

Economic benefits of integrated soil fertility management (ISFM)

By Rodney Lunduka and Valerie Kelly

Policy implications

Direct government support to extension services to train farmers about ISFM might be a viable option that complements other policies such as fertilizer subsidy programmes. Some introductory dissemination of legume seeds with subsidized fertilizers, in combination with improved extension services to educate farmers on how to make quality manure and use it in combination with inorganic fertilizers, is a critical policy direction that can be taken by governments. This may require increased budgets for extension in the short run but could contribute to substantial reductions in the budget for fertilizer subsidies in the long run.

Policy summary

The combined application of organic manure plus inorganic fertilizers gives highest net cash returns and returns to labor. Intercropping maize with pigeon peas also provides high net returns when combined with inorganic fertilizers. The implication of this is that by applying organic manure and intercropping with legumes, the amount of inorganic fertilizers can be reduced without reducing total output and net revenue. This can translate into reduced subsidy costs with less pressure on government budgets. Savings from the fertilizer subsidy could be used to distribute legume seeds or increase extension services (staff numbers, field demonstrations, dissemination materials e.g. posters and radio programs) to train farmers on how to make quality manure and use it in combination with inorganic fertilizers and intercrops.

Introduction

Soil fertility depletion has been singled out as the fundamental cause of low per capita food production in sub-Saharan Africa. Soil fertility depletion is mainly caused by physical soil loss from erosion, nutrient leaching and nutrient mining from continuous cropping. The use of organic manure, inorganic fertilizer and leguminous crops has been advocated to restore lost fertility. However, farmers' resource limitations and endowments on one hand and different soil requirements on the other demand integrated management of soil fertility. Field trials and experiments done on these different soil fertility restoring technologies have successfully shown substantial increases in output of between US\$ 100-180/ha. However, due to their different cost implications, their profitability may differ hence affecting their adoption by farmers. Using data from Kenya and Tanzania, this paper

evaluates the financial benefits of using inorganic fertilizer combined with organic manure and legume intercrop in maize based systems.

Evidence

Financial analysis of farm budgets confirms that the addition of the organic and inorganic fertilizer and intercropping with legumes increases net profit per hectare. Intercropping maize with pigeon peas also provides high net returns when combined with inorganic fertilizers.

In the Tanzania trials, (Figure 1), fertilizing maize under a pigeon peas intercrop had the highest profit of US\$ 305/ha which was about US\$ 100 more than sole maize crop. Intercropping maize with half the recommended fertilizer rate gave almost similar profit margins to sole maize with full fertilization - US\$ 232/ha and US\$ 231/ha respectively. In Kenyan trials there was an additional profit of US\$ 180 from maize when fertilizer was combined with manure than when fertilizer was used alone.

Chevenge et al (2011) conducted a meta-analysis to provide a comprehensive and quantitative synthesis of conditions under which organic resources, nitrogen fertilizers, and combined organic resources with nitrogen fertilizers positively or negatively influence *Zea mays* (maize) yields, in sub-Saharan Africa. They found that on the average, yield responses were 60%, 84% and 114% over the control following the addition of organic resources, nitrogen fertilizers and organic resources + nitrogen fertilizers, respectively.

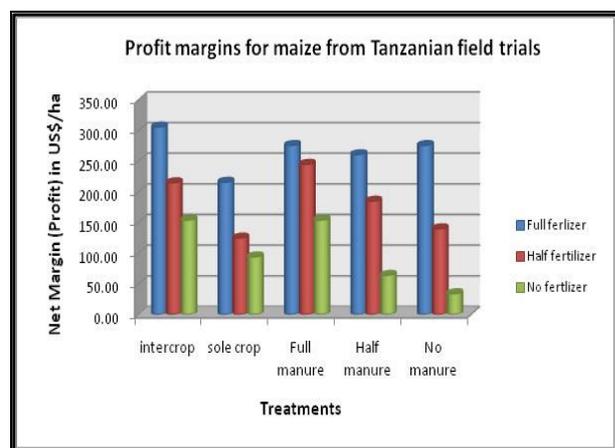


Figure 1: Profit margins for maize from Tanzania.

Data source for analysis: Kimaro et al (2009)

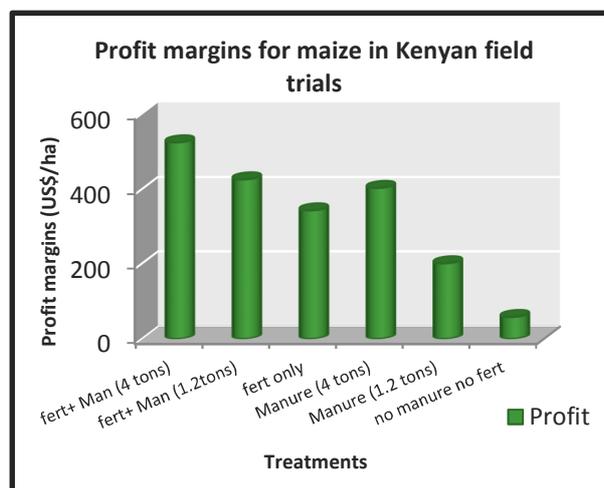


Figure 2: Profit margins for maize in Kenyan field trials.

Data source for analysis: Tittonel et al 2008

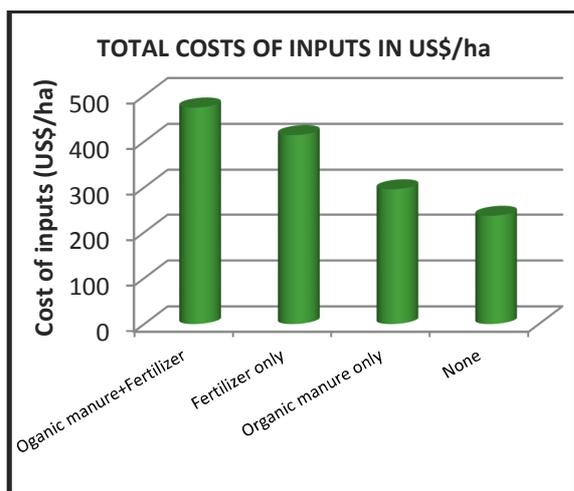


Figure 3: Total cost of inputs using meta-data
Data source: Chevinge et al 2011

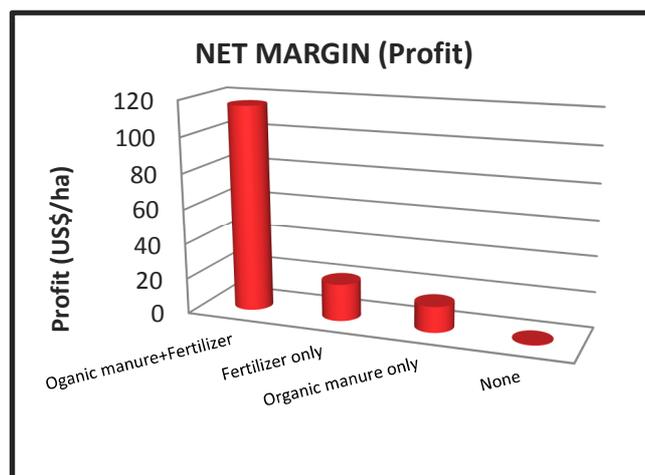


Figure 4: Net Margin (Profit) using meta-data
Data source: Chevinge et al 2011

The evidence presented above indicates that indeed organic and inorganic nutrient systems can increase profits and returns to farmers. There is enormous potential in Africa to boost yield and income by integrating the smaller amounts of fertilizer with organic inputs. However, farmers still opt not to use these inputs because of lack of financial resources. The graphs on costs and net margins show that the combination of inputs is the most expensive but the net margins are greater than for fertilizer only. The higher costs suggest that there may be a need to support farmers to overcome the financial and resource constraints in order to enable them to use both inorganic and organic inputs and realize greater profits.

Policy implications

The implication of this is that by applying organic manure and intercropping with legumes, the amount of inorganic fertilizers can be reduced without reducing total output and net revenue. This can translate into a reduced cost for fertilizer subsidies and reduce pressure on government budgets. Making fertilizers less expensive for farmers through subsidies is a commendable goal, but unless these subsidy programs are accompanied by a concerted effort to promote other fertility management options e.g. organic manure or legume intercrops, governments will fail to realize the full benefits of their expenditures on fertilizer subsidies, and most farmers will fail to improve productivity enough to be able to finance fertilizer and other complementary inputs on their own in the future.

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The African Soil Health Consortium

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