SUSTAIN AFRICA

Sustain Africa programme in Tanzania

Sustain Africa did not run a fertilizer support programme in Tanzania but instead co-funded (with Yara) a feasibility study on liming. The study was managed by Prorustica Ltd and was conducted between May and October 2023.

Background

Currently, 14% of Tanzania's 32.7 million ha of cropland is acidic. Acidity is prominent in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) regions and the Lake Zone regions. Soil acidity inhibits root growth and nutrient absorption, reducing yields of major cash and staple crops (e.g., maize, rice, beans, and cassava) in Tanzania. Maize, for example, faces a 40% loss in production efficiency in acid soils. The loss in production efficiency means that only 2.2 million mt of maize are produced in acid soil against potential production of 5.5 million mt.

Reduced crop productivity threatens the food security of the country – with an estimated 15% of rural households classified as food insecure and 15% more at risk of becoming food insecure . Lime is the most easily available and effective way of reducing soil acidity and is a viable solution to treat soil acidity due to its impact on acid soils over a relatively short period of time. Tanzania shows that lime application on different crops has the potential to significantly improve crop yield – up to 50% in maize and 360% in beans .

Fertilizer prices have remained high in Tanzania even as International prices have returned to pre-crisis levels, making it imperative to improve returns to fertilizer (i.e. the surplus income a farmer can generate through crop sales after paying for inputs).

A number of donors have expressed an interest in supporting the United Republic of Tanzania in the development of a public works program to expedite the use of liming material to address soil acidity and ensure optimum/improved fertilizer nutrient uptake efficiency. The feasibility study therefore provides a basis for the development of a national soil reclamation program that will support a range of demand and supply side interventions across the lime value chain.

This study documents a pragmatic way to, as a first stage, address extremely low pH levels on productive cropland in three regions of Tanzania; Njombe, Iringa, and Katavi. These were identified using public geospatial resources complemented with Yara's SoilHive tool. In the first stage of a live project, 50,000 hectares with soil pH of 5.6 and lower would be treated with 100,000 metric tons of lime over two seasons, with follow-up monitoring and impact assessment over the following three years.

Very few liming programs have planned bulk use of lime in quantities that would make a meaningful and significant scaled impact on large numbers of farmers. Stage 1 of the project would target 45 - 50,000 farmers. Learnings from Stage 1 would therefore deliver good information on the challenges of scaling further.

Costs and return (economic and social) on investment

The total estimated cost of Stage 1 was calculated to be $14.2 million, with lime procurement constituting 42% of the project's expenses. An internal rate of return of 36% and net present value of $2.3m were calculated, implying that investment in the project would pay off. To ensure a good early-stage adoption rate, the cost and transportation of lime was assumed to be fully subsidized. A sensitivity analysis showed the economic model was sensitive to application rates, crop yield responses and farmgate prices. The program's primary beneficiaries are farmers who stand to benefit from increased crop productivity, resulting in higher incomes. Additionally, the initiative is expected to contribute to food security by boosting crop yields. Over four years, a unit farm of 1.2 hectares is projected to generate a total additional revenue of $451.

- **African Fertilizer and Agribusiness Partnership (AFAP), Lime Scoping Study, 2018**
- **Tanzanian Food Security and Health, n.d.; Integrated Food Security Phase Classification (IPC), Tanzania, IPC, Acute Food Insecurity Analysis, 2020**
- **AFAP, Lime Study, 2018**

The study also investigated linking the liming project with Building a Better Tomorrow – Youth Initiative for Agribusiness (BBT-YIA) a Tanzanian Flagship for Agribusiness project for youth and women. Young people would be engaged in coordinating, deploying and monitoring soil liming logistics and impact using digital tools.

The study concluded with a series of recommendations for making the program more conducive to investment from the international donor community.

Challenges

A number of challenges are detailed in the report, including:

1. The bulkiness of lime and the relatively high amounts of material required to functionally reduce soil acidity (~1 tonne/ha for lime and ~100kg/ha for mineral fertilizers) make farm-level application challenging.
2. The frequency of liming and the time it takes to neutralize the soil acidity is essential for application timing as agricultural lime is not readily soluble in water and may take up to a year or more for any measurable soil pH change.
3. Transporting large quantities of lime over challenging terrain presents logistical hurdles. Distribution to remote areas demands meticulous planning. Transportation, whether by rail or road, constitutes approximately 17% of the overall project cost, with rail being approximately 8% more expensive than road.

Scalability and Sustainability

- Launch a national movement in reclaiming acid soils: Raise awareness and secure public support for soil restoration, making it a government priority.
- Work with fertilizer users and encourage lime adoption: Improving access to information through training and better extension services can improve adoption. Research shows that farmers already using mineral fertilizers are more likely to adopt new products. Demonstrating the profitability of lime through improvement in crop output can further strengthen the adoption.
- Integrate holistic approaches to soil health: Integrate agricultural extension materials on actionable methods to increase soil organic matter to ameliorate soil acidity in the long term.
- Negotiate lime costs: Collaborate with lime manufacturers to lower prices via bulk order procurement and (later) increased generation of demand, as lime costs currently account for 42% of project expenses.
- Embrace digital solutions: Implement digital systems for efficient distribution and monitoring, ensuring program accountability.
- Address lime supply shortages: Evaluate opening new lime deposits, especially in Western Tanzania and the Lake Zone, to meet future program needs.
- Develop a network of agricultural service organizations: Develop and coordinate a network of public, private, and NGO organizations working in agricultural farmer services to facilitate soil acidity activities.
- Cultivate integration in partnerships: Various organizations and initiatives have been working on similar issues related to soil acidity, including TARI, Guiding Acid Soil Management Investments in Africa (GAIA), and Excellence in Agronomy (EiA). Research and implementation in subsequent phases will draw from inclusive partnerships.

Study partners

The feasibility study was completed through close collaboration and coordination – with Prorustica Ltd providing leadership, overall management and details on the economic and sensitivity analysis. Local coordination and editorial management was provided by the Centre for Tropical Agriculture (CIAT/CGIAR) based in Arusha. Independent consultants were employed with expertise in local geology and youth/digital activities. One Acre Fund was contracted to lead on soil agronomy as well as provide insights into their recent work in Arusha on smaller scale liming programs. Tanzania Freight Forwarders, a local transport and logistics company, provided insights and knowledge into the transportation of bulk products. Finally, TARI (Tanzania Agricultural Research Institute) provided local knowledge and direct contact with the Ministry of Agriculture who were regularly updated on the progress of the study.

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