Key Messages

- The sub-Saharan smallholder farmers’ productivity challenge is multi-dimensional in nature; therefore, the solution needs to be multifaceted.

- Population growth in densely populated smallholder farming areas is contributing to growing land pressures and unsustainable forms of agricultural intensification.

- Loss of micronutrients and soil organic matter depress the efficiency of inorganic fertilizer in contributing to crop output.

- Despite the combined use of fertilizer and hybrid seeds, maize yield levels are low for many African farms when compared to Chinese smallholder farms.

- Improved farm management techniques can mitigate the impact of soil degradation, contribute to efficient use of fertilizer, and promote productivity growth for smallholder agriculture in Africa.

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1 Common forms of soil degradation include declining nutrient balances (“soil mining”), erosion and loss of topsoil, acidification, and loss of organic matter. An important contrasting study by Tiffen et al (1994) argues that population pressures between 1950 and 1980 in the Machakos District of Kenya induced households to make land-augmenting investments that contributed to sustainable intensification. However, in a more recent revisit to these same areas in 2014, Kyalo and Muyanga (forthcoming) note that population densities during the period studied by Tiffen et al., were generally below 400 persons per km2, that densities of some divisions have risen well over 800 km2, and that there is now widespread evidence of soil degradation and unsustainable forms of intensification.
ReNAPRI’s study on improved farm management and productivity

The Regional Network of Agricultural Policy Research Institutes (ReNAPRI) conducted a study of the determinants of variations in maize production costs on various proto-typical farms in Kenya, Tanzania, Malawi, the Democratic Republic of the Congo, Zambia, Mozambique and South Africa (ReNAPRI, 2014). The study found that despite the combined use of fertilizer and hybrid seeds, maize yield levels were low for many African farms when compared to Chinese smallholder farms.  

Comparison of nitrogen application and yield levels from ReNAPRI study (1000 tonnes)

Notes:

HHS: Household Survey Small-scale farm
MW3LADD: Malawi, 3 ha, Lilongwe
ZA1700WFS: South Africa, 1700 ha, Western Free State
ZA1600NFS: South Africa, 1600 ha, Northern Free State
TZ2IR: Tanzania, 2 ha, Iringa
ZM7SP: Zambia, 7 ha, Kalomo
CN1HP: China, 1 ha
CN1SX: China, 1 ha
DRC5KAT: Democratic Republic of the Congo, 5 ha, Katanga
MW25MD: Mozambique, 25 ha, Moamba

For example, national survey data from Malawi indicates an average nitrogen application rate of approximately 87 kg per hectare. However, maize yields are significantly lower when compared to South African commercial and Chinese small-scale maize producers. The study recommended more research was needed to understand factors affecting maize response to inorganic fertilizer and concluded that specific farm management practices that contribute to fertilizer use efficiency should be integrated holistically into agricultural extension programs alongside the use of fertilizer (ReNAPRI, 2014).

To further investigate this conclusion, a case study in South Africa tested the impact of farmer training alongside fertilizer application (ReNAPRI, 2014). The study compared the productivity of two small-scale maize farms operating within the KwaZulu-Natal Province. One farm used traditional methods of farming and fertilizer application. The other used fertilizer, while also participating in GrainSA’s mentorship program. The mentoring program included training on: lime application, land preparation, fertilizer use, and plant protection. The farm with the mentoring training component produced more than four times that of the farm using traditional methods; thereby demonstrating the positive impact of farm management on farm productivity.

Difference in yield and gross margin per hectare for traditional farming versus the farm management protocols recommended by GrainSA

Notes:

2 The Agri-Benchmark is an international network which utilizes a consistent methodology for measuring production costs, coordinated by the agri benchmark Centre at Thünen-Institute in Braunschweig, Germany.
3 Conducted in partnership with BFAP and GrainSA.

Working hand-in-hand: fertilizer and farm management

The smallholder farmers’ productivity challenge is multi-dimensional in nature. To address these challenges the solution needs to be multifaceted. Increased use of inorganic fertilizer is indeed crucial for achieving agricultural productivity growth and food security in Africa. Yet soil degradation is increasingly recognized as depressing many farmers’ ability to generate much additional production from the use of fertilizer, which then depresses farmers’ willingness to continue to use it. Improved farm management techniques can mitigate the impact of soil degradation, contribute to efficient use of fertilizer, and promote productivity growth for smallholder agriculture in Africa.

The mean yield for the improved farming system was 5 t/ha versus 1.2 t/ha for the traditional system.
Suggested Readings:


Regional Network of Agricultural Policy Research Institutes in East and Southern Africa

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