Biofertilization and "bioirrigation" for sustainable mixed cropping of pigeon pea and finger millet (The BIOFI project)

Mathimaran N1,2, Mäder P3, Kahmen A1, Singh D1, Muthukumar T3, Sakthivel N4, Varshney RK5, Prabavathy VR6, Sekar J7, Ashok EG7, Schader C2, Meier M2, Blättler D8, Rengalakshmi R8 and Boller T1

1Uni. Basel, CH; 2FiBL, CH; 3Bharathiar Uni., IN; 4Pondicherry Uni., IN; 5ICRISAT, IN; 6MSSRF, IN; 7GKV, IN; 8HAFL, CH

Indo-Swiss Collaboration in Biotechnology (ISCB)

The widespread adoption of sustainable intercropping technology promotes resilient food production and livelihood to resource-poor people

**Major Research Questions**

- How do "hydraulic lift" and a common microbial network operate between pigeon pea and finger millet under laboratory conditions and in the field?
- Which biofertilizer strains are best suited to which climatic and soil conditions?
- Which pigeon pea lines are best suited for the proposed mixed-cropping scheme?
- What are the consequences of the new mixed-cropping scheme for soil fertility and the soil microbial community?
- How can the planned mixed-cropping system be implemented through the concept of eco-enterprises, and
- What is its climate impact as assessed in a life cycle analysis?

**Research Hypothesis**

**Field Trial**

**Location and setup**

**Inputs**

- Finger millet (FM) variety: (a) Bangalore: GPU-28; (b) Kolli Hills: Surutai Kelvaragu
- Pigeon pea (PP) variety: (a) Bangalore: BRG-2; (b) Kolli Hills: SAA3: Arbuscular Mycorrhizal Fungi (AMF): Glomus leptoticum for PP, G. fasciculatum for FM; All FM received G. fasciculatum except in treatments 16 and 17; Plant Growth Promoting Rhizobacteria (PGPR): Pseudomonas sp. MSSRF041; Farm Yard Manure (FYM): @ 7.5 t/ha applied as blanket for all plots; Recommended Dose Fertilizer (RDF): FM: 50–40–25 Kg NPK/ha, PP: 25–50–25 Kg NPK/ha. All treatments were replicated four times.

**Grain yield at 50% recommended mineral fertilizer dose**

- Biofertilizers (AMF + PGPR) increased grain yield of finger millet and pigeon pea at both the sites, probably facilitated by "bioirrigation".
- Grain yields in the treatment 50% RDF was on par with 100% RDF without biofertilizer addition, indicating that biofertilizers have a high potential to replace chemical fertilizers without jeopardising yields.
- Yield response due to biofertilizer was greater at a low fertility site (Kolli Hills) than at a high fertility site (Bangalore), indicating that biofertilizers can increase yields particularly in marginal lands of poor farmers of remote areas.

**Analysis carried out excluding treatments 16 and 17. Error bars represents ± 1 standard error of mean**

**Vision**

The widespread adoption of sustainable intercropping technology promotes resilient food production and livelihood to resource-poor people