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.

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.

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:
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.