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Cultivating success: the need to climate-proof Tanzanian agriculture

All farming is a gamble with nature. The impacts of climate change, however, can pit farmers against impossible odds – particularly in poor, geographically vulnerable nations with largely agrarian economies. Tanzania is one such country. Some 80 per cent of its workforce is in agriculture and, with climate change set to lower yields in key crops, the implications for its economy are serious. Where, how and when climate impacts will hit is key – as is an action plan for averting the highest costs. Policy needs to focus immediately on helping farmers adapt to climate impacts by addressing both food production and marketing efficiencies. This is crucial: Tanzania is a test case for economic impacts predicted throughout sub-Saharan Africa. Replicating this policy approach in other low-income countries is essential if low-carbon growth and other development priorities are to become realities.

Policy pointers

- **The impacts of climate** change in Tanzania could reduce yields for some crops, effectively shrinking its GDP by 0.6-1 per cent by 2030.
- **After 2030, the overall** impact of climate change in Tanzania is forecast to be extreme.
- **These figures underestimate** the actual impact: macroeconomic analyses in developing countries exclude the informal economy.
- **Climate impacts will be** uneven across the country and a range of social groups.
- **Farmers will need to adapt** to climate impacts over the next 20 years to avoid catastrophic future costs, but will need policy backing.

Climate vulnerability: Tanzania as a test case

Low-income, largely rural and highly vulnerable to climate change: Tanzania's profile reveals a country facing a major climate challenge. Despite this sprawling sub-Saharan country's massive natural riches – from the Serengeti to gold, diamonds and natural gas – poverty is endemic, spanning pastoralists to small-scale farmers, and rural to urban. Tanzania suffers from data poverty too. But building up an accurate picture of the country's economic vulnerability to climate change is key if policy is to be directed at reducing risks and exposure. A look at the available data and insights offers a starting point.

Climate forecasts Climate change is expected to affect this large and physically diverse country in a variety of ways. Temperatures in East Africa are expected to rise by between 2-4 ºC by 2100, shifting agro-ecological zones. Climatic patterns are becoming both less predictable and more severe: a 1997 drought was followed by a fivefold increase in rainfall in 1998, and then one of the worst droughts in four decades in 1999.

Rainfall patterns are expected to become highly variable across the country, with an increase in the north of 5 to 45 per cent and decreases of 5 to 15 per cent elsewhere. Wetter regions are at risk of more frequent and severe flooding. Parts of Tanzania's 1400-kilometre coastline are also at high risk: sea level is predicted to rise by up to 0.9 metres, aggravating coastal flooding.

Climate variability, a precursor of climate change, is already affecting Tanzania in the form of droughts, flooding and coastal erosion. Climate change will worsen all of these.

Forecasts for the agricultural economy Tanzania has made good economic progress over the past decade. For it to continue, attention needs to be paid immediately to climate impacts. This is something of a challenge, as the economy's climate vulnerability is not uniform across the country, and does not conform precisely to top-down estimates about future climate scenarios. What is sure is that in Tanzania, agriculture is the sector most vulnerable to changing climate.

Currently, agriculture accounts for 45 per cent of GDP, 80 per cent of employment, 66 per cent of merchandise exports, and 55 per cent of foreign exchange earnings. Farming is practised at the small scale, with most farms 3 hectares or less. With pastoralism, such farms form the bedrock of rural subsistence and informal economies, and take up 60 per cent of total cultivated land. It is clear that small changes to agricultural production owing to droughts, floods, disease or pests will affect rural livelihoods and the national economy severely – particularly as this is a country where 70 per cent of the total crop area is cultivated by handheld hoe.

Agricultural development underpins Tanzania's Development Vision 2025, which has an economic growth target of 8 per cent. Agriculture is also the priority sector in the country's National Adaptation Programme of Action or NAPA, effectively the national blueprint for adaptation to climate impacts. So in Tanzania, agriculture plays the part of both challenge and solution.

The government recognises that a high dependence on it is risky in the context of the country's economic development, yet also envisions agriculture as the engine driving economic transformation. Tanzania's ability to meet its growth and poverty reduction targets depends much on how climate impacts pan out in this sector. Growth in agriculture will boost growth in other sectors over time – which paradoxically will decrease agriculture's share in the overall economy, from 45 to 15 per cent by 2085.

Factoring in the differential impacts of climate change across landscapes and social groups is crucial to showing where costs and benefits will occur and what these mean for delivering on the 2025 Vision. The agricultural production base is varied (spanning highland, lowland, large- and small-scale farms, for instance), however, so this is a tall order for planners. They need to know future climatic scenarios and how these will affect the agricultural sector.

Yields will change and this will hurt livelihoods. As a benchmark, a 10 per cent reduction in rainfall will make many parts of the country unsuitable for producing maize, Tanzania's staple food. The impact here will fall initially on the poorest rural farms and households that operate outside the formal economy.

Quantifying the impacts

To quantify the climate impacts on Tanzania's national economic development projected for the 2010-2085 period, a novel approach was used. Data was generated from a series of stakeholder engagements, and analysed via macroeconomic computer modelling. The social accounting matrix developed by the International Food Policy Research Institute for 2000 was used as a baseline. (Economic forecasts due to climatic impacts on other sectors were not included in the model. Nor was the informal economy; although this is important in Tanzania, it is omitted from national accounts.)

The computer model estimated the general equilibrium effects of climate impacts on agriculture on the economy as a whole. The model also used expected changes in agricultural productivity in East Africa. It assumed a steady investment as a share of GDP, declining importance of agriculture to the economy as other sectors grow, and an annual population growth of 2.9 per cent. The model's key variable responding to climate change was agricultural productivity.

What the model found was that climate change will trigger a 0.6 to 1 per cent decline in GDP by 2030. By 2085, the decline in GDP will range from 5 to 68 per cent, depending on the severity of climate impacts. Climate change will boost productivity in barley, rice, wheat and some other grains, yet will decrease productivity in maize. Given that this is Tanzania's key crop, the implications are serious (see below).

This finding is in line with that of the 2006 Stern Review on the Economics of Climate Change, which states that while certain impacts may be locally beneficial in the short term, the overall effects over time will be largely detrimental. The more extreme impacts shown by the model for the years after 2030 are largely the result of continued warming. Climatic and economic uncertainties over those years could in effect push economic losses to the upper limit of 68 per cent, if no adaptive measures are taken. The end result is the reversal of any land production gains made in the early years of the period studied, post-2010.

Who will be hit hardest?

At national level, the net economic costs and benefits of climate impacts appear close to neutral. However, the poor are expected to be hardest hit by shocks to the system, even though the analyses show few distributional impacts across socio-economic groups.

Over 80 per cent of Tanzania's poor grow maize. As we have seen, maize yields are highly likely to decline under the impacts of climate change. This constitutes a blow to food security. Women – who dominate Tanzanian agriculture – would be badly affected. Poor small-scale farmers have little capital to set up irrigation systems or otherwise maintain high land productivity. The poorest tend to grow mainly subsistence crops, so would gain little from anticipated increases in prices for crops that stem from higher food prices. Poor urban households would also lose out in such a scenario, as food prices could rise beyond their means.

An eye to the future

Tanzania needs to build on its economic progress via climate-proofing measures. The first priority is helping farmers to adapt. The second is helping rural livelihood systems become more resilient. If a policy of appropriate adaptation is pursued over the next 20 years, the needed level of resilience can be built to withstand the climate impacts of the coming decades. But this depends on whether policies make adaptation easier for rural people.

New supply chains for inputs, new 'middleman' relationships, access to appropriate credit, insurance, technology and training will all be needed. The private sector could deliver much of this. Experience elsewhere shows that a kickstart from public policy stimulus can have a significant effect on livelihoods. Given the political will to match its vision, Tanzania and countries like it could turn the corner on climate change.

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