

Comments on “Low Carbon Strategy for Agriculture and Forestry” by Prof. Hoda et al.

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Paper illustrates well who will be most hurt by climate change

- **Vulnerability of poor, esp. rural poor** in tropical countries to CC—this is confirmed by both macroeconomic and agronomic work
- Paper shows **impressive efforts Gol is making** to promote adaptation to coming climate change
- One thing that could be added is that in fact **world as a whole can probably muddle through for another 25 years** under BAU
- But the **impact of this on resource base that nourishes the country would be severe** and make situation much more dangerous

Macro literature on impacts of climate change on poverty (Skoufias, Rabassa and Oliveri 2012) supports view in paper:

- Estimated impacts of CC on poverty headcounts very sensitive to assumptions about **capacity for adaptation** (outmigration, job changes, technology, etc.)
- They are also very sensitive to independent **assumptions about growth**
- The worst poverty impacts come from increased (but still low) **likelihood of extreme weather**
- Most negative impacts are projected for **Africa and South Asia**, where current poverty is highest, the share of agriculture in employment is still relatively large, and present adaptation policy is lowest
- The vehicle for impacts are effects on **agricultural productivity and food prices**

As does a general equilibrium model of India with distributional effects to 2040

Reference: (Jacoby, Rabassa, and Skoufias, 2011)

- **Climate Change impacts hurt the poor more than the rich** b/c of role of cereal prices
- Under average growth outlook, poverty head count (<\$1/day) **increases 3.5% relative to no CC** baseline by 2040
- But the increase is **4.4% in (already poor) rural areas** and 0.6% in urban areas
- **With a low growth outlook**, the corresponding increases in the poverty head count are 4.8% overall, and 5.9% in rural areas, 1.1% in urban areas.

Agric. research shows danger of 5 % lower crop yields from each degree C of global warming!

- Each day above 30 deg. C reduces the yield of maize by 1% to 1.7 % depending on rainfall (Lobell et al. 2011).
- Flooding already affects up to 15 million hectares of rice fields in South and SE Asia, an estimated \$1 billion in yield losses per year.



Est. Impacts of 2 Degree C. Climate Warming on Cereal Yields in South Asia by 2050

Crop	Production in 2000 (mmt)	Projected annual yield growth WITHOUT climate change	Projected annual yield growth WITH climate change
Rice	120	0.9%	-0.2%
Wheat	97	1.6%	-1.3%
Maize	16	0.6%	0.1%

Note: Assumes no additional CO2 fertilization effect under climate change.

Implies about a 1/3 decrease in cereals production per capita under CC!

Source: Nelson et al. 2010 (IFPRI)

Climate change threatens what has been achieved since 1960s for poverty, food security, and social stability

- Adequate global amounts of food are necessary to food security, even if not sufficient
- Climate change of 3 degrees+ C could send World backwards with reductions in food per capita of the order of 10-20% perhaps as soon as 2050 and definitely by 2100
- The impacts at lower tail of distribution likely far worse
- Some effects as in low-lying SE Asia may happen by 2030 instead of 2050 as thought before
- Effects on rural poor in developing country societies/economies would be catastrophic

Source: World Bank 2013 reports from Potsdam Institute (PIK)—"Turn Down the Heat", vols. 1-2

Paper makes strong case that what is good for BOTH food security and mitigation of GHG is greater efficiency in resource use

- Shows in detail how **agriculture is in fact one of the big contributors to CC** in tropics, and this is linked to inefficiencies , many policy-induced
- Recognizes the need for more food in tropics for **food security, and that latter is something that cannot be done without**
- Growing the necessary food needs means the **world needs to be much more efficient in food production**
- And this path **will reduce GHGs significantly**

Putting the food production problem in a global “resource squeeze” context...

- Population increase to 9.6 billion, changing diets and other uses means agricultural production **must add 69% more calories by 2050** (FAO, WRI 2013)
- Additional food must come **primarily from intensification** as the land and water frontier tightens (WB 2008; FAO 2012; WRI 2013)
- Need **another 150 cubic km/yr water and another 100 million tons of NPK** (FAO 2012)
- **And to meet the need without further land expansion yields would have to grow 32% faster to 2050 than they did since 1970!!**



And the GHG Emissions from Agriculture and Land Use Change.... (2010, in Gt CO₂e)

	Global	India	China	USA
Livestock related	3.46	0.40	0.30	0.26
Fertilizer	1.28	0.11	0.23	0.07
Direct Ag total	6.4	0.64	0.68	0.45
Land Use Chg	5.4	-0.02	-0.30	-0.09
AFOLU Total	11.8	0.62	0.38	0.36
% Total National GHGs	24%	22.6%	3.3%	5.4%

Source: Country data is from FAOStat; national aggregates from WRI CAIT 2.0

Paper nicely details actions to improve efficiency for both growth and sustainability

Examples:

- **Efficiency savings in agric:** >50 Mt CO₂e/yr in 5-10 years and >75 Mt CO₂e/yr longer term
 - Water, more efficient use of electricity and diesel for pumping
 - Livestock
 - Fertilizer efficiency
 - Rice, using SRI technology
- **Restoration of degraded forest land,**
 - Up to 55 MT CO₂e additional to direct ag savings

Bottom line of paper

- Vital to get **yields up in order to reduce extensification**—and need more research for **“triple wins”**--increased productivity, greater resilience of livelihoods to climate change, and mitigation of GHG emissions
- **Interventions need to be at landscape level** and need **landscape level institutions** to share costs and benefits across small farms
- **Need policies that motivate efficient behaviour**
- **Of the order of 0.1 Gt CO₂e/yr in emission savings possible as a co-benefit of needed growth in production**

Bottom line globally....(1)

- **Zero net deforestation is a realistic goal, but should set a formal target** in terms of timing—2030 in UN post-2015 process, or much sooner?
- **Need monitored target on reforestation** as part of UN Post 2015 process—but not clear how much suitable land given other land uses, probably 300 Mha max by 2030 (double Bonn Challenge)
- Need to **expand best-practice on landscape-level institutions** (e.g. Loess Plateau in China) to allow small farmers to share more fairly in both costs and benefits of investments improving ecosystem services

Bottom line globally....(2)

- **Expand best practice on conditional cash transfers (e.g. *Bolsa Familia* in Brazil) to smallholder subsidy issues** where behaviors are vital to productivity and sustainability, like input use and tree planting.
- **Target and expand agric research** to “triple wins”, in a way that can be monitored and evaluated
- **Reduce share of global food that is avoidably wasted (up to one third)**, including storage losses in developing countries—implement food waste protocol like GHG protocol