

#### Emerging and Indigenous Technologies for Climate Change Adaptation in the Farming Systems of Southwest Nigeria: Issues for Policy Action

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The African Technology Policy Studies Network (ATPS) is a multidisciplinary network of researchers, private sector actors and policy makers promoting the generation, dissemination, use and mastery of science, technology and innovation (ST&I) for African development, environmental sustainability and global inclusion. ATPS intends to achieve its mandate through research, capacity building and training, science communication/dissemination and sensitization, participatory multi-stakeholder dialogue, knowledge brokerage, and policy advocacy.



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## Introduction

Changes in climate can be expected to have significant impacts on farm yields and product quality as a result of changes in temperatures, moisture, air and soil. There is however no universally applicable measure for adapting agriculture to climate change, hence managers in the agricultural industry should have sufficient flexibility to deploy the adaptation measures most appropriate for their local situations. This paper is a product of the strategic objective of the African Technology Policy Studies (ATPS) Climate Sense Program that uses the results of a survey of technological and farming systems adaptation to climate change to propose four key policy coordinates for addressing adaptation to climate change in the farming systems of southwest Nigeria. These are:

- 1. the need for facilitating attitudinal change among key stakeholders in the agricultural sector
- 2. the importance of raising awareness and training for early career researchers on climate change
- 3. the fact that climate change adaptation strategies need to be location specific and
- 4. the need for facilitating exchange of climate change information through appropriate combination of media

As such, this document:

- 1. highlights the importance of addressing climate change challenges and the need for adaptation technologies for farming systems in Southwest Nigeria
- 2. examines the issues arising from key stakeholder perspectives (farmers, extension workers and researchers) and
- 3. presents the policy implications and issues for policy action for addressing adaptation to climate change in the farming systems of southwest Nigeria

## Stakeholder Perspectives on Emerging and Indigenous Technologies for Climate Change Adaptation

#### **Farmers' Perspectives**

Crop production is the dominant agricultural enterprise that farmers in southwest Nigeria engage in. It is practiced by over 90% in the savanna and rainforest zone, but only 37.82% in the swamp regions where the primary agricultural enterprise is

fishing/fish farming. Even though farming is the commonest primary occupation, 2.44% engage in charcoal production as their primary occupation in the savanna zone. The major environmental issues of charcoal production are deforestation and loss of biodiversity. The consequences of these are increased incidence of wind erosion, higher rates of flooding during the raining season, excessive environmental heat regimes. This is more worrying as an additional 10.57% of the farmers in the same zone engage in charcoal production as a secondary occupation.

There is a high level of climate awareness among farmers (more than 90%) in southwest Nigeria. Their main sources of information about climate change are personal observation, personal contacts, family and friends as well as radio and television. It should be of concern however that only 3.36% of the farmers in the swamp zone and not anywhere else recognize government agencies, research institutes and extension agencies as their sources of information about climate change phenomena.

Location (agro-ecological zone) remains the significant variable in indicating the variability in the farmers' observation of changes in the key climate change indicators (temperature, rainfall and wind). Most of the farmers (65.75%) opine that farming activities such as bush burning, use of agro-chemicals and deforestation contribute to climate change. Coping with climate change had therefore become essential part of farmer's life in southwest Nigeria. However, 52.9% of the farmers in the savanna zone have not yet adopted any strategy or technology to cope with climate change. The main coping strategy adopted by 87% of the farmers in the swamp zone is the construction of drainages. In the rainforest and savanna agro-ecological zones, 48.3% and 16.3% of the farmers respectively are coping with water shortage for farming activities by adopting small-scale irrigation systems. In the traditional farming systems of southwest Nigeria, fadama farming is new and is mainly adopted as response to changing climatic conditions. Fadama farming became more popular in southwest Nigeria in the 1990s when the National Fadama Development Project (NFDP) popularly called FADMA Project was introduced as a major instrument for achieving the government's poverty reduction objective in the rural areas of Nigeria.

The main constraints faced by farmers implementing adaption strategies to climate change in the swamp zone are poverty (84.78%) and lack of awareness

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(72.27%). In the rainforest, the high cost of implementing adaption strategies is the major constraint to adoption.

#### **Extension Officers' Perspectives**

Majority of the extension officers have observed climate change phenomena in all there three agro-ecological zones (swamp (94%), rainforest (89%) savanna (79%)) of southwest Nigeria. Their main sources of information about climate change are personal observation (74.4%), radio (45.6%) and television (37.6%). It is noteworthy that less than 20% mentioned research institutes and government agencies as their sources of information. This finding may suggest an information gap between researchers and extension officers or perhaps a reflection of the dearth of research on climate change in southwest Nigeria.

Majority of the extension officers (about 90%, except in the rainforest where it is 61%) have observed higher environmental temperatures in southwest Nigeria. Similarly, more than 80% of the extension officers in the swamp and savanna agro-ecological zones concur that rainfall volumes have been lower. Only 55% of the officers in the rainforest appear convinced that rainfall volumes have been lower. Finally, except in the savanna agro-ecology, there is no clear-cut opinion among extension officers as to their observation of wind variability. Unlike farmers, extension officers' observation of general climate change phenomena is independent of location. It is however a significant factor in extension officers' observation, rainfall and wind).

Most of the extension officers opine that the causes of climate change in southwest Nigeria are: transportation (88%), industrial activities (86%) and farming activities (82%). The main strategies and technologies promoted by extension officers for farmers to cope with the effects of climate change in southwest Nigeria are: tree planting (30%), timely planting of crops (6%) and avoidance of bush burning (6%) in the swamp zone. In the rainforest zone, it is provision of small scale irrigation (25%), mulching (16.7%) especially on yam farms, and avoidance of felling trees (8.3%). In the savanna zone the main coping strategies and technologies promoted are: avoidance of tree felling (25.6%), avoidance of bush burning (23.1), small scale irrigation (5.15) and studying weather condition before planting crops (5.1%). It noteworthy however that 88% of the extension officers in the swamp zone and 62% of the officers in the

rainforest opine that farmers response to the coping strategies and technologies have been positive. Conversely, half of the extension officers in the savanna agroecological zone opine that most farmers have been indifferent to the coping strategies and technologies they have promoted. The reason for this perceived poor farmers' response to extension messages require further investigation as only 5.6% of the extension officer sees farmers' refusal to adopt extension message as a key constraint to implementing climate change adaptation strategies.

#### **Researchers' Perspectives**

Only 14 researchers were found whose work is relevant to climate change after an extensive search of all the agricultural research institutes and universities with agricultural faculties in southwest Nigeria. Six of the 14 researchers hold a M.Sc., one had an M.Phil. and 5 hold PhDs in their respective fields. The minimum number of years on the job as a researcher spent by any of them is 1.5 years while the maximum is 30 years. Half of them have spent less than 5 years on the job. In terms of the agricultural enterprises on which their research is focused, 9 of them work on crop production related enterprises, 6 work on tree cropping and forestry related issues, 4 carry out their research on fishing and fish farming, and carry out their research on livestock enterprises. Three of them are agricultural economists; two each are fisheries and soil scientist while other areas of specialisation such as agro-metrology, animal science, crop management, entomology, forest ecology and conservation, forestry and wildlife as well as plant pathology are represented by one respondent each. This may be an indication of the overall dearth of climate related researchers in Africa. It may also reflect the fact that the relevance of the influence of climate change issues to various areas of specialisation in agriculture is only beginning to gain ground in southwest Nigeria despite the predominance of agricultural research institutes and higher institutions of learning offering courses in agriculture and related fields. All of them have noticed climate change phenomena in their vicinity. Unlike farmers and extension officers, researchers rely on external sources such as the internet, television, research institutes and radio for information on climate change.

## **Conclusion and Policy Options**

#### Need for attitudinal change among key stakeholders

Attitudes have strong influences on peoples' decision-making. It is important therefore to further explore how farmer's attitude to climate change influences their response to the uptake of climate change adaptation technologies. It should also reveal how their attitude could be positively influenced to attain higher levels of adoption of climate change technologies and improve that overall ability to make conscious and responsive decisions to climate change.

There is a general conviction among farmers, extension officers and researchers that crops and forests management technologies are the main tools for adapting to climate change. It is noteworthy however that adapting to climate change is as much a technology issues as an attitudinal one. This study have shown that unless peoples' general attitudes to climate change issues are altered, the decision to adopt relevant adaptation techniques (emerging or indigenous will follow a very slow path.

Raising awareness and training for early career researchers on climate change The number of researchers working on climate change related issue is few in southwest Nigeria. There is a need to consciously raise awareness of climate change issues in the shot-run among early career researchers and in the long run a deliberate campaign in schools and universities to focus young minds into investigative enquiries on the climate and how best society should adapt as change occur that are most often irreversible.

Even though farmers, extension officers and researchers appear to have very high levels of awareness of changes in climate change phenomena, there sources information differ markedly from personal contacts among farmers to a bit of personal contact and mediated sources such as radio and television among extension officers and to internets and other non-personal and external sources among researchers. It is also noteworthy that many farmers and extension officers did not consider research institutes and government agencies ad their main sources of information on climate change adaption. This finding suggests that media campaigns designed to reach farmers, extension officers and researchers need to be audience specific. The power of the school system to unleash societal change have been demonstrated in the 1960s when the government of Western Nigeria used the school systems under its Free education System as the fulcrum of social change. This potential of the school system is recognised and used in a haphazard manner in very small pilot level projects such as PATTIN. A bolder approach similar to the social change approach of the 1960s is required to fully utilize the school system to promote a more lasting climate sense in southwest Nigeria. This should be done with conscious investments in research to fully understand the changes that the school system have undergone over the years and how it can be best used as a long term climate change response system at all levels (farming extension services, research, inputs delivery and other ancillary requirements).

#### Climate change adaptation strategies need to be location specific

The influence of location (agro-ecological zones) on the observation of climate change phenomena by farmers and extension officers is staggering. While farmers in the swamp and rainforest appear to have a basket of emerging and indigenous technologies to cope with climate change, farmers in the savanna zone seem to be on the back-bench. Unfortunately, the most vivid climate change impact for visitor to southwest Nigeria, especially in the transition zones between agro-ecological zones is that as rainforests become savanna-like (derived savanna), savannas becomes desert-like (desert encroachment). It is important therefore that a location specific strategies need to be developed to raise the profile of climate change awareness and the urge to adopt emerging and indigenous technologies to cope with climate change in the various agro-ecological zones.

Furthermore, given that farmers in this zone earn less from their primary occupation (farming) than in the other two agro-ecological zones, it can be concluded that financial limitations as a key constraint to adopting emerging and indigenous technologies for climate change adaption at least in the savanna zone of southwest Nigeria. But it is not enough to throw money at problems. A deliberate attempt at raising farm productivities and improving return to farming as a business would help in the long-run to facilitate uptake of relevant climate change adaption strategies.

The major technologies adopted by farmers to adapt to climate change as expectedly agro-ecology specific. Construction of drainages is popular in the swamp zone. Small scale irrigation, mulching and IPM are common in the rainforest and afforestation is the leader in the savanna. While fitting technologies to location could address climate change in the short run, the fact that the observable change is continuous suggests that farmers need to be empowered with a range of technologies that may not be applicable to their agro-ecology toady in anticipation of future changes and therefore ability to cope when such changes eventually manifests. The farmers who will be better able to cope are those who already know what to do when the change actually manifests, not those who wait to be informed after the change is manifest. Therefore efforts to improve the general levels of formal educational attainments among farmers and improve their ability to obtain information from more external and wide-ranging sources than personal circles will contribute in this direction.

# Facilitating exchange of climate change information through appropriate combination of media

Farmer-Extensioner-Researcher linkage models as encapsulated in the Research-Extension-Farmer-Inputs Linkage System (REFILS) has been used in southwest Nigeria to promote the uptake of technologies targeted at improving the productivity of arable crops. Similar models can be used to develop farmer's response system to adopting appropriate and responsive climate change adaptation systems. Investigations to make this happen are required to properly focus research investments and direct the attention of the research community currently engrossed in yield-increasing models to more sustainable climate sense approaches to agricultural production.



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