Breeding Pipeline: P-Efficient Legumes 2006-2017

Field day and evaluation of P-efficient genotypes

Southern Africa Community of Practice

Project Partners

Agricultural Research Institute of Mozambique (IIAM) - Mozambique

Zamorano University

Penn State University

National Ag Research Center

University outside of Region

Promote seed policies that **encourage cultivars for specific niches:**

2017: 12 new P-efficient bean lines are in the process of being **officially released,** these lines have an average yield of 1400 kg/ha under low P that is about **40 % higher than commercial** varieties grown in Mozambique. Under optimum P the average yield of these varieties is 3200 kg/ha.

More resilient and productive cropping systems:

Hale Amade, 28 years old with his family, **received the P-efficient lines** and keeps 10kg of Catarina and 5 Kg of black bean **for seed. Since he received** the **new lines**, the family **has increased their income** which **has allowed for diversification** by buying goats and poultry.

Include multi-dimensional outcomes

Seed systems: varietal testing and seed production by farmers:

Since **2014** the participating **farmers** have **kept about 2kg of seeds each season,** which **produces almost 50kg** of beans **compared** with the **20kg** they **obtained** with the **local variety.** The yield they get and the price of beans in Angonia have **increased their income** by **almost 50%.** Since they **received** the **seed** they **have multiplied and shared** it among **other village members.**

Multi-environment Trial methodologies and protocols:

2014: the **6 lines were distributed** in **200 gram packs to** over **3000 farmers in 166 villages** (4MT of seed) for further **testing and use**. **Selected genotypes** showed productivity **increases of 50-150%** in low P soils **without increase in inputs.**

Keep the focus on smallholder, marginalized farmers

Understand local **preferences and knowledge**

The **criteria for selection differed between** researchers and farmers. For **farmers** the key criteria were: **size of grain, quality for market, household consumption preferences and yield.** And for **researchers, yield and root system** were the most important. After the participatory variety evaluation, 6 lines were selected for further testing.

Modern **breeding tools:**

An **integrated platform** has been developed that allows manual and image-based measures of traits to differentiate field-grown genotypes. **Visual ratings were found to agree well with manual measurements for 12 root parameters of common bean.**

Characterizing agrobiodiversity:

Screening of **Andean bean gene** pools, which tend to have **shorter**, **denser root hairs**, with Mesoamerican material, which tends to have longer ones, led to the **identification of 17 drought tolerant and 19 P-efficient lines.**

The diagnosis:

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One of the major **limiting factors in legume production** is the **low availability of phosphorous** (P) **in soil** and the **inability** of **bean** crops to **explore it efficiently**. The project **results showed** that **shallow root** architecture **favors production** in low fertility soils **because P** is **concentrated** in the **topsoil,** and **deep root** architecture **favors production** in **drought environments** to **reach stored water.**

LEGEND:
Results
CCRP Principles

COLLABORATIVE CROP RESEARCH PROGRAM

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