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The first Millennium Development Goal, agriculture and climate change

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'Over 60% of people in sub-Saharan Africa are reliant on agriculture for their income. However, the potential impacts of climate change pose two key questions for current agriculture-led strategies to reduce poverty.'

Do the physical impacts of climate change affect the prospects for achieving the first target of the Millennium Development Goals (MDGs), to halve world poverty? With the official mid-point of the MDGs on 7 July 2007, this is an important question to consider as we assess challenges to meeting these goals, and look beyond them.

At a global level, the latest UN MDG report argues that the proportion of people living in extreme poverty has fallen, from 28% in 1990 to 19% in 2002, using the $1-a-day poverty line. However, this progress has been highly uneven. Structural change in East and South Asia has driven the reduction in global poverty incidence, but in sub-Saharan Africa (SSA) there was no progress in the 1990s, and it is too early to say whether tentative declines in poverty since 2000 are a new trend. Despite rising urbanisation, over 60% of people in SSA are reliant on agriculture for their income. The potential impacts of climate change pose two key questions for current agriculture-led strategies to reduce poverty.

Climate change: Certainty and uncertainty

Current scientific evidence suggests that the physical impacts of climate change are unlikely to be substantial in the short-term, that is before 2015. But the medium term is a different matter. This is important, not just for looking beyond the 2015 target to the Goal proper – to eradicate extreme poverty and hunger – but also for the durability of the poverty exits achieved before 2015.

While the future physical impacts of climate change are unclear and contested, with aggregate figures masking significant intra-continental variation, two general trends in SSA are discernable.

First, in the longer-term, small increases in temperature are, in aggregate, expected to reduce crop yields and the area of arable land to a greater extent than other regions.[1] Some project up to a 9% decrease in potential agricultural land by the 2080s and a reduction in yield of up to 10% and 18% for cereals and maize, respectively, by 2050.[2]

However, the pathways of change are not straightforward. A clear example is the 'hill function': that the positive effects of higher temperatures and CO2 levels on crop yields (through increased photosynthesis) reach an inflection point after which further increases in temperature reduce yields.[3] Such thresholds differ across species and landscapes, with, for example, maize yields being particularly sensitive to increases in temperature, because maize does not utilise higher CO^2 levels effectively.[4] Improvements in crop varieties and wider agricultural technology might counteract reduced yields, especially as current figures are often considerably below optimal levels, but this is not certain.

The second general trend is that episodes of heavy rainfall and drought are likely to become more frequent and severe, and that prediction of these events will remain difficult. These physical impacts are much more short term. The The Intergovernmental Panel on Climate Change (IPCC) finds that it is likely (› 66% probability) that there has been an increasing trend in such events in the latter half of the 20th Century and 'very likely' (› 90% probability of occurrence) that the frequency and severity of such natural hazards will increase in the mid to late 21st Century.

Both of these general trends – decreased crop yields and areas of arable land, and increased occurrence and intensity of natural hazards – have implications for agriculture-led poverty alleviation policies.

The challenges of climate change for agricultural policy

Current approaches to poverty reduction, as exemplified by the UK Department for International Development's (2005) Agriculture Policy Paper, highlight the critical role of agricultural productivity in stimulating agricultural growth and poverty reduction.[5] Supported by the experience of Green Revolution productivity gains in South and South-East Asia, and based on the inverse relationship between farm size and productivity, small farm approaches argue that labour-intensive smallholder-led increases

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in yields can address both growth and equity goals at once: directly (through income increases), and indirectly (through increased employment and demand for goods and services). Small farms are generally owned and operated by the poor, use locally-hired labour, and distribute income within nearby locales, creating multipliers. They also have advantages over large farms in certain types of transaction costs: the supervision of labour, local knowledge, and food purchases and risk.

Climate change might challenge this current policy approach in two ways. First, climate change raises questions about the source of agricultural growth, and the relationship between land and labour productivity. For African countries in the early stages of rural growth, the current policy approach argues that both land and labour productivity must rise, but land productivity must rise faster – to create employment, absorb surplus labour, and stimulate demand for non-farm goods and services. Some already question whether this Asian-style agricultural model is applicable to the SSA context, and what effect HIV/AIDs may have on the land and labour productivity ratio. Moreover, if climate change also means that there is less agricultural land available, and the area of low-potential land is increased, the need to increase land productivity to stimulate agricultural growth becomes all the more pressing.

Second, climate change poses a question about the likelihood of the multipliers stemming from agriculture-led growth. Increases in farm-based income are closely linked with increases in non-farm income in the wider rural economy (e.g. from vending, petty trading, provision of everyday services). This is especially pronounced from broad-based smallholder-led agricultural growth. However, a key issue for a dynamic non-farm rural economy is that there must be consistent and stable increases in agricultural incomes. Diversification into non-farm activities usually only occurs to a significant extent when demand for goods and services at the end of agricultural cycles is regular and constant. As we have seen, the only certainty regarding climate change is increased variability (including increasingly changeable rainfall patterns), implying that agricultural growth patterns will become more capricious. Therefore, what is the likelihood of sustaining non-farm rural growth when agricultural incomes are increasingly unpredictable?

A mixed picture, but good grounds for concern

We do not wish to paint an overly-pessimistic picture regarding the impacts of climate change. Increased meteorological variability might increase yields in particular locations, open up new cropping possibilities, and lead to reconfigured patterns of growth and trade that will benefit some.

There are potential benefits for farmers from climate change mitigation, for example through new revenue flows from carbon markets and biofuels. And there are also good reasons to suggest that communities and systems may adapt to such a long-term shift. The high flexibility and adaptability of small farms – not least the experience of farmers in coping with variable climates – may also enable labour-intensive smallholder-led agricultural growth to occur. On the other hand, there are also reasons to think that small farms might struggle to adapt: poorer farms are often found on less productive land, and in marginal environments; and will clearly struggle if adaptation requires large financial costs. Overall we feel there are good reasons to be concerned.

In the face of increased uncertainty and risk, the two key adaptive responses at the country level are diversification and flexibility. However, such responses may be difficult for many SSA countries. Path dependence on conventional export crops, and few opportunities to shift to manufactured exports (due to trade regulations and market conditions), could mean that climate change might further lock countries into cycles of low and fluctuating agricultural growth and limited poverty reduction.

In short, there might be a limited window of opportunity for current strategies to trigger rural growth processes, and wider multipliers, in rural economies in parts of sub-Saharan Africa. It may only be a matter of two or three decades before current strategies to foster smallholder-driven rural growth become much harder to achieve. If so, this is a clear reason to redouble efforts at stimulating smallholder-driven rural growth processes immediately. And while we have focussed on SSA, similar dynamics may be significant in parts of rural Asia, particularly India, where a large number of the world's poor live.

Governments and aid agencies must start to think beyond 2015. The first Millennium Development Goal has always begged the question: what about the other half?[6] The projected impacts of climate change pose a further question: if poverty is not reduced substantially in SSA countries by, say, 2040, then can poverty reduction using current strategies be achieved at all?

Endnotes

1. See http://www.ipcc-wg2.org/. Also Cline, W.R. (2007) 'Global warming and Agriculture' *Centre for Global Development Brief,* September 2007.
2. Fischer, G., Shah, M. and van Velthuizen, H. (2002) *'Climate Change and Agricultural Vulnerability'* Report prepared for the World Summit on Sustainable Development, Vienna: International Institute for Applied Systems Analysis.
3. Parry, M. L., Rosenzweig, C., Iglesias, A., Livermore, M., and Fischer, G. (2004) 'Effects of climate change on global food production under SRES emissions and socio-economic scenarios' *Global Environmental Change* 14, p. 53–67.
4. Stern, N. (2007) '*The Economics of Climate Change: the Stern Review*' London: HM Treasury.
5. See http://tinyurl.com/34xy5h
6. See http://www.chronicpoverty.org/

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