TROZ Centre for Agriculture in the Tropics and Subtropics

The Uplands Program
Research for Sustainable Land Use and Rural Development in Mountainous Regions of Southeast Asia

Universität Hohenheim

Spatial Variability in Maize Productivity in Uplands of Northwest Vietnam

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View of Field 1 before planting maize with Gerlach troughs and erosion pins installed to measure erosion and soil loss.

Set up of Gerlach troughs in Feld 3; 55 days after planting

Introduction

In Northern Vietnam, agricultural land is under strong pressure to meet population and economic requirements with maize as the major crop, often intercropped with cassava. Current production systems of maize and cassava make fields prone to erosion, which leads to a spatial variability of crop performance due to an unequal decrease in soil fertility.

Study area of Yen Chau, Northern Vietnam

Objectives

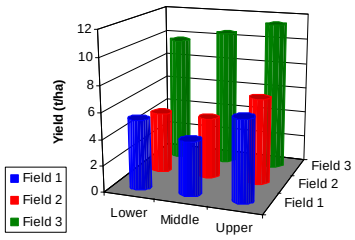
- Assessing spatial variability in maize development and yield at landscape level
- Explaining differences in crop performance between fields based on distance from the homesteads

Material and Methods

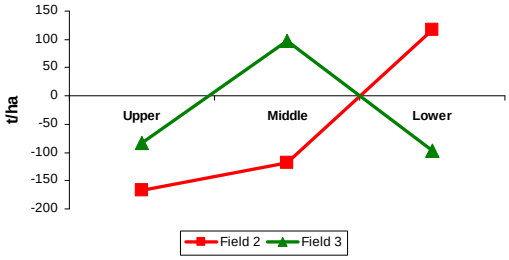
This study was conducted in the Chieng Khoi commune, Yen Chau district, Son La province, Northern Vietnam. The area has a tropical monsoon climate with very hot, wet summers and dry, cool winters. Three fields were selected according to distance to homestead. In each field, plant density, plant height, leaf area index (LAI) and greeness of leaves (SPAD) were measured at four growth stages on upper, middle and lower slope position. At final harvest, yield parameters were assessed at the three slope positions. Changes of surface levels were measured with erosion pins to predict erosion rates.

Field characteristic and crop management

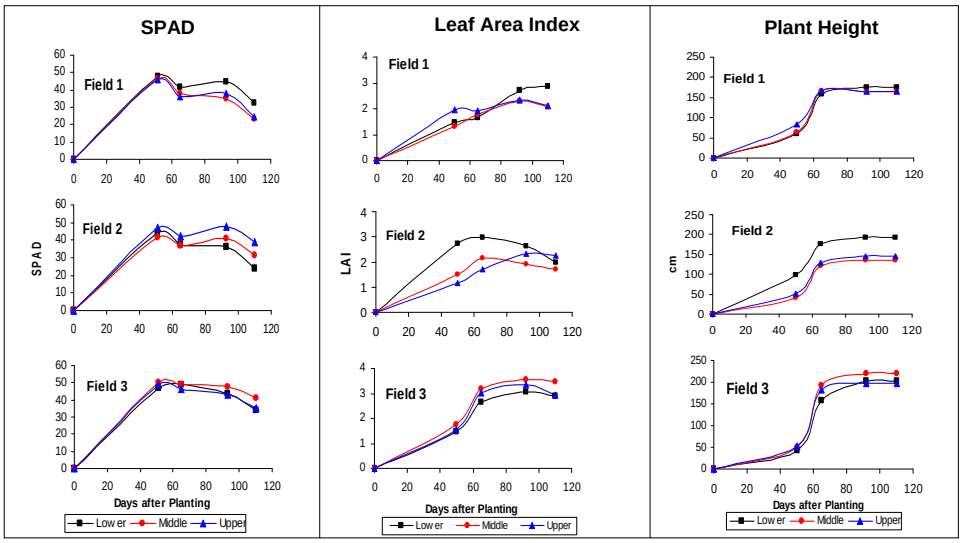
	Field 1	Field 2	Field 3
Distance to homestead	0 m	500 m	1000 m
Cropping history	>30yr of cultivation Since 2005 maize-cassava cultivation	maize cultivation since 1999	maize cultivation since 2004
Planting date	March 30th	March 30th	March 30th
Field practices	Ploughing: twice Weeding: once	Ploughing: twice Weeding: once	Ploughing: twice Weeding: once
Fertilization	NPK (5-10-3): 50 kg N /ha Urea: 368 kg N /ha	NPK (5-10-3): 33,5 kg N /ha	NPK (5-10-3): 25 kg N /ha Urea: 236 kg N /ha
Field Size	1000m²	1500m²	1000m²
Maize Variety	CP888	CP888	CP888
Plant Density	2.7 plants/m²	3.8 plants/m²	4.2 plants/m²
Intercropping with Cassava	Yes	No	Yes



Yields (t/ha) of three upland fields at upper, middle and lower slope position, in the Chieng Khoi watershed, Son La province, NW-Vietnam



Preliminary results on amount of soil loss at upper, middle and lower slope position of two upland fields in the Chieng Khoi watershed, Son La province NW Vietnam, measurements are based on erosion pins



SPAD, LAI and height development of maize on three upland fields in the Chieng Khoi watershed, Son La province NW Vietnam 50, 65, 92 and 110 days after planting.

Results

- Fields with longer distance to homestead have a more recent cropping history and have, therefore, a higher yield potential than fields closer to homestead which were already cultivated for longer periods.
- Fields with long-term cropping history show a higher variability in grain yields depending on slope position
- Strong changes on surface level were observed in all fields and slope positions.
- 55 days after planting, SPAD values were similar in all fields and across slope position (~ 47) within a field; 110 days after planting, values of Field 1 and 2 started to differ among slope positions.
- LAI values developed differently across fields and among slope position within a field.

Conclusions

Distance of field to homestead influenced crop productivity. This effect was driven by land use history.

Spatial variability of crop development within a field is linked to slope position which again is linked with soil losses.

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