left: Paddy field ready for planting with corn using Conservation Tillage Technology (Photo: Romeo V. Labios)
right: Corn grown using Conservation Tillage Technology at 10 days after planting (DAP) (Photo: Romeo V. Labios)

Conservation Tillage Practices for Corn Production

Philippines - "Tipid Saka"

Conservation Tillage Technology (Zero Tillage) or "Tipid Saka" - A crop production system which focuses on soil conservation and reducing excessive tillage operations, reduces labor and farm inputs while increasing productivity and profitability

Brief Description about Conservation Tillage Technology Conservation tillage is the practice of planting seeds through the stubble of last season's crop, rather than plowing and disking the field. The stubble protects topsoil against loss to wind and rain and reduces chemical run-off to streams. By not plowing, farmers also conserve soil moisture, which can reduce irrigation demands. Farmers can save fuel by reducing the number of farm machinery passes across their fields. In simple terms, Conservation Tillage can be said to lie along a continuum of two other techniques: Minimum Tillage - mouldboard plowing is replaced by light tillage with tined implements, with or without a low toxicity non-residual herbicide to eliminate both perennial and annual weeds. 30% or more of the soil surface is kept covered by soil residues until final seedbed preparation. Conventional planting equipment can normally be used. Zero Tillage - planting is normally conducted without any preparatory tillage, or seedbed preparation. Normally, this technique requires specialized machinery for planting which can displace residues from the previous crop. A low toxicity non-residual herbicide application is recommended where growing weeds are present. There are numerous potential advantages of conservation tillage: Farming Benefits For farmers the primary benefits of CT, achieved with any loss of yields, include: - More sustainable farming due to dramatic reductions in soil erosion caused by water or wind - More efficient conservation and utilization of water under dryland conditions - Improved energy efficiency as a result of reduced fuel requirements associated with fewer field operations - Greater crop and farm profitability through reduced direct and indirect costs for chemicals, fuel and labor. Environmental Benefits At the same time, CT offers a number of significant benefits to the environment, these include: - Greater biodiversity than with standard cultivation practices where the surface has no crop residues - Reduces the build-up of soil sediments in reservoirs, drainage, ditches, etc. caused by soil erosion - Less pollution of drinking water sources caused by run-off of soil, fertilizers and pesticides - Reduced CO2 emissions due to increased soil organic matter level Furthermore, crops grown without tillage use water more efficiently, the water-holding capacity of the soil increases, and water losses from runoff and evaporation are reduced. For crops grown without irrigation in drought-prone soils, this more efficient water use can translate into higher yields. In addition, soil organic matter and populations of beneficial insects are maintained, soil and nutrients are less likely to be lost from the field and less time and labor is required to prepare the field for planting. In general, the greatest advantages of reduced tillage are realized on soils prone to erosion and drought. Also achieved are greater water-stability of surface soil aggregates, higher microbial activity and earthworm populations and higher total carbon. Soil loss is less from sprinkler irrigation than in the plow treatment.

Location: Laguna
Region: San Jose, Abra de Ilog, Sta. Cruz, Sablayan
Technology area: 100 km^2
Conservation measure: agronomic
Stage of intervention: prevention of land degradation
Origin: Developed externally / introduced through project, recent (<10 years ago)
Land use type:
Cropland: Annual cropping
Climate: humid, tropics
WOCAT database reference: T_PHI044en
Related approach:
Compiled by: Romeo Villamin Labios, Farming Systems and Soil Resources Institute, University of the Philippines Los
Date: 2001-09-04

Classification

Land use problems:

- Continuous salinization due to intrusion of salt water and soil fertility decline. Loss of topsoil by water erosion seriously affects soil productivity, degrades water quality and causes costly sedimentation problems. (expert's point of view)
Soil productivity decline; need more inputs to maintain and increase crop yield. (land user's point of view)

Land use

Annual cropping
rainfed

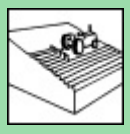
Climate

humid

Degradation

Chemical soil deterioration: fertility decline and reduced organic matter content

Conservation measure



Agronomic

Stage of intervention

- Prevention
- Mitigation / Reduction
- Rehabilitation

Origin

- Land users initiative
- Experiments / Research
- Externally introduced: recent (<10 years ago)

Level of technical knowledge

- Agricultural advisor
- Land user

Main causes of land degradation:

Main technical functions:

Secondary technical functions:

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): 150 days(Jun - Oct), 120 days(May - Sep)
Soil texture: medium (loam)
Soil fertility: medium
Topsoil organic matter: medium (1-3%)
Soil drainage/infiltration: good

Soil water storage capacity: medium

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: 50-100 persons/km2
Annual population growth: 3% - 4%
Land ownership: individual, not titled
Land use rights: leased
Relative level of wealth: average, which represents 5% of the land users; 45% of the total area is owned by average land users

Importance of off-farm income: 10-50% of all income: Carpentry, plumbing, business, offer of labor services to neighbors
Access to service and infrastructure:
Market orientation: mixed (subsistence and commercial), mixed (subsistence and commercial)
Mechanization: mechanised
Livestock grazing on cropland:

Implementation activities, inputs and costs

Establishment activities

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour	147.60	100%
Agricultural		
- seeds	30.00	100%
- fertilizer	60.00	100%
- biocides	1.60	100%
- BIO-N	2.00	100%
Other		
- man-person days	70.00	100%
- post harvests: person days	200.00	100%
- marketing: transportation-tota	20.00	100%
- marketing: packaging-total cos	10.00	100%
TOTAL	**541.20**	**100.00%**

Maintenance/recurrent activities

- Spray POWER herbicide, Planting
- 2nd side dressing, Off-barring and hilling-up
- Retouch application of POWER herbicide, Replanting
- Detasseling
- 1st side dressing, Release of trichogramma

Remarks:
Land cultivation- zero tillage offset the costs incurred during land preparation. Labor costs for hand tractor and carabao-drawn plows are substituted by costs of spraying POWER herbicide which is significantly less expensive
Per hectare of land

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ increased crop yield
+++ increased farm income

Production and socio-economic disadvantages

Socio-cultural benefits

++ improved conservation / erosion knowledge

Socio-cultural disadvantages

Ecological benefits

++ increased soil moisture
++ reduced soil loss
++ increase in soil fertility

Ecological disadvantages

Off-site benefits

Off-site disadvantages

Contribution to human well-being / livelihoods

Benefits /costs according to land user

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

Acceptance / adoption:

20% of land user families (300 families; 10% of area) have implemented the technology voluntary. estimates
There is strong trend towards (growing) spontaneous adoption of the technology. Multinational company such as Monsanto Philippines, Inc. Continuously disseminate the technology through promotion of POWER herbicide

Concluding statements

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
Easy to establish and maintain →	Soil compaction and flooding →
Improved production efficiency →	Soil compaction and flooding →
Increase soil water storage →	
Easy to establish and maintain →	
Improved production efficiency →	