SLOPE MANAGEMENT FOR SUSTAINABLE AGRICULTURE IN THE UPLANDS

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The Problems

• Due to the fragile nature of upland soils and steep slopes much of the UDP area has been classified as *not suitable* for upland crops or even for orchards.

• “The permanent cultivation of upland in a hot humid climate presents some of the most troublesome problems of tropical agriculture” (Ruthenberg).

• There is hardly anything as destructive to the environment as the expansion of impoverished smallholder farming producing unfertilised arable crops on depleted soils in a tropical setting.

• Cultivating highly erosive, soil fertility depleting crops, such as corn and cassava, on very steep slopes increases the damage.
Findings

• Contour hedgerows are inappropriate on slopes >20% as they cannot prevent a progressive build up in the volume and velocity of run-off on long slopes.

• Arable cultivation can be extended onto 45% slopes by forming terraces with contour ploughing.

• Some upland farmers plan to switch from mixed cropping to growing annual crops on small plots separately from perennial crops.

• This is to be encouraged as mixed cropping, which involves heavy intercropping of annual crops, reduces the total yield of perennial crops but brings early returns.

• There is a need for site-specific prescriptions to help ATs and BEWs give farmers sound advice on slope management.
Hedgerows are unable to reduce the volume and velocity of run-off generated by long steep slopes.
Hedgerows are ineffective as soil conservation measures if the slope above is left unprotected.
Heavy rilling between hedgerows
Reducing slope steepness by terracing is effective on upper slopes as run-off volumes and velocities are lower.
Identifying a replicable model

• Planting any crop anywhere in the uplands, regardless of the slope and soils, is *unplanned* agriculture.

• Increasing the area under cash-generating perennial crops and growing the household’s food requirements, on smaller, separate arable plots, is a characteristic of *dualistic* cropping systems.

• *Dualistic* cropping is typical of smallholder producers in the tropics: cacao growers in Ghana, smallholder rubber planters in Malaysia, coffee farmers in Kenya and Columbia, coconut holdings in the Philippines, etc.

• As yield-increasing innovations can be applied more easily than in mixed cropping, *dualistic* systems should enable upland communities to produce better marketable surpluses.
Identifying suitable locations.
The Land System Approach
Promote dualistic cropping by growing short-term crops on the small areas with gentler slopes (small plateaux, ridges, upper slopes). Plant tree crops on the steeper slopes.
Replace annual crops with tree crops and grass cover to reduce the high erosion risk on slopes with rapidly steepening convexity. (No ditches!)
Support intensification of backyard gardening rather than waste scarce resources trying to develop very steep slopes.
**Advantages of dualistic cropping**

- By relocating arable cultivation to sites where run-off is lower, hedgerows, suited to slopes below 20%, become appropriate soil conservation and soil fertility enhancing measures. The maintenance of terraces is reduced.
- With improved protection of the slopes, the minor valleys can be developed for vegetable production.
- Small intensively cultivated fields of annual crops can yield higher returns per hour of work than larger, neglected fields.
- ACIAR found that chemical fertilisers effected a change from soil mining to balanced systems of land use. With better retention of inorganic fertilisers behind hedgerows, farmers maintained or decreased inorganic fertiliser use and, in many cases increased their use of organic fertiliser.
Proposed strategies

• Second-line model farms should be readily accessible and visible, with a range of minority land units.

• Select younger and better-educated farmers as second-liners as they are more likely to adopt soil conservation technologies.

• Intensively train a core team of SAD and RM specialists from each province in applying STOP and in recognising *land units* with potential for arable agriculture. They will train the extension workers in their own provinces.

• Involve ATIs in demonstrating yield-increasing and quality-improving techniques such as improved technologies, bio-intensive gardening, and better fruit tree maintenance such as pruning, mulching, fertilising etc. to produce new marketable surpluses.
Criteria for providing inputs to second line model farms

• To encourage a change to dualistic cropping, inputs provided to the second-line model farms should aim to:
  – Substitute corn-based mixed farming with perennial crops on long slopes.
  – Relocate the production of highly erosive crops to sites receiving little or no run-off.
  – Encourage terracing of clay soils on upper slopes.
  – Promote improved technologies to compensate for the reduced area under cultivation.
  – Intensify high value vegetable production in backyards of homes and in minor valleys.
CONCLUSIONS

A model for sustainable agriculture in parts of the rugged terrain of the Mindanao uplands is feasible if a dualistic system of cropping is adopted. This will require:

• Concentrating the cropping of arable crops to the better soils on gently sloping crests and ridges where hedgerows are appropriate;
• Lowering steep gradients on upper slopes by terracing;
• Direct seeding of tree crops on steep slopes up to 65%;
• Using scarce organic manures and composts for vegetable production in the minor valleys and backyards; and
• Improving crop husbandry (weeding, spacing, pruning etc) (No practical interventions available for slopes above 65%)