Residue Incorporation (Corn)

Philippines - "Palugdang", "Palata"

Incorporation of corn stalks during land preparation for the succeeding crop.

The technology is practiced in corn farm. It involves the incorporation of stalks and leaves, usually chopped, during the land preparation for the suceeding crop. Corn ears are harvested manually. After harvesting, the stalks are cut and spread on the farm. This provides surface protection to the soil during the turn-around period when erosive rainfall events can occur. After a 2-3 weeks turn-around period, land preparation for the succeeding crop starts. Land preparation can either be by machine or animal. The crop residues are incorporated during plowing which is done twice. The technology is intended to increase organic matter and other nutrients through recycling, improve soil structure and porosity and increase soil water holding capacity. The more common practice done in the past in disposing crop residue is by burning. Residue incorporation has added benefits in that it lessens the emission of gases, particularly carbon dioxide which contributes to global warming.

left: Corn stalks are left in the field to serve as mulch during turn-around period. (Photo: A. Salaum and R. Gallano)
right: A newly harvested corn field which has undergone first plowing operation. Corn stalks are being incorporated into the soil for nutrient recycling. Note that stalks are only "burried" during the first plowing (Photo: A. Salaum and R. Gallano)

Location: Bukidnon
Region: Bukidnon
Technology area: 10 km^2
Conservation measure: agronomic
Stage of intervention: rehabilitation / reclamation of denuded land
Origin: Developed externally / introduced through project, traditional (>50 years ago)
Land use type:
Cropland: Annual cropping
Climate: humid, tropics
WOCAT database reference: T_PHI008en
Related approach:
Compiled by: Not registered
Date: 2001-08-15
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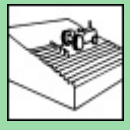
Classification

Land use problems:

- Soil acidification, soil mining and fertility decline. Increasing soil erosion problem due to the culitvation of land with steep slope. (expert's point of view)
Increasing inputs to maintain yield. (land user's point of view)

Land use	Climate	Degradation	Conservation measure
			
Annual cropping rainfed	humid	Chemical soil deterioration: fertility decline and reduced organic matter content	Agronomic

Stage of intervention

- Prevention
- Mitigation / Reduction
- Rehabilitation

Origin

- Land users initiative
- Experiments / Research
- Externally introduced: traditional (>50 years ago)

Level of technical knowledge

- Agricultural advisor
- Land user

Main causes of land degradation:

Main technical functions:
- increase in soil fertility

Secondary technical functions:
- increase in organic matter

Environment

Natural Environment

Average annual rainfall (mm)

- > 4000 mm
- 3000-4000 mm
- 2000-3000 mm
- 1500-2000 mm
- 1000-1500 mm
- 750-1000 mm
- 500-750 mm
- 250-500 mm
- < 250 mm

Altitude (m a.s.l.)

- > 4000
- 3000-4000
- 2500-3000
- 2000-2500
- 1500-2000
- 1000-1500
- 500-1000
- 100-500
- <100

Landform

- plateau / plains
- ridges
- mountain slopes
- hill slopes
- footslopes
- valley floors

Slope (%)

- flat
- gentle
- moderate
- rolling
- hilly
- steep
- very steep

Soil depth (cm)

- 0-20
- 20-50
- 50-80
- 80-120
- >120

Growing season(s): 250 days(Apr - Nov), 220 days(May - Oct)
Soil texture: fine / heavy (clay)
Soil fertility: medium
Topsoil organic matter: low (<1%)
Soil drainage/infiltration: medium

Soil water storage capacity: high

Human Environment

Cropland per household (ha)

- <0.5
- 0.5-1
- 1-2
- 2-5
- 5-15
- 15-50
- 50-100
- 100-500
- 500-1,000
- 1,000-10,000
- >10,000

Population density: 10-50 persons/km2
Annual population growth: 2% - 3%
Land ownership: individual, titled
Land use rights: individual
Relative level of wealth: average, which represents 55% of the land users; 50% of the total area is owned by average land users

Importance of off-farm income: 10-50% of all income: Carpentry, trading, temporary employment (e.g. construction
Access to service and infrastructure:
Market orientation: commercial / market
Mechanization: animal traction
Livestock grazing on cropland:

Implementation activities, inputs and costs

Establishment activities

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Equipment		
- animal traction	27.80	100%
Agricultural		
- seeds	13.30	100%
- fertilizer	75.00	100%
- biocides	74.00	100%
Other		
- Planting (hours)	20.75	100%
- Harvesting (hours)	30.00	100%
- Maintenance (hrs.)	41.50	100%
TOTAL	**282.35**	**100.00%**

Maintenance/recurrent activities

- Cutting/chopping of corn stalks
- Planting
- Plowing/incorporation of crop residue

Remarks:
Labor and material inputs (seeds, fertilizers, chemicals) are the main costs involve
The cost is calculated starting from residue incorporation (plowing), crop establishment, maintenance (spraying, weeding) and harvesting.

Assessment

Impacts of the Technology

Production and socio-economic benefits

++ increased crop yield
++ increased farm income
++ soil structure improved
++ soil fertility improved

Production and socio-economic disadvantages

+ hindered farm operations

Socio-cultural benefits

++ improved conservation / erosion knowledge

Socio-cultural disadvantages

Ecological benefits

+++ increased soil moisture
+++ improved soil cover
+++ increase soil fertility
+ reduced soil erosion

Ecological disadvantages

Off-site benefits

++ reduced smoke emission

Off-site disadvantages

Contribution to human well-being / livelihoods

Benefits /costs according to land user

Benefits compared with costs	short-term:	long-term:
Establishment	slightly positive	very positive
Maintenance / recurrent	positive	positive

Acceptance / adoption:

90% of land user families (900 families; 40% of area) have implemented the technology voluntary. estimates
There is moderate trend towards (growing) spontaneous adoption of the technology. Due to the escalating cost of commercial inorganic fertilizer, farmers are now inclined to used other alternatives/sources of soil nutrients

Concluding statements

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
Low cost method of improving soil physical/chemical properties → Sustained information education campaign (IEC)	Nutrient immobilization during the process of decomposition → Incorporate residue at least one month before the suceeding crop
Increased soil infiltration capacity → Sustained information education campaign (IEC)	Difficult to incorporate (residues) using animal drawn plow → Mechanization/chopping of stalks into shorter pieces
Prevent smoke emission which contributes to global warming → Sustained information education campaign (IEC)	
Reduced soil erosion → Sustained information education campaign (IEC)	
Increase soil fertility → Sustained information education campaign	
Less labor cost during land preparation (no need to haul residue) → Sustained information education campaign (IEC)	