Mountainous Agrarian Systems

Traditional slash-and-burn cultivation of upland rice in Bac Kan Province, northern Vietnam: An agronomic diagnosis

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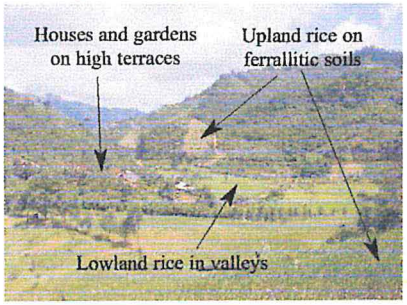
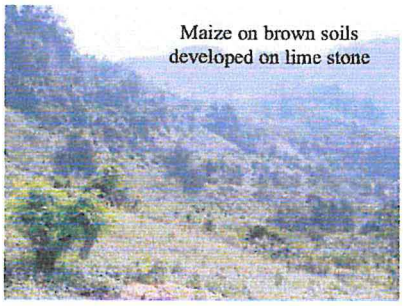
In the mountains of northern Vietnam, traditional farming systems are based on upland-rice or maize cultivation, after slashing and burning forests or shrubs. However, this practice leads to low and extremely variable yields. A rapid sound and clear agronomic diagnosis was conducted in 1998/1999 to identify the main factors limiting rice growth and yield, and to understand the source of the high variability and instability of upland-rice yields.

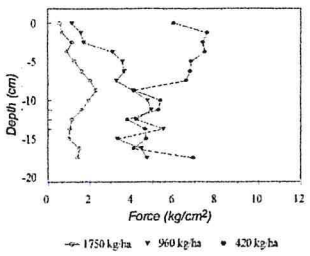
Cropping situations and land use



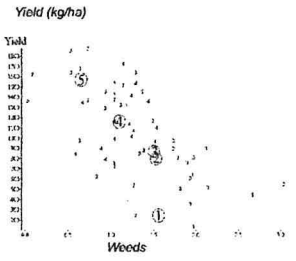


Upland-rice yield variability

Between fields, upland rice yield is mainly explained by preceding vegetation type and number of years of cultivation after slashing the forest. Within fields, major factors limiting rice yield are physical soil and chemical characteristics in relation to poor biological activity. These factors reflect the level of soil regeneration (during fallow periods but limited by grazing and extraction) or degradation (erosion during cultivation periods). Yield is also limited by growing weed pressure.

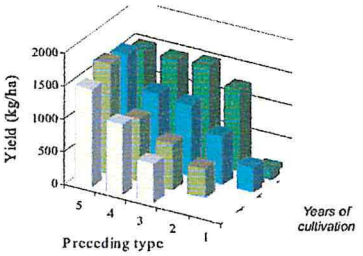


Rice yield as a function of soil compaction



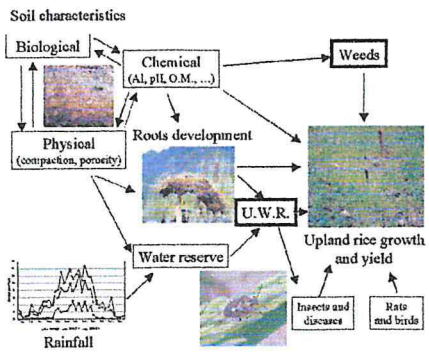
Rice yield as a function of weed pressure and preceding vegetation type

Type 1: Old pasture (over 20 years)
Type 2: Less than 10 years-old or 10-20 y.o. heavily grazed forest
Type 3: 10-20 y.o. moderately grazed or over 20 y.o. heavily grazed forest
Type 4: 10-20 y.o. not grazed or over 20 y.o. moderately grazed forest
Type 5: Over 20 years-old ungrazed forest



Rice yield as a function of preceding vegetation type and number of years of cultivation

Factors limiting upland rice yield



Rainfall and physical soil characteristics bring out the amount of water reserve. Physical soil conditions and chemical characteristics, in relation to biological activity, limit root development. As a consequence, useful water reserve (UWR) is very limited. Both limited UWR and high weed pressure leads to poor plant development. Weak plants also have low resistance to pests and diseases. As a consequence, yields are low (1 t/ha on average) and unstable.With rapid population growth, intensive grazing pressure of cattle and changes in land tenure, traditional systems of slash-and-burn are no longer sustainable.

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