Ecological Distribution of Bacterial wilt (*Xanthomonas campestris* pv. *musacearum*) of Enset (*Ensete ventricosum* (Welw.) Cheesman) in Gamo Highlands of Ethiopia

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Background and objective

Enset is an important food security crop for nearly 20 million people in Southern Ethiopia. Nicknamed the 'tree against hunger', it is a drought-tolerant, perennial multipurpose crop that can be harvested at any stage. In the last decade, Enset bacterial wilt (EXW) has wreacked heavok in Enset-based farming systems, with yield losses so substantial that the system is in danger of disappearing. The disease affects all known varieties and so far phytosanitary practices have had little effect. Despite being present in the entire Enset belt, EXW severity varies greatly from region to region and even from farm to farm. Hence, studying the agro-ecological niche of EXW may provide a new take on its control. This study therefore aims to relate the occurrence of the disease to environmental factors, management factors and socio-economic variables. Semi-structured questionnaires, in-field inventories and on-station experimental trials were performed in Chencha and Bonke Districts in the heart of the Enset growing area.

Typical Enset garden (top) and Enset plant with bacterial wilt symptoms (bottom)

Materials and Methods

In-field inventories

- **80 randomly chosen farms along an altitudinal gradient**
- **Assessment of incidence and severity of EXW**
- **Exploring correlations between environmental factors (altitude, soil type, climate), management factors (fertility management, phytosanitary practices) and socio-economic factors (farm size, household size, budget and acces to markets and information) via inventories and semi-structured questionnaires**
- **Addressing inter- and intra- farm variability in soil type and nutrient balances via soil and plant samples**



Leaf and soil sample collection (left and centre), pruning of sick leaves (right)

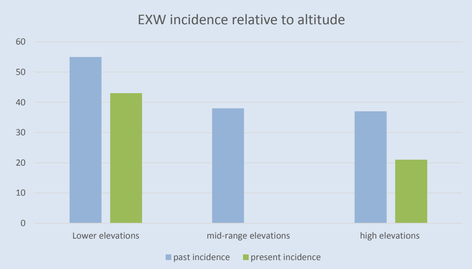
On-station trials

- **3 experimental plots at research stations at low (1200 masl), intermediate (2403 masl) and high altitude (3013 masl)**
- **Planted with 2 common Enset clones in a fully fertilised and control treatment**
- **Artificial inoculation of half of the plants with EXW**
- **Evaluation of the progression of the disease relative to altitide, nutrient status and clone type via visual symptoms and spectrographic assesment**


Enset plot for artificial inoculation experiment (2403masl, left) and different stages of enset (right).

Preliminary results and discussion

- Results confirm farmer's perception that EXW incidence is higher at lower altitudes
- There was no clear correlation between socio-economic factors (gender, education, family size, cattle number and extension advise) and disease incidence, and reported use of phytosanitary measurements
- The observed variability in and between Enset farms was much greater than expected, with farmers differentiating between 4 very different soil types and with fertility management strategies varying greatly between farms: although fertilizers are not used, the amount and frequency of manure application varies among households and even within one field
- The severity of EXW seems difficult to quantify at farm levels as the onset of symptoms and progression of the disease is so variable on every sick plant
- Wilt incidence and the observed variability within and between farms needs further assessment at spatially different sub-catchments.
- Agro-ecological trials need important attention to arrive at a better conclusion of the in-field inventories.



EXW incidence relative to altitude

Management methods (% HHs)	Elevation range (masl)		
	2017-2180	2515-2610	2741-2893
Uproot and disposal to rivers/road sides/outfields	62.5	23.81	31.58
Uproot and feed to cattle	10	19.05	-
Harvest and process/cook before spoilage	17.5	19.04	5.26
Flaming of contaminated knife	72.5	28.57	42.1

Knowledge and use of phytosanitary measures as % of households (HH)

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