Alternate Wetting and Drying

Philippines

Alternate Wetting and Drying is a water-use management technique wherein irrigation water input could be substantially reduced to as much as 35% without significantly affecting rice yields.

It was observed that most of the farmer's irrigation practice of continuously flooding their rice fields is wasteful and uneconomical. The imbalance amount of water, either in deficit or excess, might affect the development and productivity of the crops. With this inefficient water use and coupled by the increasing frequency of drought, vulnerability to water scarcity is inevitable. Furthermore, it has been recognized that poor water management practices contributed to the process of land degradation. Hence, there is a need to practice proper water management in rice cultivation. As an integral part of the Palayamanan system, the Philippine Rice Research Institute (PhilRice) introduced a water saving technology to the farmers called Alternate Wetting and Drying (AWD). The AWD modifies the irrigation scheduling and application and eventually the amount of water to be use in the field. Irrigation water is applied a few days after the disappearance of the ponded water in the so-called "observation well". Hence, the field is alternately flooded and non-flooded.
The following are the purpose of this technology: (1)reducing water use for irrigation so that it can be used for other purposes, (2) reducing the use of irrigation water because there is less of it, and (3) reducing the use of irrigation water to reduce the cost. Emission of greenhouse gas (GHG) specifically on methane is reduced since this is caused by flooding of ricefields.
Practical implementation of AWD is facilitated using a simple tool called a 'field water tube' as observation well, used in monitoring the water level in the field.It is made of a 25 cm long PVC pipe with a diameter of 10 to 15 cm. In some instances, bamboo can be used instead of the PVC pipe. The pipe is perforated with many holes on all sides to allow lateral movement of water in the root zone. It is installed into the soil by ensuring that 10 (dry season) or 5 (wet season) cm protrudes above the soil surface. Soil must be removed inside the tube so that the bottom is visible. During the first 21 to 30 days after direct seeding or transplanting, 2 to 3 cm of water is maintained to control weeds and to ensure that the crop has already recovered from transplanting shock. AWD is imposed after 21 to 30 days where the water in the tube is monitored. Once the water inside the tube disappears, irrigation is applied to a water depth of 5 cm above soil surface. It is noted that during fertilizer application and flowering stage, sufficient water is maintained to avoid spikelet sterility. Terminal drainage from one to two weeks before the expected time of harvest is also done to promote uniform maturity of the crop and to facilitate easement of post-harvest operations in the field.
The area is under a humid climate experiencing wet and dry season with an annual average rainfall ranging from 1000-1500 mm per year. The technology was applied to irrigated rice field in flat and plain areas.

left: Flooded field with field water tube (Photo: FSSP Associated Tech)
right: Measuring the water level inside the field water tube (Photo: FSSP Associated Tech)

Location: San Nicolas, Dingras
Region: Ilocos Norte
Technology area: < 0.1 km2 (10 ha)
Conservation measure: management
Stage of intervention: prevention of land degradation
Origin: Developed externally / introduced through project, 10-50 years ago
Land use type:
Cropland: Annual cropping
Climate: humid, tropics
WOCAT database reference: T_PHI059en
Related approach: Palayamanan (A_PHIO11EN)
Compiled by: Philippine Overview of Conservation Approaches and Technologies, Bureau of Soils and Water Management
Date: 2016-02-11
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Classification

Land use problems:

- lack of irrigation water (expert's point of view)

Land use

Annual cropping

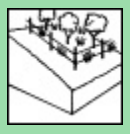
Climate

humid

Degradation

Water degradation: change in quantity of surface water

Conservation measure



Management: Others ()
Management: Major change in timing of activities

Stage of intervention

- Prevention
- Mitigation / Reduction
- Rehabilitation

Origin

- Land users initiative
- Experiments / Research
- Externally introduced: 10-50 years ago

Level of technical knowledge

- Agricultural advisor
- Land user

Main causes of land degradation:
Direct causes - Human induced: crop management (annual, perennial, tree/shrub), other human induced causes, water use management

Main technical functions:
- more efficient water use

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

Soil texture: medium (loam)
Soil fertility: medium

Availability of surface water: good
Water quality: good drinking water
Biodiversity: medium

Tolerant of climatic extremes: floods, droughts / dry spells

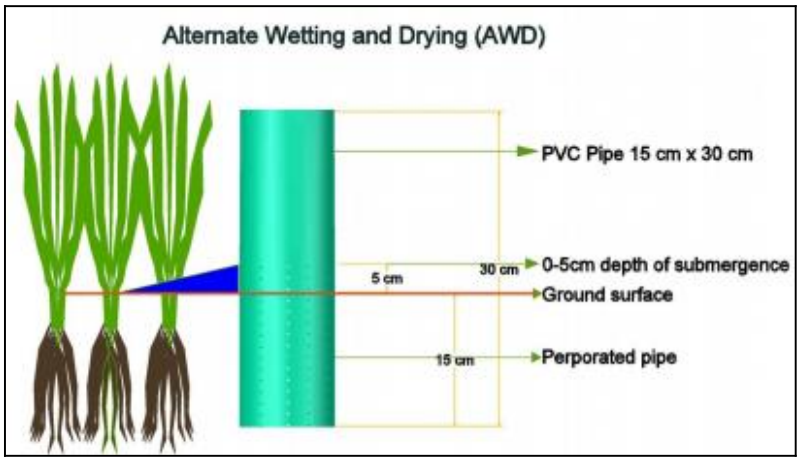
Human Environment

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

Land user: groups / community, Small scale land users, common / average land users, mainly men
Population density: 10-50 persons/km2
Annual population growth: 1% - 2%
Land ownership: individual, titled
Land use rights: individual
Water use rights: communal (organised)
Relative level of wealth: average

Importance of off-farm income: less than 10% of all income:
Access to service and infrastructure: moderate: health, education, employment (eg off-farm), market, roads & transport, financial services; high: technical assistance
Market orientation: mixed (subsistence and commercial)
Mechanization: animal traction
Livestock grazing on cropland:



Technical drawing

PVC pipe used for the technology. (Engr. Mamerto F. Martinez)

Implementation activities, inputs and costs

Establishment activities

- Preparation of the PVC/bamboo pipes
- Perforation with many holes on all sides of the PVC/bamboo pipe

Establishment inputs and costs per unit

Inputs	Costs (US$)	% met by land user
Labour	3.33	100%
Construction material		
- PVC pipe	4.44	100%
TOTAL	**7.77**	**100.00%**

Maintenance/recurrent activities

- Installation of the PVC/bamboo pipe into the soil

Remarks:

Assessment

Impacts of the Technology

Production and socio-economic benefits

+++ reduced demand for irrigation water

Production and socio-economic disadvantages

++ weed growth during dry period

Socio-cultural benefits

++ improved conservation / erosion knowledge

Socio-cultural disadvantages

Ecological benefits

+++ reduced surface runoff
++ reduced evaporation
++ improved excess water drainage

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	positive
Maintenance / recurrent	positive	positive

Acceptance / adoption:

There is moderate trend towards (growing) spontaneous adoption of the technology. Most of the land users practicing "Palayamanan" in the municipality and province of Ilocos Norte is adopting the technology.

Concluding statements

Strengths and → how to sustain/improve	Weaknesses and → how to overcome
Simplicity of the technology's method. →	Prone to weed growth during the period when the soil is dry. → Proper weed management
AWD leads to firmer soil conditions at harvest, which is beneficial to operating machines in the field. →	
Positive outcome primarily in water savings without significant yield difference from the usual practice. →	