Driving Sustainable land productivity through doubled-up legume technology on small farms

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Doubled-up legume rotation technology

The doubled-up legume rotation (DLR) technology entails intercropping two grain legumes, exploiting the opportunity presented by complementary growth habits and plant architecture. The most successful doubled-up legume intercropping system involves pigeonpea intercropped with groundnut in an additive design.

Photo A. Groundnut and pigeopea plants explore resources in different 'niches' – resulting in little intra-specific competition.

Utility of the doubled-up systems

On tiny farms that are 0.5- 1ha, crop diversification is severely constrained by limited land. Intercropping systems ensure farm crop diversity on such farms, but are often constrained by unacceptable yield penalties on either or both component crops, if the crops are not ecologically compatible.

- The groundnut-pigeopea DLR system success hinges on the very slow initial growth of pigeonpea.
- It follows that the groundnut component grows as if sole-cropped until its reproductive stage (insignificant competition for water, nutrients and sunlight with small pigeonpea plants).

Photo B. Groundnut –pigeonpea DLR

- Pigeonpea only starts rapid growth when the groundnut component has approached maturity (mature groundnut understory -Photo B).
- After this, pigeonpea continues to grow on its own in the field, forms pods, and will be harvested later.
- This legume - legume intercrop system 'doubles' grain legume crops and 'doubles' soil fertility benefits as both groundnut and pigeonpea add soil fertility through biological N2-fixation, when the residues are retained in the field.
- This leads to more intensified production of maize grown in sequence – a form of N fertilizer subsidy to farms that do not access adequate mineral N fertilizers

Key contacts

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Results and outputs

This product has been extensively tested in Malawi, with the following results:

1. *Increased labour productivity*: On smallholder farms in Malawi, land preparation involves hand hoe construction of ridges on which crops are planted (Photo C). This is extremely labour demanding, usually on infertile soils that do not support large crop yields. The DLR accelerates soil fertility restoration, and better returns to labour for current and rotational crops.

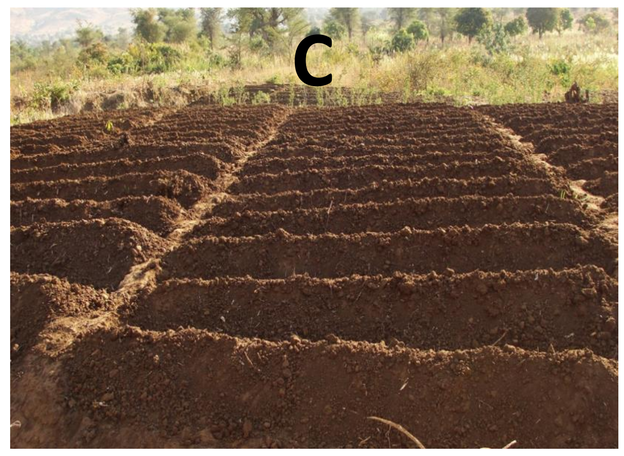

Photo C. Much manual labour is invested in making ridges

2. *Increased land productivity*: The groundnut – pigeonpea DLR technology has consistently resulted in land equivalency rations (LER) of at least 1.3. LER is a measure of land productivity, and a number >1 indicates that intercropping is advantageous. This is especially critical for small farms of <1 ha that are largely under water limited rain-fed agriculture, with only one feasible cropping cycle per year. With increased farm fragmentation, as the trend in Africa, the DLR contributes to offsetting the effects of reduced farm sizes.

Who is the legacy product useful for?

1. Up to 1 million households situated in pigeonpea and groundnut growing agro-ecologies in Malawi will benefit from this technology. This applies to other countries with similar conditions.
2. This is a sustainable system that contributes to multiple development objectives (nutrition, natural resource management, income).
3. National extension systems and development partners need to be supported to disseminate and support adoption of this technology
4. Farmers must be concurrently supported to acquire knowledge on local level value addition and processing their grain legumes for increased local consumption

Key partners

- Michigan State University: implementing partners for the Africa RISING project in Malawi
- LUANAR: Lilongwe University of Agriculture and Natural Resources invested years of research in early stages of the development of the DLR technology
- IITA – Africa RISING East and Southern Africa project lead