Specialty Fertilizer Blends for Common Bean

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Summary

Common bean production in Sub-Saharan Africa suffers widely from low nutrient availabilities in soils. To counter this conditions, blends of fertilizers specifically for common bean are known and available that provide a balanced supply of nutrients. These fertilizer blends contain phosphorus, potassium, sulfur and other nutrients in proportions that are aligned with soil fertility status and crop requirements. In some cases, small amounts of “starter nitrogen” are included. Readily accessible types of fertilizers and manufacturing facilities in Sub-Saharan Africa can be used to make additional specialized blends for bean farmers. Applying the right fertilizer at the right time and place to common bean greatly enhances nitrogen fixation, productivity and nutritional value, and strengthens resilience to drought and pests. Specialty fertilizer blends allows farmers to obtain greater returns on input investments.

Technical Description

Formulations of blended fertilizers balance and replenish nutrient stocks in soils, which ensures that the added inputs get utilized more efficiently for increasing common bean production. The various elements that are mixed together have specific benefits; i.e., phosphate and potassium enhance flowering and pod filling, sulfate reinforces photosynthesis and transpiration, and calcium, magnesium and zinc promote the uptake of nutrients and water from soils and raise the nutritional value of beans. Use of specialty fertilizer blends for common bean has very strong synergies with biological nitrogen fixation, as they are made in a way that boosts symbiotic activity. Mixing phosphorus fertilizer with potassium, calcium, magnesium and zinc provides consistent yield advantage because it allows the crops to absorb more nutrients, particularly under acid soil conditions common across the tropics. In some cases, small amounts of mineral nitrogen (e.g. 25 kg per ha) stimulate root growth and results in greater early nodulation. Blending technology offers a very large degree of flexibility to adapt fertilizer formulations in line with general soil characteristics and production objectives.

Uses

Fertilizer blending technology is suitable for all major growing areas and especially important in low fertility soils. Specialty blended fertilizers applied at the rate of 100 to 150 kg/ha in common bean fields, combined with improved bean varieties and rhizobium inoculants serve greatly improves the health of plants and their yields and nutritive

value. This approach is particularly important when farming highly weathered soils characterized by low fertility status and pH imbalance. Fertilizer mixes designed for common beans can be suitable on other types of grain and forage legumes and this versatility is advantageous for input manufacturers and farmers.

Composition

Specific nutrient formulas can be made by blending a wide range of solid granular types of fertilizers like sulphate of potash (50% K2O), potassium chloride (50% K2O), single Superphoshate (16 to 20% P2O5, 11 to 21% Ca and 11 to 12% S) or Triple Superphosphate (46% P2O5). In addition blending with small amounts of nitrate-bearing fertilizers providing “starter N” is sometimes necessary especially for common bean. Micronutrients like zinc, boron and copper, amongst others can be added in solid form or impregnated as liquid. A good example is the legume fertilizer blend manufactured in Kenya known as Sympal containing: 23% P2O5, 15% K2O, 10% CaO, 4% S, 1% MgO and 0.1% Zn.

Means of application

Information about the nutrient deficiency and imbalance in specific growing areas is contained within soil maps and past agronomic trials, sufficient for developing blended formulations. However, since soil fertility varies a lot even in specific locations, it is recommended that farmers get their soils tested. The production of the specialty fertilizer blends is also subject to the availability of different single fertilizers. Manufacturing of specialty blended fertilizer is done using a dry rotary system available at medium to large sizes, and is best packaged into sizes needed by farmers. Fertilizer blends designed specifically for legumes such as common bean are becoming available across Africa but only manufactured by a few fertilizer companies. Their specific composition, formulation and means of combination are often protected by trade secrets.

Agroecologies	Highlands, Humid forest, Moist savanna.
Regions	Africa South of Sahara.
Developed in Countries	Ghana, Kenya, Nigeria, Rwanda, Tanzania, Uganda.
Available in	Ghana, Kenya, Nigeria, Rwanda, Tanzania, Uganda.
Solution Forms	Input Supply.
Solution Applications	Soil fertility management.

Agricultural Commodities	Common bean.
Target Beneficiaries	Small-scale farmers, Commercial farmers, Agro-dealers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

To produce a new blended fertilizer, the following steps are required: 1) Derive the formula of blended fertilizers based upon nutrient demands and the soil fertility conditions requirements across a large production area, 2) Establish manufacturing protocols for mixing different sources of fertilizer and packaging the blend, 3) Sensitize agro-dealers about the benefits and profitability of specialty fertilizer blends and provide customer information about them, 4) Provide these branded fertilizers at affordable prices on local markets and monitor their sales, and 5) Conduct demonstrations and trials to assess the efficacy of a blend compared to other management options, and refine the formulation and branding campaigns over time as necessary.

Production Costs

Designing a new fertilizer blend needs not be expensive as it can be based upon desk study from a wealth of secondary information, including the composition of similar products. Refining that blend over time based upon agronomic trials and plant and soil analysis is considerably more expensive. Manufacturing specialty blended fertilizers bears a considerable start-up cost based upon capital investment for on multi-channel dry rotary systems and automated packaging. There is also the cost of assembling the primary fertilizers to be blended. These costs are considerably reduced for fertilizer companies with existing blending capacity that is seeking to expand their product lines. Smaller, more labor-intensive blending systems may be developed for localized operations, and even operated as a community-based operation once specific formulations are known.

Customer Segmentation

Blended fertilizers are intended for use by common bean producers through distribution via agro-dealer networks.

Potential Profitability

The profitability of fertilizer blending is not based upon crop response to individual component fertilizers, but rather their improved response to strategic combinations of

those ingredients, a feature that well informed farmers are willing to buy. Basically, blended fertilizers should offer returns that are greater than the sum of the ingredient parts. Combining two or more needed fertilizers offers more efficient labor operations as well. The profitability of using blended fertilizer for common bean (legume) production can increase returns by 50%. In some cases where nutrients are extremely limited, application of combined nutrients can result in a 10- to 16-fold return on investment.

Licensing Requirements

The formulations of fertilizer blends may be subject to licensing but are more often protected as trade secrets. Those with knowledge of fertilizer composition may easily calculate desired blend proportions from different primary fertilizer materials.

Innovation as Public Good

Responses to fertilizer application and combination are abundantly available as published information, particular when performed by research institutions as Regional Public Goods. Those with knowledge of fertilizer composition may easily calculate desired blend proportions from different primary fertilizer materials.

Solution Images



A multichannel blender in operation at MEA Fertilizers used to produce SYMPAL for grain legumes in Kenya



Example of a fertilizer blend

Institutions

Alliance

Bioversity International

CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change