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High rural population density Africa – What are the growth requirements and who participates?

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ABSTRACT

A large and increasing proportion of agricultural growth in Africa must come from continuous gains in land productivity in areas of high population density and hence with already relatively high yields. What that requires is analogous to the green revolution in Asia. Several features differentiate the African situation. Those include greater diversity in cropping pattern including a historically larger and more widespread tropical commodity export sector. The physical infrastructure in rural Africa is far inferior to that of most Asian countries. While the greater diversity of agriculture calls for a larger and more diverse institutional structure the reality is that the research systems, the ancillary education systems to spread innovation and the rural financial systems are generally greatly inferior to those of Asia at the beginning of the green revolution. Ethiopia's record of a steady six to seven percent growth for agriculture and nearly halving of rural poverty demonstrates that with the right policies and investments a very poor country starting with poor physical and institutional infrastructure can bring a major contribution from agriculture growth to increased GDP and reduced poverty. As in Asia, the bulk of accelerated agricultural growth will come from small commercial farmers. They have sufficient farm income to reach or exceed the poverty level. Those are farms with, depending on the country, as little as 0.75 hectares to a few tens of hectares of land. They comprise up to half the rural population and produce on the order of 70–80 percent of agricultural output. They are in general not poor. The poor have inadequate land to reach the poverty level, initially with much underemployment, and with substantial non-farm employment. The primary driver of poverty reduction is the small commercial farmer spending on the order of half of increased income on nontradable, employment intensive goods and services from the rural non-farm sector.

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Background

The other papers in this issue document that in rural Africa, a large area, number of families, and volume of production are characterized by high population densities with increased inequality of income and assets. In such areas, growth in production and income can occur only modestly from enhanced area and must increasingly be dominated by expanded value of output per hectare. That suggests an African green revolution as the appropriate approach and from that an appeal to Asian models.

The African Union has sponsored an intensive exercise to provide an appropriate model. That model, CAADP, has been signed off on by the heads of state of all the African countries (African Union, 2010). It prescribes a rapid six percent agricultural growth rate, a minimum ten percent of government expenditure on

agriculture, and agricultural growth recommendations explicitly modelled on the green revolution in Asia. It should be kept in mind that green revolution technology, although biologically based, substantially increases labor productivity. In India the elasticity of employment with respect to output was typically about 0.3 (Rao, 1975).

However, for Africa, the national level success stories in achieving such growth are few. This text draws attention to three countries sometimes cited as success stories, but with differing levels and means of achieving accelerated agricultural growth. Each made the CAADP strategy central to its approach with national adaptation. Rwanda and Ethiopia set a higher than CAADP growth target of eight percent, while Ghana set six percent (Ghana, Government of, 2010; Rwanda, Government of, 2007; Ethiopia, Government of, 2010, 2009). Each was explicit that this was a “Green Revolution” strategy. Each accepted in principle the CAADP target for a ten percent share of government expenditure to agriculture. Rwanda started with seven percent and then raised that

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to ten percent with a stated goal of 15 percent. Ethiopia exceeded the ten percent target by 50 percent. Ethiopia and Rwanda have been explicit in setting a high fertilizer growth target (Ethiopia, Government of, 2010, 2009; Rwanda, Republic of, 2007, 2012). Ethiopia started earlier than the other two, pre-dating CAADP, was explicit that agriculture is central to its overall strategy.¹ Ghana's success has been largely restricted to the smallholder coffee areas. It is too early to judge the success of Rwanda. The Ethiopian success of 15 years of six to seven percent growth rate for cereals production is now well documented (Stuff, 2013).

Given the low level of achievement of the CAADP targets generally, this paper states how the African situation may differ from Asia, calling for modification of the strategy, but not a departure from the core of high output high input agriculture driven by biological science based technological change. The paper then provides the theoretical basis for the increasing rural income inequalities in high population density areas and the consequent dominance of the not poor small commercial farmer in agricultural growth. It then briefly explains how that growth is converted through the rural non-farm population into the rural poverty reduction that accompanies accelerated agricultural growth. Finally the paper draws on Asian and African experience to briefly summarize the critical public goods essential to high agricultural growth rates in high population density rural areas.

Intensification – green revolution – Africa is different

The green revolution had massive impact on agricultural growth rates in much of Asia, changed the public attitude towards agricultural growth, and with a few years lag greatly reduced poverty (Mellor and Desai, 1985). Six characteristics stand out as differentiating Africa from Asia and make it more expensive and perhaps time consuming for Africa to achieve the Asian results.

Greater diversity

In general, Asian countries were dominated, in production and population concentration, by irrigated rice and wheat. When Robert Chandler became the first Director-General of the International Rice Research Institute (IRRI) he stated a single objective – to double rice yields in Asia. With such a straight forward objective IRRI very quickly created the varieties that would do that. They spread rapidly, and were followed by a series of varieties adapted to an ever widening but still modest range of conditions. Doubling rice yields had massive national and regional impact. When CIMMYT in Mexico, the sister institution of IRRI, dedicated to maize and wheat production, nearly concurrently had the break-through in wheat, another very large area was covered.

Africa does not have a similar homogeneity of production conditions. The paper by Headey and Jayne (2014) in this volume notes that cereals have a much smaller share of total agricultural output in Africa than in Asia. It follows that for Africa to have as big an impact on food production there must be a much larger expenditure on research, and extension as well, to add up to a total comparable to Asia.

Of course, just as in Asia, research breakthroughs for particular commodities will cause greater specialization and decreased diver-

¹ Ethiopia's Prime Minister Meles set a vision of middle income status by 2025 and a strategy of Agriculture Development Led Industrialization (ADLI). For a set of case studies on such a strategy see Mellor (1992). The agricultural development strategy was backed by an intensive analysis and quantification of the policy and investment requirements (PIF). The PIF was widely reviewed within both the Ethiopian government and the donor community before it was accepted by the government. The members of the drafting committee were Demese Chanyalew, Chairman, Berhanu, and John W. Mellor.

sity as farmers shift to the more profitable varieties and crops. Asia used to be much more diversified than it is now. For example in India the wheat crop was typically inter-planted with an oilseed crop (Mellor et al., 1968). Similarly, pulses soon largely disappeared from the irrigated areas, and imports of pulses from Africa increased. In the vast areas suitable to irrigated wheat the research breakthroughs radically increased its profitability relative to inter-cropped oil seed and to pulses.

Some deplore this loss of diversity and it does have a cost, but it was a major part of the green revolution results.² With high productivity research systems, crop specific breakthroughs and diverse production conditions African countries will certainly specialize more than now. Nevertheless, ex-anti it is difficult to judge where to concentrate the research money and consequently the research expense will be higher than for Asia.

A common criticism of the CGIAR international research system in Asia is that it focused inadequately on soils and problems of fertilizer response relative to plant breeding. That criticism is far more apt in Africa (e.g. Tittonell and Giller, 2012), with its highly variable soils, very low organic matter, and some argument of low response to inorganic fertilizer, perhaps due to low organic matter.

Perennial export crops important

This of course should be a large plus factor for Africa. Perennial export crops are high value per hectare and per worker. Having a large base and potential to expand should be a major driving force in accelerated income and production growth. That has not been the case. For one, donors who control so much of the investment in African agriculture have emphasized food crops. In addition, perennial crops require more fixed investment than annual food crops and the financing institutions are lacking. More on that, below. It is argued that both inelastic demand and wide fluctuations in prices justify neglect of the tropical export crops. However, as below, Malaysia has done very well in palm oil, Kenya in tea and Ghana in cocoa. Coffee should suffer somewhat less on the price front, since the bulk of African coffee production is from high elevations with excellent quality for which demand has been growing rapidly.

Malaysia is dominated by two agro-ecological types – the poor upland soils and the rich river basins that also characterize coastal West Africa. Malaysia saw a huge potential in smallholder oil palm. It brought an improved variety from INEAC (located in the erstwhile Belgium Congo), the most advanced oil palm research station in Africa and the world, modelled its budding oil palm research system on INEAC, trained an oil palm extension system, and subsidized planting in smallholdings thereby assisting the relatively poor rural Malay people.³ Ignoring foreign aid negativism about inelastic demand, Malaysia soon became the number one producer of oil palm, which it still dominates. Shifting of the demand function with rapid growth in low and middle income countries has been far more important than its inelastic shape. Oil palm is now inconsequential in West and Central Africa. Nigeria's share of global oil palm exports dropped from 23 percent in 1961–63 to 0.6 percent in 1971–73 (Lele, 1991).

In the rich river basin soils Malaysia quickly took up the high yielding rice varieties that could pay for increased irrigation (Bell

² For a broader discussion of the bio-diversity aspects of a green revolution see Mellor (2002).

³ The Chairman of the Malaysian Palm Oil Organization states that forty percent of the area is held by smallholders (Bainow, 2013). I emphasize this because of the much greater impact of growth in the smallholder sector on poverty reduction through the income and employment multiplier effect as documented in a later section as compared to large scale estates and because of the large effort by the Malaysian government to support smallholder production. This argues for support of the smallholder sector in Africa. The problem is not that the ex-colonial powers did not foster large scale plantations – it is the lack of support for smallholder production.

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