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Use of Evaporation Suppressant

Rice Technology Bulletin Series

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Foreword

The rice plant needs 108 liters of water to produce a cavan of palay through the process of photosynthesis. Farmers depend on rainwater and irrigation water to grow their rice. However, insufficiency of irrigation water has been a major constraint to rice production in the Philippines. A substantial amount of water is lost through evaporation, water seepage and percolation, and water conveyance from dams to the field.

Through evaporation alone, water loss already amounts to more than 2 million liters per hectare per season. Therefore, reducing evaporation can help increase water use efficiency. Since 60% of evapotranspiration is evaporation, reducing evaporation can also result in an increase in area that could be irrigated by the same amount of water.

Reducing evaporation can be achieved through the use of the substance called evaporation suppressant or evaposuppressant. The substance prevents nitrogen from escaping to the atmosphere while facilitating oxygen exchange. It also maintains ideal water temperature necessary for faster rice growth. Thus, at least 50% evaporation reduction is achieved without reducing yield.

LEOCADIO S. SEBASTIAN
Executive Director

Introduction

Water is one of the indispensable elements that sustain humans, plants, and animals. For one, it carries the nutrients to the different parts of an organism. In the process of photosynthesis, rice plants would need 108 liters (L) of water to produce a cavan of palay. Insufficient water can hinder its growth and thus, affect its yield. With the recurring problem of irrigation water insufficiency in Philippine farms, the evaporation suppressant (evaposuppressant) was developed to save on water by reducing loss through evaporation.

Causes of water shortage in rice production

1. Excessive use of water

The estimated present volume of water being used in the current irrigation systems is 174,000 L per hectare (ha). The International Rice Research Institute worldwide figure is 250,000 L of water per hectare.

The 17.4 million L of water apparently needed to produce the desired minimum national average of 100 cavans/ha of palay is more than 12 times the transpiration requirement to produce that palay yield. This means that we are currently wasting too much water to produce a cavan of palay.

2. Evaporation

Water lost through evaporation can reach 2.54 million L/ha per season. Evaporation averages 3-4 mm per day in the rainy season and 5-8 mm per day in the dry season in the Philippines. High evaporation rate causes stress in the rice fields which can lead to a yield loss of 1 ton per hectare.

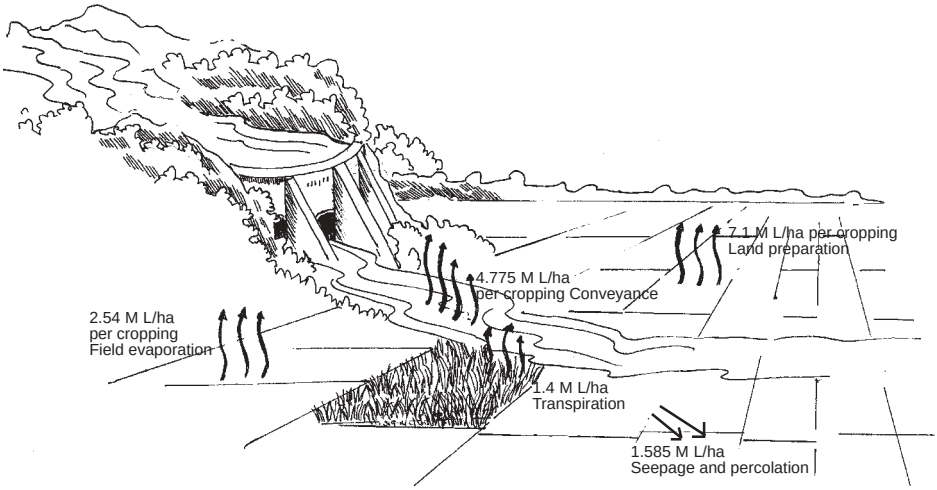

Fig. 1. Different avenues through which water is lost.

Evaporation accounts for 100% during land preparation. As the rice crop matures, evapotranspiration becomes 60% evaporation and 40% transpiration.

3. Other areas of water loss

Seepage and percolation losses are also present aside from evaporation during conveyance of water from dam to the field, during land preparation, and from transplanting until harvest. About 5M L/ha are lost during conveyance, 7 million L/ha during land preparation, and 1.6 M L/ha through seepage and percolation in dikes. Some 1.4 M L/ha are also lost through transpiration from transplanting until the last irrigation before harvest.

Benefits of using evaposuppressant

- Evaposuppressant is a nontoxic and biodegradable chemical substance that suppresses water loss by forming a thin continuous film above the water surface.

- The cheapest and most readily available evaposuppressant is a cetyl-stearyl alcohol mixture prepared from coconut oil.
- Evaposuppressant saves up to 2 M L of water/ha per season which can irrigate up to 20% more ricefields with the same amount of irrigation water available.
- It also reduces nitrogen loss while facilitating oxygen exchange.
- At least 50% evaporation reduction can be achieved with the use of an evaposuppressant (1.3M L/ha).
- It maintains optimum water temperature needed for faster growth of rice plants. This is because reducing evaporation raises surface water temperature by 2-3 degrees Celsius, increasing seedling growth rate during cold months.
- In rainfed ricefields, use of evaposuppressant can minimize water stress during the 2-3 week dry spells in rainy season. This can result in an additional 20 cav palay/ha.
- Evaposuppressant can reduce irrigation pumping cost.

Where evaposuppressant may be applied

- Rainfed lowland rice fields and those in the tail end of irrigation systems
- Municipal water reservoirs
- Small farm reservoirs
- Small water impounding projects (SWIPs)
- Swimming pools
- Aquaculture ponds
- Lakes

When to apply evaposuppressant

- In the rice fields with standing water:
  - One week after transplanting
  - Two weeks after transplanting
  - One week before flowering
  - At flowering
  - One week after flowering
  - Two weeks after flowering
- In reservoirs and ponds, apply weekly

How to use evaposuppressant

Evaposuppressant can be applied in the form of paste, slurry, and solution (with organic solvent). To apply:

1. Determine the actual size of the rice field or reservoir.
2. Measure the necessary amount of evaposuppressant corresponding to the area (see table on next page).
3. Pour evaposuppressant into the different parts of the rice field or reservoir.

Fig. 3. A farmer measuring the amount of evaposuppressant.

Paddy Size (sq m)	Paste (tbsp) [43% a.i.]	Slurry (tbsp) [7.5% a.i.]	Solution (tbsp) [25% a.i.]
200 - 600	2	10	4
601 - 800	3	14	5
801 - 1,000	4	17	6

a.i. = active ingredient; *[1 tbsp = 14.4 mL]*

***Note**: Increase application of evaposuppressant more than the recommended rate depending on field conditions (e.g. windy.)*

Terms used

Slurry formulation - a milky liquid mixture. To prepare, add 250 ml of water, 309 carboxymethylcellulose (cmc), 40g cetyl alcohol, and 60 g stearyl alcohol in a container. Blend mixture until the suppressants are finely ground to produce a milky liquid.

Paste formulation - a soft composition like a toothpaste. To prepare, dissolve 30 g of sodium methylcellulose (NaC MC) in 250 mL of boiling water while stirring. Add the other suppressants and continue stirring until all the suppressants are dissolved. Cool to room temperature while stirring. Blend for 5 minutes until a white paste is formed. For field application, reconstitute the required amount of paste in water and apply as per the recommendation in the above table.

Solution formulation - a liquid form. The solution is already prepared. To apply on the field, follow the instructions in the evaposuppressant container.

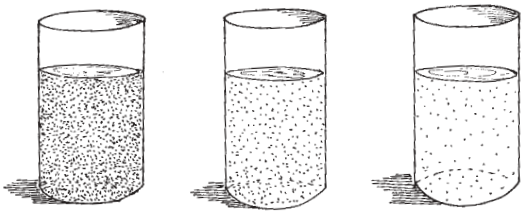

Fig. 4. Different forms of evaposuppressant

Tips for better results

- Establish windbreaks.
- Increase the dike's spillway height to at least 10 cm from the ground level.
- Solution form - Dissolve the suppressant in organic solvent. It is the most recommended form for use in the field because of the rapid spread of the film. Finely powdered evaposuppressant, however, is recommended for use in the reservoir because it is cheaper than dissolving it in organic solvent (solution form).
- Do not use evaposuppressant in solution form at floodwater temperature below 20°C. There is a tendency for the suppressant to solidify before it can completely spread.
- Do not apply evaposuppressant in running water. Turbulent mixing of the evaposuppressant in water may cause more of the suppressant to be dispersed instead of staying on the surface.

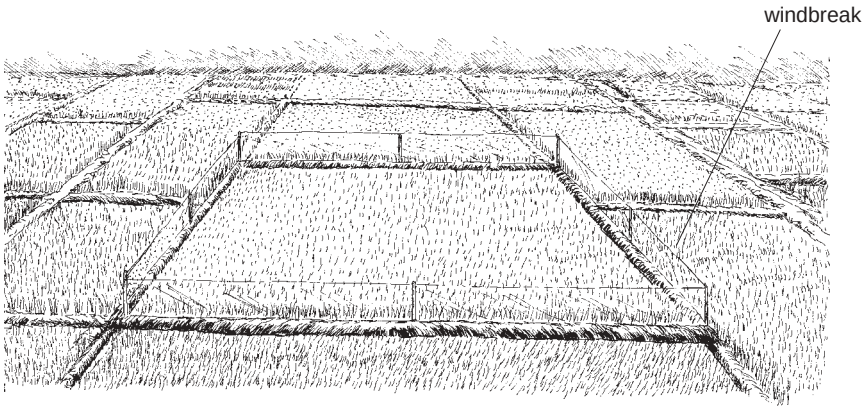

Fig. 5. Windbreaks help improve performance of the evaposuppressant

Where to buy

(a) PhilRice Los Banos, College, Laguna
Phone: 63 (049) 536 - 3631 to 33

(b) Croptrade Philippine Corporation, 36 Guada Sanchez St., B.F. Resort Village, Las Piñas City

or

Km.16 Republic Street Tube Compound, Alabang-Zapote Road, Pamplona, Las Piñas City, Tel. Nos.: (02)873-9759, 874-3077

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Subject Matter Specialists: **Maximo Baradas***
Milagros Peralta
Moises Dorado
Josephine Mina
Basilio Pimentel, Jr.
Ma. Andrea Demacale
Vicente Ballaran, Jr.
Andrew Tangonan
Ma. Theresa Manalili
Ma. Tzarina Trio
Eduardo Jimmy Quilang
Jovino de Dios

** Dr. Maximo W. Baradas is posthumously recognized for the great work he accomplished in developing and promoting the evaposuppressant technology.*

Writer and Managing Editor: **Solomon G. Anaeto**
Layout Artist: **Carlo G. Dacumos**
Illustrator: **Carlito N. Bibal**
Editorial Advisers: **Leocadio S. Sebastian**
Karen Eloisa T. Barroga

For more information, contact:

Agronomy, Soils, and Plant Physiology Division
Philippine Rice Research Institute
Maligaya, Science City of Muñoz, Nueva Ecija 3119
Tel. No. (044)456-0285;-0113 local 212, 217, 814
or
PhilRice Los Baños, College, Laguna
Tel. No. (049)536-3631 to 33

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DA-PhilRice

The Philippine Rice Research Institute (PhilRice) is a government corporation attached to the Department of Agriculture (DA). Executive Order 1061 approved on November 5, 1985 and amended by EO 60 dated Nov. 7, 1986, created PhilRice to help develop high-yielding technologies so that farmers can produce enough rice for all Filipinos. PhilRice accomplishes this mission through research, technology promotion, and policy advocacy, which are implemented through a network that includes 57 agencies and 109 seed centers strategically located nationwide.

Its interdisciplinary programs include the following: (1) direct-seeded and (2) transplanted irrigated lowland rice; (3) hybrid rice; (4) rice for adverse environments; (5) rice-based farming systems; (6) rice and rice-based products; (7) policy research and advocacy; and (8) technology promotion. With these programs, PhilRice aims to develop and promote technologies that are ecosystem-based, location- and problem-specific, and profitable to the Filipino farmers.

for more information, write, visit or call:

DA-PhilRice *Maligaya*
Science City of Muñoz, 3119 Nueva Ecija
Tel: 63 (044) 456-0113, -0258, -0277, -0285, -0354
Tel/Fax: (02) 843-5122; 63 (044) 456-0112; -0649 local 803; -0651 local 511; -0652 local 515; -0653
e-mail: philrice@mozcom.com
Website: http://www.philrice.gov.ph

DA-PhilRice *Los Baños*
UPLB Campus, College, 4031 Laguna
Tel: 63 (049) 536-3631 to 33, -3635
Tel/Fax: 63 (049) 536-3515
e-mail: philrice@laguna.net

DA-PhilRice *San Mateo*
Malasin, San Mateo, 3318 Isabela
Tel: 63 (078) 664-2280, -2954
Tel/Fax: 63 (078) 664-2953
e-mail: philrice_isabela@digitelone.com

DA-PhilRice *Batac*
17 Tabug, Batac, 2906 Ilocos Norte
Tel: 63 (077) 792-4714
Tel/Fax: 63 (077) 792-4702
e-mail: philrice@ILN.CSI.com.ph

DA-PhilRice *Midsayap*
Bual Norte, Midsayap, 9410 North Cotabato
Tel/Fax: 63 (06422) 98178
e-mail: philrice@microweb.com.ph

DA-PhilRice *Agusan*
Basilisa, RTRomualdez, 8611 Agusan del Norte
Tel: 63 (085) 818-2277, -3377; (0918) 406-1145
Tel/Fax: 63 (085) 818-4477
e-mail: cvces001@cdo.philcom.com.ph

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