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Green Revolution in Sub-Saharan Africa: Implications of Imposed Innovation for the Wellbeing of Rural Smallholders

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Summary. — Green Revolution policies are again being pursued to drive agricultural growth and reduce poverty in Sub-Saharan Africa. However conditions have changed since the well-documented successes of the 1960s and 1970s benefitted smallholders in southern Asia and beyond. We argue that under contemporary constraints the mechanisms for achieving improvements in the lives of smallholder farmers through such policies are unclear and that both policy rationale and means of governing agricultural innovation are crucial for pro-poor impacts. To critically analyze Rwanda's Green Revolution policies and impacts from a local perspective, a mixed methods, multidimensional wellbeing approach is applied in rural areas in mountainous western Rwanda. Here Malthusian policy framing has been used to justify imposed rather than "induced innovation". The policies involve a substantial transformation for rural farmers from a traditional polyculture system supporting subsistence and local trade to the adoption of modern seed varieties, inputs, and credit in order to specialize in marketable crops and achieve increased production and income. Although policies have been deemed successful in raising yields and conventionally measured poverty rates have fallen over the same period, such trends were found to be quite incongruous with local experiences. Disaggregated results reveal that only a relatively wealthy minority were able to adhere to the enforced modernization and policies appear to be exacerbating landlessness and inequality for poorer rural inhabitants. Negative impacts were evident for the majority of households as subsistence practices were disrupted, poverty exacerbated, local systems of knowledge, trade, and labor were impaired, and land tenure security and autonomy were curtailed. In order to mitigate the effects we recommend that inventive pro-poor forms of tenure and cooperation (none of which preclude improvements to input availability, market linkages, and infrastructure) may provide positive outcomes for rural people, and importantly in Rwanda, for those who have become landless in recent years. We conclude that policies promoting a Green Revolution in Sub-Saharan Africa should not all be considered to be pro-poor or even to be of a similar type, but rather should be the subject of rigorous impact assessment. Such assessment should be based not only on consistent, objective indicators but pay attention to localized impacts on land tenure, agricultural practices, and the wellbeing of socially differentiated people.

Key words — Sub-Saharan Africa, Malthusian trap, agricultural modernization, impact assessment, policy framing, Rwanda

1. INTRODUCTION

"Green Revolutions" transformed the rural economies of many Asian and Latin American countries during 1960–90. The transfer of the same strategies to Sub-Saharan Africa (SSA) had limited success, due in part to locally unsuitable seed varieties (Evenson & Gollin, 2003) and a lack of human and institutional capacity (Denning *et al.*, 2009). Contemporary proponents of an African Green Revolution claim these obstacles have now been overcome through capacity building and the development of locally relevant technologies (Ejeta, 2010). Indeed agricultural growth is widely viewed as the only pathway to long-term and pro-poor economic development in SSA, by driving growth in the wider economy and allowing for absorption of excess labor through growth in the rural non-farm economy (Adelman, 1984; Collier & Dercon, 2014; Diao, Hazell, & Thurlow, 2010; Minten & Barrett, 2008). As a result of this analysis, policies for a Green Revolution in Africa have become heavily supported by donors (Jayne & Rashid, 2013; Sanchez, Denning, & Nziguheba, 2009).

In considering the prospects for an African Green Revolution, it is important to consider changes in the political economies of rural development since the 1960s and 1970s. Earlier Green Revolutions occurred when rural development politics was shaped by narratives of state-led modernization, import substitution, and growth through redistribution, a political context that justified transformative levels of state financing and extension activities (Ellis & Biggs, 2001). For example policies in India, Indonesia and the Philippines in the mid-1960s promoted smallholder-driven agricultural intensification through massive public investments that included price guarantees to raise smallholders' incomes (Birner & Resnick, 2010). By contrast, the context for contemporary African rural development was transformed by the spread of neoliberal political agendas, including the structural adjustment policies of the 1980s and 1990s, with governments now facing greater conditionality structures and smallholders facing lower and more volatile prices and less favorable terms of trade (Dorward, Kydd, Morrison, & Urey, 2004). These political constraints on state support for agriculture are arguably compounded by the challenges faced in SSA today, including relatively high population densities in those areas best suited to agriculture, high dependency ratios, relatively poor infrastructure, and vulnerability to climate change. These are major challenges for realizing directly pro-poor impacts from

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agriculture. As a result, there has been a shift away from viewing Green Revolution technologies as directly pro-poor and scale neutral, toward a view that poverty alleviation will be achieved indirectly and over longer timescales, through trickle-down effects from an agricultural boom, including employment opportunities, reduced food prices, and a developing rural non-farm economy (Dorward *et al.*, 2004). Green Revolution policies still aim to create material benefits through more immediate micro-social processes as well as longer term macro-economic logic; but the balance has shifted toward the latter in SSA (Collier & Dercon, 2014).

Just as the politics of statehood have changed since earlier Green Revolutions, so too have the political narratives of civil society. In particular, we note that ideas of food sovereignty have become significant, both in more organized forms of advocacy and more generally in terms of how the rural poor respond to imposed agricultural policies (Chaifetz & Jagger, 2014). In a context in which agriculture has already been exposed more to variability in market prices and climate, farmers might be characterized as increasingly resistant to changes that are perceived to further reduce their control over food production (Agarwal, 2014).

For these reasons we contend that the mechanisms by which many of SSA's agricultural policies are expected to alleviate poverty and enhance food security are not inherently clear. In particular, we are interested in how policies play out at local level and affect different groups of local stakeholders. Much policy assessment work operates at the macro scale, and either aggregates people (providing average effects only) or evaluates limited types of impact (focusing for example on income or nutritional status). More localized cases that shed light on micro-level experiences are important to complement these macro surveys as they can capture socially differentiated experiences and explore locally relevant factors in poverty and wellbeing. The importance of such understanding is elaborated in the remainder of the introduction. We then introduce our case study, describing policies to drive growth in agricultural production in Rwanda. The specific contribution of this paper is to reconcile opposing perspectives of Green Revolution policies, to elucidate relevant micro-social processes in the case of rural Rwanda in order to complement the macro-economic logic which guides policy implementation and dominates its assessment. The results are utilized to draw out general conclusions about agricultural policy and assessment in SSA and more specifically to make recommendations for adapting and improving Rwandan policies' contribution to the wellbeing of the rural poor in the study region.

We conceptualize agricultural intensification as an innovation comprising multiple and nonlinear processes (Hall, Bockett, Taylor, Sivamohan, & Clark, 2001; Spielman, Ekboir, & Davis, 2009). Green Revolution policies represent a radical change to agricultural practice and related political, social and economic systems. Policy evaluation will benefit from considering this change as an innovation which involves complex interactions between numerous people, groups, institutions and organizations. This contrasts with mainstream evaluations that tend to employ a simplified, linear theory of change whereby policies are implemented, cause changes in farmer behavior and contribute to changes in production, incomes, and poverty rates (Knickel, Brunori, Rand, & Proost, 2009).

Such theories of change have often evolved in association with entrenched problem narratives. Notably in SSA a Malthusian narrative has repeatedly described a crisis arising from growing populations in the context of finite and degrading land resources (Roe, 1999). Proponents of a Green Revolution in SSA point out that much of the agricultural growth achieved to date has been caused by expansion into new land, which, in the face of increasing population, has reached its geographical limits and is often associated with soil fertility decline (Breisinger, Diao, Thurlow, & Hassan, 2011; Denning *et al.*, 2009). Malthusian crisis framings have not only justified the prioritization of agricultural intensification policies but also their imposition with limited consultation (Peters, 2009). Such top-down governance of agriculture neglects the key role which rural people play in the implementation of agricultural innovation in Africa and in determining how it affects different actors (Gabre-Madhin & Haggblade, 2004). Indeed while Malthus did not envisage that innovation could help feed a growing population, Boserup (1965) suggested that farmers themselves would respond to population growth through bottom-up innovation. Ruttan and Hayami (1984) developed the idea further to suggest that shifts in demand and prices should incentivize "induced innovation" among farmers, attributing a significant role to institutions operating at different scales and to the design and implementation of policies which facilitate innovation by affecting input supply, factor prices, land markets and tenure and output markets.

The contrasting perspectives on the pathways through which Green Revolution policies' effects are realized raises questions about the way in which their impacts are assessed. There is limited empirical, household-level research on the pathways by which increased agricultural production reduces poverty, particularly in different circumstances and contexts (Abro, Alemu, & Hanjra, 2014). Policy impacts are commonly assessed using large-scale household survey data, analyzing changes over five or 10-year periods in household assets, incomes, and consumption. Such policies may be deemed to have contributed to poverty alleviation and food security based on favorable movements, in the medium to long-term, of objective indicators representing agricultural outputs, rates of fertilizer application, income levels, or poverty rates. Analyses sometimes also aggregate indicators over large scales.

Assessing such far-reaching and ambitious policies in this way may be inadequate for several reasons: Firstly, at least in the short-term, there may be considerable material costs for rural inhabitants which are not captured by the selected indicators or by aggregate patterns. Agricultural sector growth has been shown in a number of recent examples from SSA to correlate with reduced levels of poverty at aggregate national or regional levels (Breisinger *et al.*, 2011; Denning *et al.*, 2009; Diao *et al.*, 2010). However studies in the same countries which focus on disaggregated local perspectives of those same policies have highlighted material costs and vulnerabilities among poor smallholders or at best an inability to benefit from policies, in Malawi (Bezner Kerr, 2013; Harrigan, 2003), Ethiopia (Abro *et al.*, 2014), Uganda (Kijima, Otsuka, & Sserunkuuma, 2011) and in Kenya's Millennium Villages (Wanjala & Muradian, 2013). More generally a number of studies have suggested that agricultural growth is less likely to result in reduced poverty in instances where high inequality exists and may in fact lead to exacerbated poverty or marginalization among disadvantaged groups (Negin, Remans, Karuti, & Fanzo, 2009). This is particularly relevant in SSA where levels of inequality are relatively high (Thorbecke, 2013) and where current rural development politics may preclude significant investments to support farmer incomes (Dorward *et al.*, 2004).

Secondly, reliance on normatively selected objective indicators may overlook locally meaningful values and definitions of wellbeing and poverty. Incorporating plural perspectives can