies** and planning so as to minimize losses and damages resulting from climate change, through:

- **Setting up a clear national strategy and budgeting predicted financial losses** incurred by emergency climatic events that will impact agriculture and in turn food security. Foresight into farmers needs' at the onset of these calamities will facilitate implementation of remedial programs.
- Setting clear goals for developing appropriate replacement technologies and practices followed by an implementation stage in consultation with farmers.

There is an urgent need to **address the needs of rural areas** in particular in **developing countries through:**

- Creation of enabling environments to encourage decentralized cooperative initiatives for region specific implementation policies.
- Linking rural and agricultural development with natural resource management.
- Promotion of gender equality as women are key players in ensuring that sustainable practices are adopted to prepare and adapt to climate change.
- Supporting farmers in particular in developing countries to diversify their insurance sources to financially safeguard them from climate induced catastrophes.
- Developing funding mechanisms to allow farmers from developing countries benefits from international catastrophe bonds and weather insurance contracts as useful insurance mechanisms.
- Establishing crop insurance guarantee fund schemes by national governments to help farmers recover from losses and stabilize their incomes in a situation on increasing "climate vulnerability".

It is important to **involve farmers' organisations** in decision making processes, design and implementation of actions related to climate change strategies through the **establishment of follow up commissions including all stakeholders** for implementation and monitoring strategies aimed at fighting climate change.

There is a need to **help farmers keep abreast of climate friendly farming technologies** and initiatives through support incentives from governments and the international community.

ENHANCING AND SUPPORTING FARMERS' DRIVEN INITIATIVES

Farmers are already making efforts to mitigate and adapt to climate change effects through increasing the efficiency of their farming practices e.g carbon sequestration

Adaptation measures should be focused on efficiency and conservation

- Some apex farmers' organizations throughout the world already support individual farmers' initiatives aimed at mitigating or adapting to climate change adverse effects such as the promotion of alternative carbohydrate-based renewable energy policies.
- Farmers already use sustainable farm management practices such as conservation agriculture as a means to generate carbon storage and to combat land degradation, while increasing or maintaining yields. Other techniques include crop rotation, increased crop diversity and integrated pest management.
- Reduction of greenhouse gas emissions is achieved through renewable sources of energy such as biofuels and biomass, non food production such as non food crops and carbon storage through the sustainable management of forests.
- Developing farmer participatory frameworks is needed to:
 - Raise awareness and educate farmers, citizens and consumers on climate change challenges.
 - Develop region-specific strategies.
 - Serve as a platform for knowledge sharing and lobbying to address agricultural and climate change issues.
 - Document farmers' knowledge and identify their needs thus serving as a base for partnerships.

DEVELOPING INNOVATIVE PARTNERSHIPS

- Partnerships between farmers and the research and development communities should include:
 - The development of sophisticated models for regional studies to adapt to possible changes i.e. further research on potential impacts of climate change on agriculture.
 - The development of focused farm specific climate change information.
 - The collection and dissemination of indigenous knowledge, technology transfer projects, and farmer training programs to identify and scale up good management practices.
 - Addressing and planning areas for research and development through partnerships between farmers and scientists e.g. research projects addressing energy harnessing techniques on the farm.

- The development of new technologies to face climate change and anticipate climate variability, in particular related to early warning systems.

- Innovative public-private partnerships are needed to develop sustainable farming technologies and generate high tech agricultural solutions.

CLIMATE CHANGE AND INTERNATIONAL MOBILISATION

- The ratification of the Kyoto Protocol is essential but further steps must be taken. More countries should ratify the Protocol. Farmers support more ambitious goals for a second longer commitment period. All countries should have equal green house gas efficiency requirements.
- The system of emissions quotas market, which does not include agriculture, is not sufficient to meet international commitments. However, the project mechanism system represents an opportunity for agriculture to contribute to climate change mitigation.
- There is a need to develop synergies between the three UN Multilateral Environmental Conventions namely the UNFCCC, the UNCCD (United Nations Convention to Combat Desertification) and the CBD (Convention on Biodiversity), in order to maximize efficiency of use of financial, physical and social resources. Synergies need a particular focus on capacity building, information exchange, technology transfer and carbon emission reporting.
- Climate change loss and adaptation measures need to be integrated into development agencies financial agendas and activities as well as in poverty reduction strategies and development projects.
- There is a need for international consistency in climate change reduction goals. Emissions reduced in one country cannot increase in another.
- Despite the existence of diverse financial mechanisms to support action against climate change, improvements should include:
The Least developed Countries Fund should be use as a finance mechanism for adaptation by farmers to climate change effects.
National Farmers' organizations need direct access to UNFCCC funds currently limited to national governments, parties to the Convention.
Existing funds for other Multilateral Environmental Agreements could serve to benefit climate change mitigation and adaptation efforts. This should be done through integration of climate change goals into projects aimed at combating related environmental concerns.