Do legume-based intercrops concurrently halt soil erosion, boost soil health and strengthen (natural) pest control services in cassava cropping systems of Northern Vietnam? (LEGINCROP)

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Cassava Situation in Vietnam

Cassava areas in Vietnam during 2011-2015

Cassava productions in Vietnam during 2011-2015

(Source: General Statistics Office of Vietnam, 2016)
Maize Situation in Vietnam

Maize areas in Vietnam during 2011-2015


(Source: General Statistics Office of Vietnam, 2016)
Maize and Cassava Production Regions in Vietnam

Red River Delta
Cassava: 6.7K ha; 105,100 tons
Maize: 91.3K ha; 438,100 tons

Central Highlands
Cassava: 149.5K ha; 2,542,000 tons
Maize: 240.9K ha; 1,293,900 tons

Mekong Delta
Cassava: 6.5K ha; 99,300 tons
Maize: 38.1K ha; 225,200 tons

North Mountainous
Cassava: 117K ha; 1,485,500 tons
Maize: 519.3K ha; 1,909,700 tons

North Central Coastal
Cassava: 174.9K ha; 3,027,500 tons
Maize: 210.4K ha; 925,200 tons

Southeastern
Cassava: 96K ha; 2,485,100 tons
Maize: 79.3K ha; 488,900 tons

(Source: General Statistics Office of Vietnam, 2016)
Core Problems

Mono-cropping systems
Growing mostly on slope areas
Low awareness on sustainable agriculture of Ethnic people

Insufficient organic matter
Soil erosion
Imbalance of mineral nutrient input to the soil

Low yield and production & poor soil fertility

Intercropping systems
Enhancing biological dinitrogen fixation in legumes

Insufficient organic matter
Soil erosion
Imbalance of mineral nutrient input to the soil

Low yield and production & poor soil fertility
OVERALL OBJECTIVE

To evaluate cowpea-based intercropping systems effects on cassava yields (Van Yen district) and maize yields (Van Chan district) and total economic benefits as well as on the soil quality.
Specific Objectives

- Assess the current nitrogen fixation and root mycorrhizal infection rate in legume species intercropped with maize or cassava in both districts.

- Optimize the symbiotic N fixation in cowpea by inoculation with effective rhizobia strains (comparison with commercial inoculants).

- Measure the impact of legume-based intercropping on crop yields and land productivity ratios.
Research locations
Mau Dong commune, Van Yen district: cassava intercropped with cowpea

Mau Dong's fields with soil and plant samples
There are 5 farms with a total area of 3.7 hectares.
Son Thinh commune, Van Chan district: maize intercropped with cowpea
There are 4 farms with the total area of 0.8 ha.
Cat Thinh commune, Van Chan district: maize intercropped with cowpea

*Cat Thinh's fields with soil and plant samples*
There are 3 farms with a total area of 0.65 ha.
Samplings carried out in 2017

Field (Mau Dong n°1) with soil and plant GPS points from field work
*Collecting nodulation data and plant samples at Son Thinh commune (Oct. 3-4 2017)*

- Collecting plant (maize/cowpea) samples
- Cleaning cowpea roots
- Collecting cowpea nodules
- Collecting root (maize/cowpea) samples
Collecting nodulation data and plant samples at Cat Thinh commune (Oct. 24-25 2017)

Tran Thi Ut’s farm

Cleaning and calculating cowpea nodules

Collecting maize roots
* Collecting cowpea nodules at Mau Dong commune (Oct. 25 2017)
Preliminary results obtained in 2017

Nodulation of cowpea
Preliminary results obtained in 2017

Evolution of the number of nodules in Mau dong between 2016 and 2017

Nodulation of cowpea
Preliminary results obtained in 2017
Preliminary results obtained in 2017

**PCA on soil data for all fields**

**PCA on data of fertilization and nodulation for all the field (1st season of 2017)**
Preliminary results obtained in 2017

Exemple of soil mapping in Mau Dong (field n°3)

- Soil's samples
- Levels of phosphorus in the soil (from 0.4 to 166.1)
- Means of number of nodules (from 0 to 7.3)
- Absence of nodulation data
Preliminary results obtained in 2017:

1. Inconsistent and highly variable nodulation of cowpea;
2. Fertilisation applications not compatible with effective nodulation of cowpea;

What is the way forward for 2018?

1. Inoculation of cowpea with rhizobial inoculants (commercial & cocktails with native strains from both districts).
Time schedule for 2018

1. Isolation of native rhizobia nodulating cowpea from nodules collected in both districts

2. Meetings with local committees and farmer associations of both districts to explain them what has been done in 2017 and what is the plan for 2018. Getting feedback from them will be very much relevant.

3. Assess the mycorrhization root infection rates of the samples collected on 2017 and run the same statistic analyses than for the nodulation.