Specialty blended fertilizers for root and tuber crops

Solution Holder is **Paul Woomer** and can be contacted through **plwoomer@gmail.com**

Summary

Mixes of common inorganic fertilizers have been specifically developed for tuber and root crops like sweet potato and cassava that create balanced availability of nutrients for the crop to grow fast and produce large tubers. These kind of fertilizers supply elements like nitrogen, phosphorus, potassium and sulfur that are insufficiently available in soils across many landscapes and farmer fields of Sub-Saharan Africa. Fertilizing root and tuber crops with the right nutrient formula at the right time and place can greatly enhance the productivity and quality of tubers, and strengthen resilience to drought, pests and diseases, while avoiding undesired losses to the environment. Readily accessible types of fertilizers and manufacturing facilities across Sub-Saharan Africa can be used to make appropriate blends of nutrients for sweet potato and cassava under different conditions.

Technical Description

Application of inorganic fertilizers that are specially designed for tubers and roots ensures these types of crops have adequate and balanced supply of essential nutrients that are needed for keeping a healthy stand and harvesting large tubers. Fertilizer regimes adapted for sweet potato ensure that nutrients are utilized efficiently and sustainably in the cropping system as such input usage balances and replenishes stocks in soils. Inputs of phosphate and potassium particularly benefit root development and tuber/root filling, and input of sulfate improves the regulation of photosynthesis and transpiration of crops. Specialty fertilizer that are appropriately blended and applied at the right time and place can boost the crop's ability to withstand disease, pests and drought stress because it will make the sweet potato foliage and tubers more strong and succulent.

Uses

Specialty blended fertilizers allow to address various nutrient deficiencies and imbalances in soils that are limiting the production of sweet potato crops, which are found all around growing areas in African as a result of low soil fertility, intensive cultivation and high population density. Inorganic fertilizers are best used on improved varieties of sweet potato and cassava because the yield effect and agronomic efficiency will be more stable and larger than for a non-improved crop.

Composition

Specific nutrient formulas can be made by blending a wide range of solid granular types of fertilizers like urea, calcium ammonium nitrate, potassium chloride, single or triple super phosphate and sulfate. Micronutrients like zinc, boron and cupper, amongst others can be added in solid form or impregnated as liquid, for tackling additional deficiencies limiting the production of sweet potato and cassava crops.

Means of application

Information about the nutrient deficiency and imbalance in specific growing areas has to be collected from soil maps and strategic trials for developing appropriate blend formulations in line with the availability of fertilizers. Manufacturing of specialty blended fertilizer is done with a dry rotary system which come in medium to large size. Fertilizers will be applied one or two times during the growing cycle of sweet potato and cassava crops depending on nutrient availability in soils and rainfall conditions.

Agroecologies	All Agroecologies.
Regions	Africa.
Developed in Countries	Ethiopia, Kenya, Nigeria.
Available in	Ethiopia, Kenya, Nigeria.
Solution Forms	Input Supply.
Solution Applications	Market innovation, Value addition.
Agricultural Commodities	Sweet Potato, Cassava.
Target Beneficiaries	Small-scale farmers, Commercial farmers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

1) Adapting the formula of blended fertilizers to the nutrient requirements in a specific growing area, 2) Setting up manufacturing protocols for mixing different sources of fertilizer, 3) Sensitizing growers about the benefits of specialty fertilizer blends, and 4) Providing access to fertilizers at affordable prices on local markets

Production Costs

Developing specialty blended fertilizers bears a considerable start-up cost for carrying out agronomic surveys and testing to determine appropriate formulas, which is repaid by sales to farmers which get an increased marketable value of sweet potato at harvest. Manufacturers need to make capital investments on dry rotary systems for making the blends of fertilizers, aside from producing or purchasing the raw granular forms of fertilizers. Infrastructures for blending fertilizer can be used to make all types of formulations for sweet potato and other crops in a specific growing which allows reduce production costs of a specific fertilizer product, and get a faster repayment of investment.

Customer Segmentation

Fertilizer industry and retailers, Seed multipliers and producers of sweet potato and cassava

Potential Profitability

Experiments in different areas of southwestern Ethiopia demonstrated that applying specialty blended fertilizer to orange-fleshed sweet potato at a rate of 160 kg per hectare increased marketable tuber yields by 16 to 26 ton per hectare as compared to unfertilized crops. The added sweet potato harvest by input of specialty blended fertilizer found in this study has a gross value of US $1,980 to US $3,220 for farmers on local markets (FAOSTAT 2018). Levels of carotene/pro-vitamin A in tubers also showed to be higher for orange-fleshed sweet potato that the received specialty blended fertilizers. For cassava, studies on fertilizer blends in Ghana, Kenya and Tanzania have found that the value:cost ratio of nitrogen inputs range from 4 to 16 (US $ per US $), phosphorus input from 2 to 16, and potassium input up to 10.

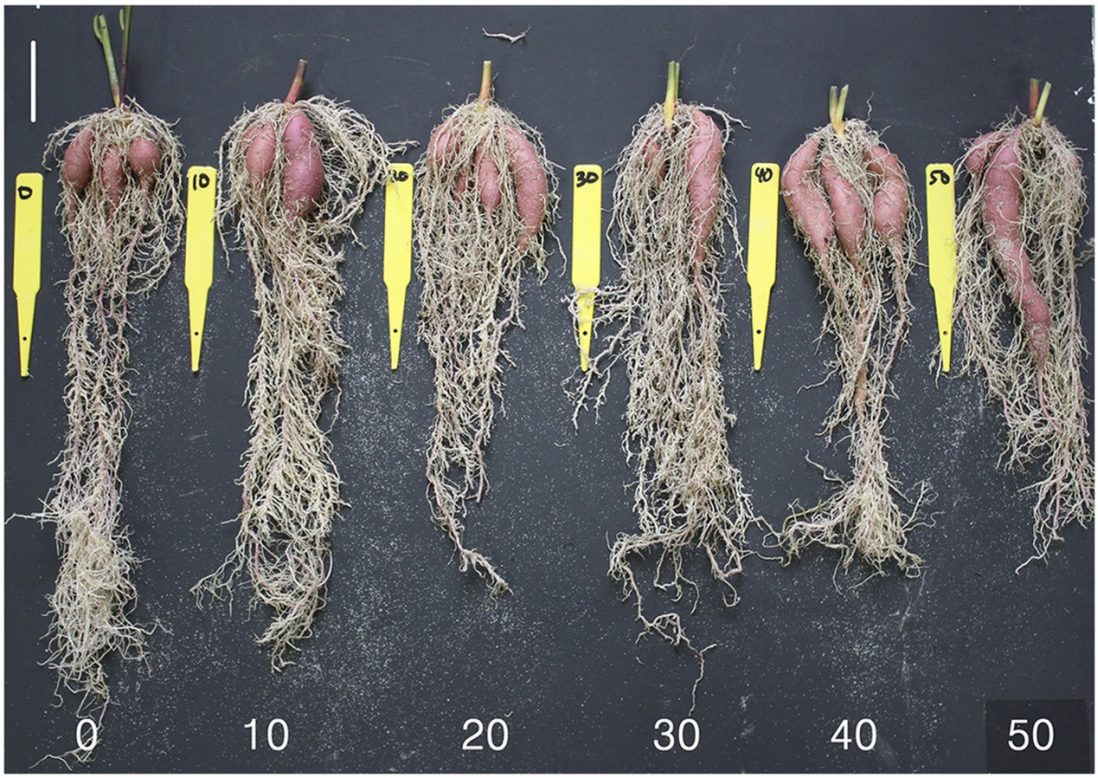
Licensing Requirements

The formulations of fertilizer blends may be subject to licensing. Those with knowledge of fertilizer composition may easily calculate desired blend proportions from different primary fertilizer materials.

Innovation as Public Good

Intellectual property connected with specialty fertilizer blends can be public goods or owned commercially.

Solution Images



Effect of increasing phosphorus supply (left to right) on root growth and tuber filling of orange-fleshed sweet potato





Institutions

Accompanying Solutions

Orange-fleshed sweet potato (Bio-fortified, Drought and virus tolerant), Raised beds for sweet potato production and weed management, Disease resistant cassava varieties, Golden cassava varieties (Vitamin A fortified)