

Save Irrigation Water Using the Innovative Machine of Soil and Water Management for Rice Crop Cultivation (SWMR)

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Background

Rice is considered one of the most important foods and export to many countries.

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**Rice is a global strategic crop**  
 Irrigated rice receives an estimated about 40 % of the total world's irrigation water, Rice is the second crop of yield amount and the third crop of the cultivated area in the world, Rice is the food for about half world people.

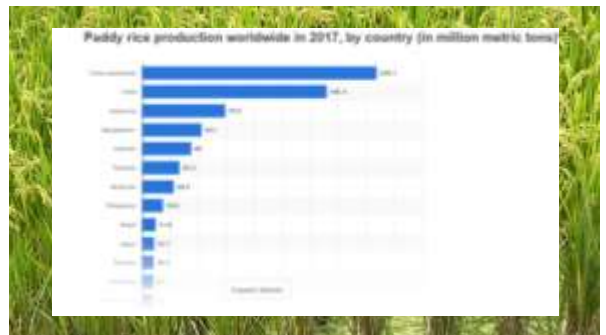
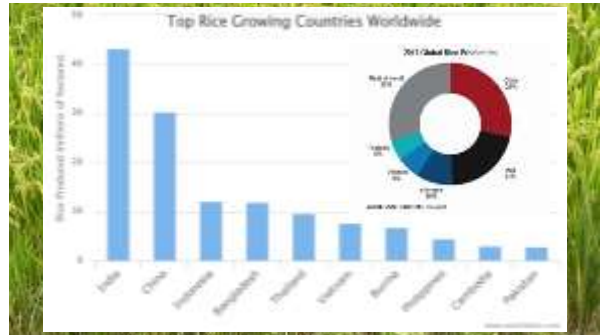
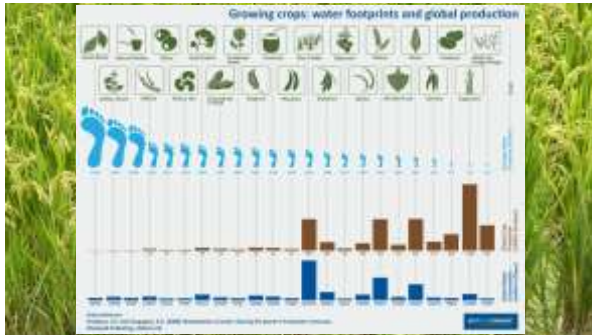
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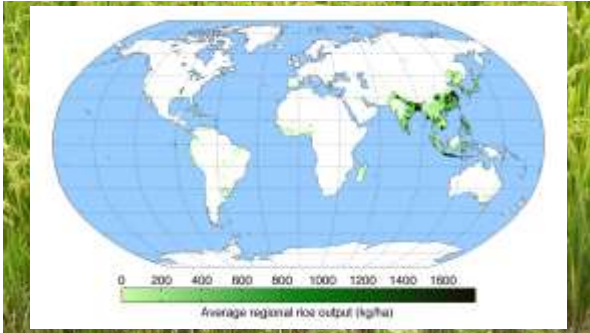
**YOUR WATER FOOTPRINT**

1,400 litres

95 litres

1kg chicken 2,500 litres  
 1kg beef 1,000 litres  
 1kg pork 1,000 litres  
 1kg lamb 1,000 litres  
 1kg turkey 1,000 litres  
 1kg fish 1,000 litres  
 1kg eggs 1,000 litres  
 1kg milk 1,000 litres  
 1kg cheese 1,000 litres  
 1kg butter 1,000 litres  
 1kg oil 1,000 litres  
 1kg sugar 1,000 litres  
 1kg flour 1,000 litres  
 1kg rice 1,000 litres  
 1kg wheat 1,000 litres  
 1kg corn 1,000 litres  
 1kg soybean 1,000 litres  
 1kg cotton 1,000 litres  
 1kg wool 1,000 litres  
 1kg leather 1,000 litres  
 1kg paper 1,000 litres  
 1kg plastic 1,000 litres  
 1kg glass 1,000 litres  
 1kg metal 1,000 litres  
 1kg coal 1,000 litres  
 1kg oil 1,000 litres  
 1kg gas 1,000 litres  
 1kg electricity 1,000 litres  
 1kg water 1,000 litres



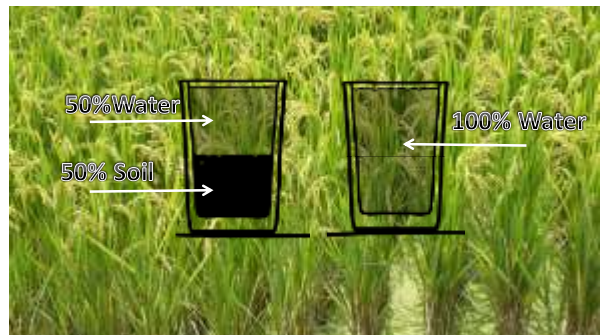


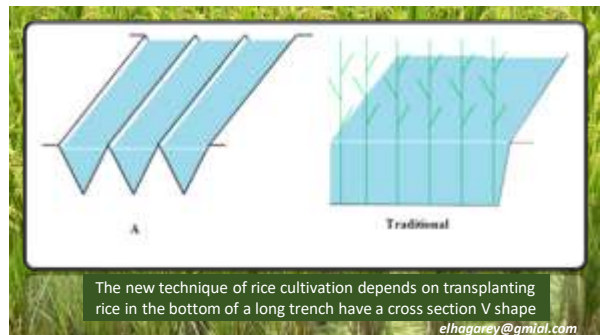
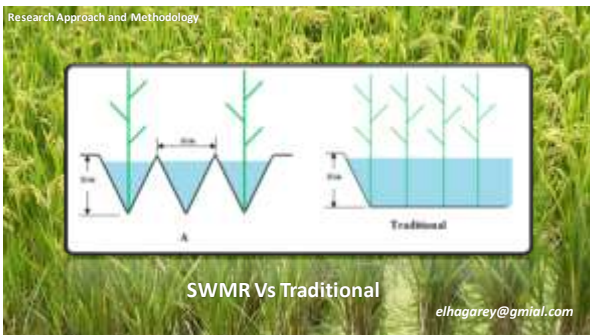
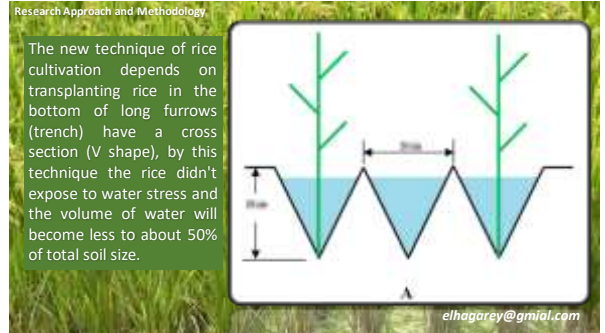
**Objectives:**

The main objectives of the Innovation of Soil and Water Management machine for Rice Cultivation (SWMR) are:

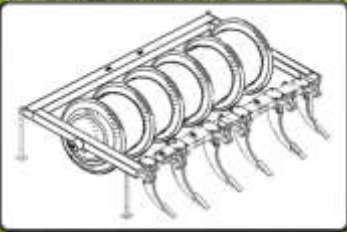
- 1) Development of SWMR design to be more flexible in various soil textures.
- 2) Resulting of the modified SWMR type to produce the mass product.
- 3) Maximizing the WUE and FUE of rice crop.
- 4) Minimizing of rice water footprints.
- 5) Applicability of a modern rice cultivation method to save water.
- 6) Reduction of water and nutrient losses by exceeding irrigation of paddy.
- 7) Change of rice cultivation map according to new innovative method.
- 8) Provide a new reclamation land using surplus water.

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SWMR Machine is Manufactured of a cylinder rule (printer on soil surface) having many of circular teeth around the basic cylinder rule to roll after subsoil chisel of depth 25 cm under the soil surface, behind the tractor on soil and printed the designed V shape of cross section of furrows.



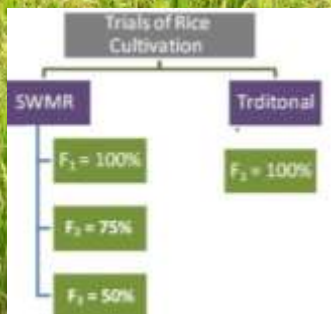
The innovative machine of soil and water management for rice (SWMR).

Research Approach and Methodology

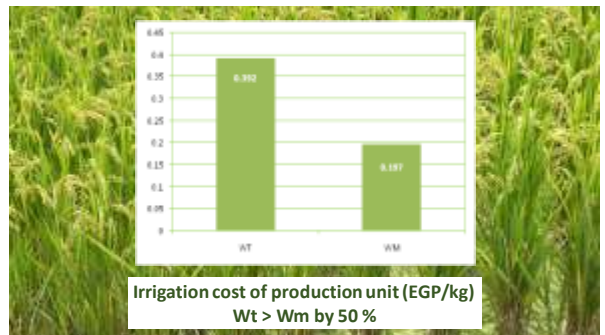
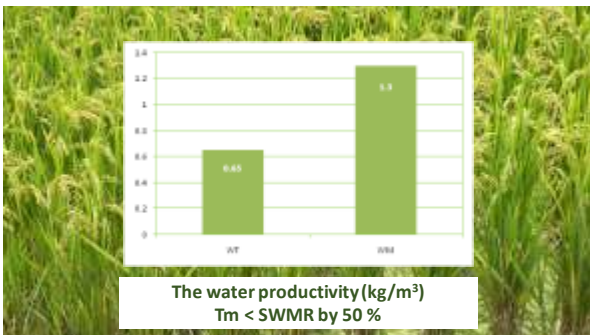
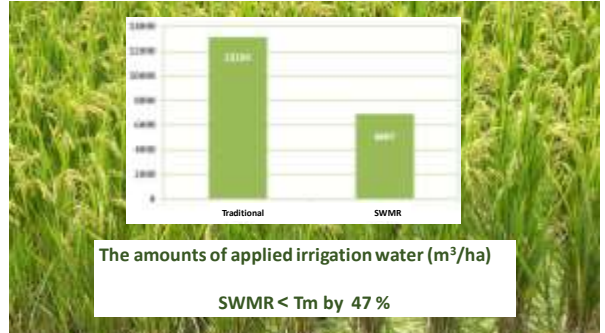


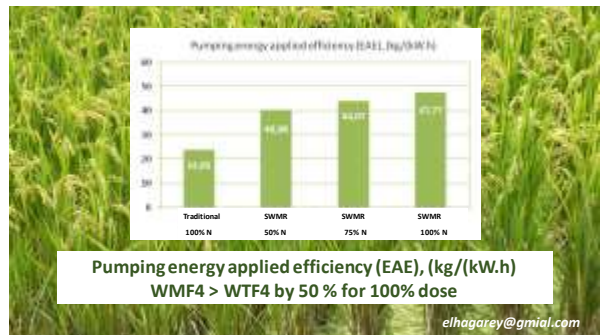
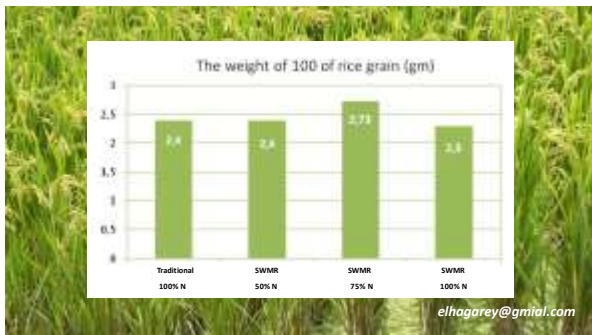
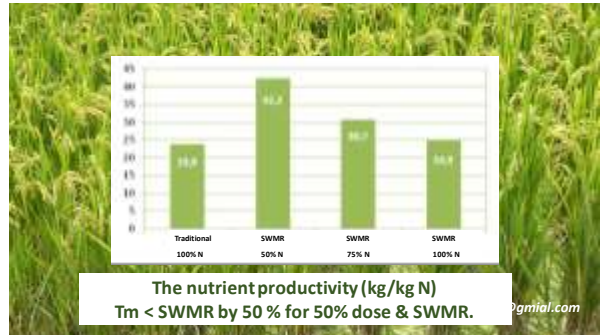
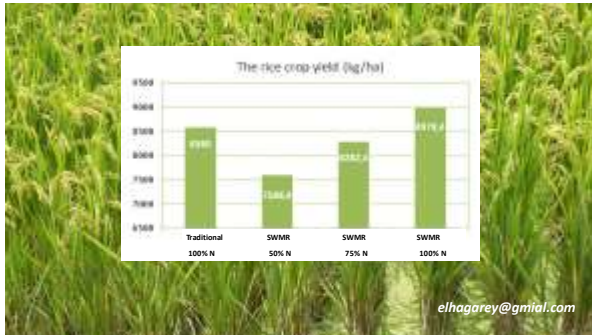
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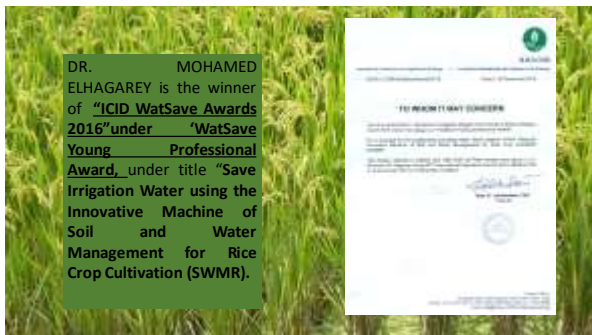
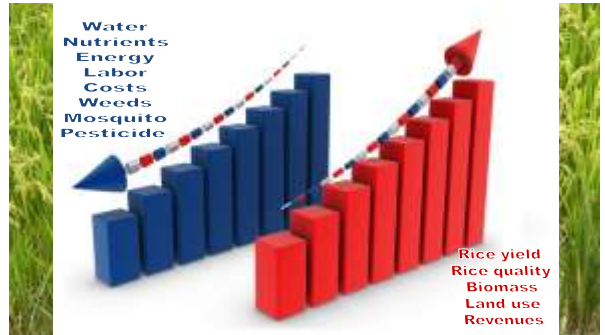
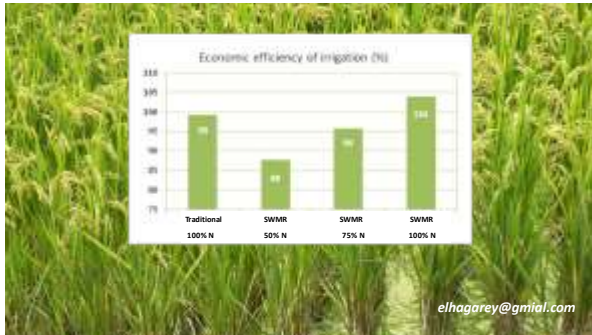
Rice is transplanted un two methods (Traditional & SWMR), the nutrients are applied in recommendation doses under traditional method and applied in three amounts under SWMR method (50%, 75% and 100% of recommended requirements.



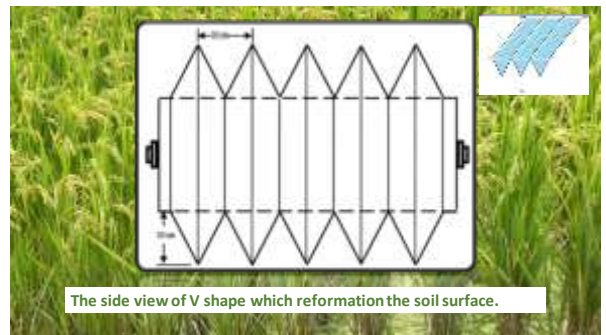
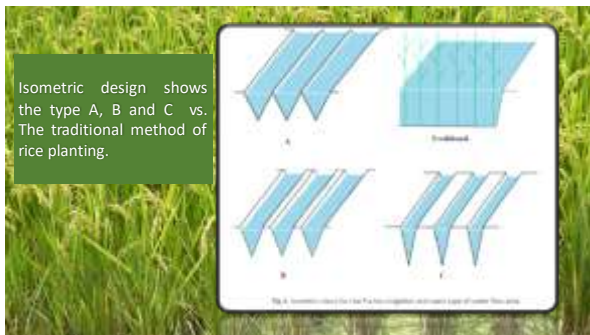
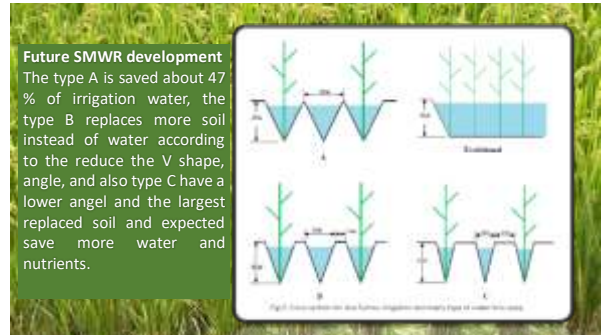
The rice paddy under the SWMR method and traditional methods

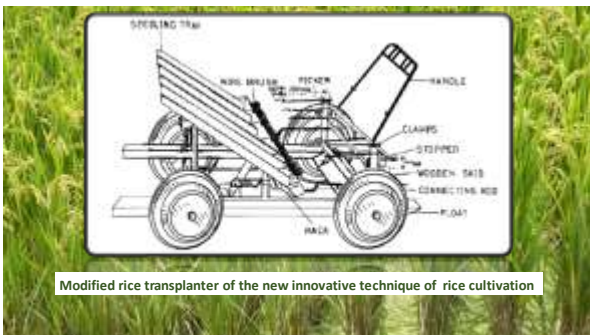
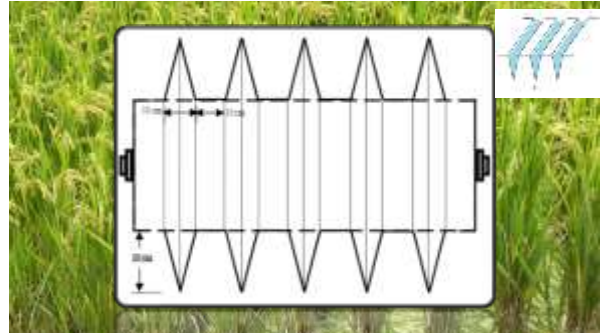
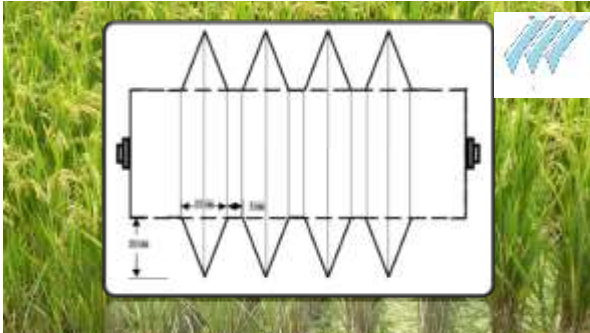




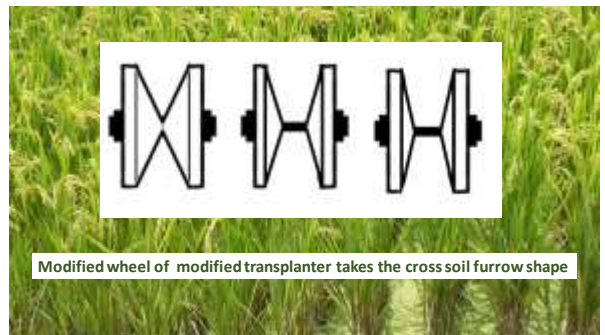




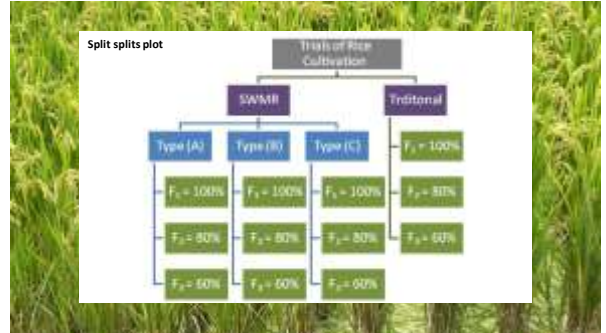
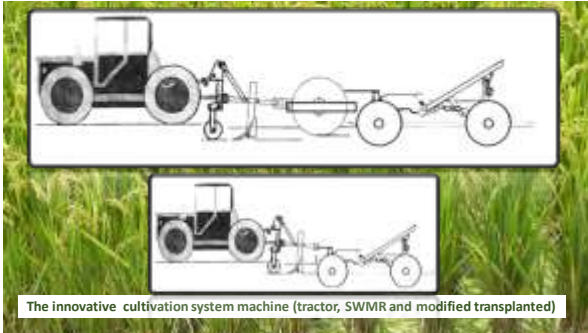




Modified rice transplanter of the new innovative technique of rice cultivation



Modified wheel of modified transplanter takes the cross soil furrow shape



**Measurements and calculations:**

**Hydraulic measurements:**

**Pump water discharge and pressure:**  
Pump discharge was measured by using discharge flow meter and pressure by pressure gauge.

**Furrow water discharge and velocity:**  
Furrow water discharge and velocity will be measured for every type of furrow irrigation and also the time of water seepage, friction losses and stagnes

**Advanced and recession phases of water movement:**  
The water advance and recession times were recorded for each 12.5 m length during the irrigation time. The total flow time T including the times of the water advance.

**Irrigation water saving percentage:**  
Crop Water use efficiency:

**Soil moisture content and soil salinity:**  
Irrigation requirements:

**Soil Measurements:**

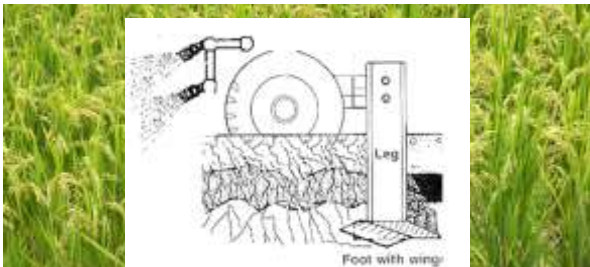
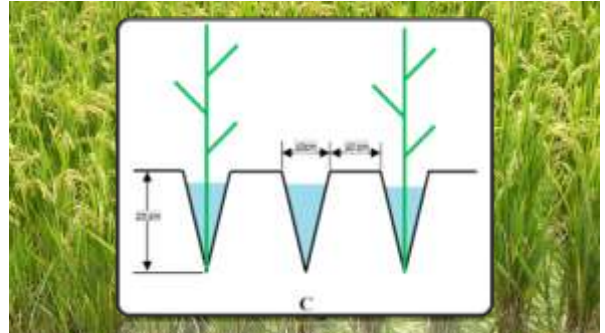
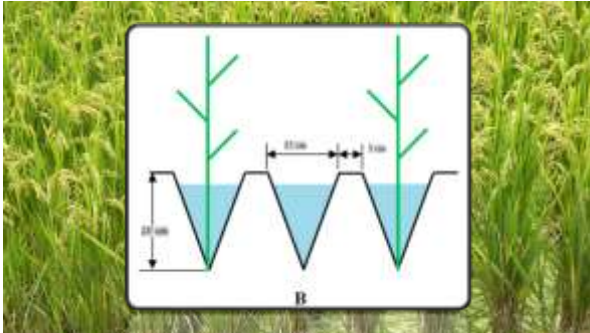
- Soil bulk density
- Soil penetration resistance
- Average infiltration rate:

**Engineering measurements:**

- Theoretical and actual field capacity and field efficiency
- Pulling force
- Slip resistance force ratio (%)
- Fuel consumption rate

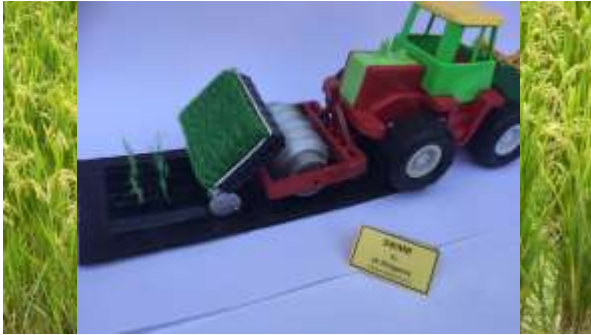
**Crop measurements:**

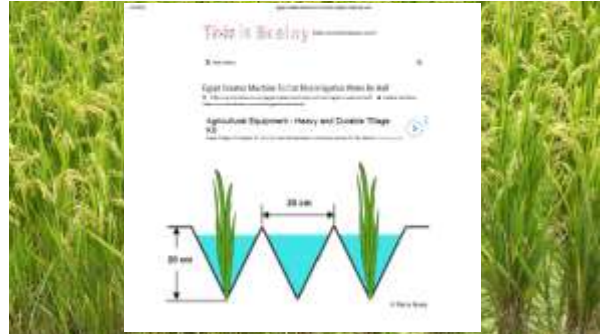
- Agronomic Characteristics:
- Engineering crop characteristics
- Energy requirements
- Cost analysis
- Efficiency (%)



- 1- Spraying of soil conditioners to save the soil bed shape as prepared after transplanter for longer time.
- 2- Spraying of water to wet soil to ease the transplant process.







Country	Area of cultivated rice area (Million hectares)	Fertilizer requirements of Million hectares (Urea 140 N)	Million tons Fertilizer cost (US \$ billion)	
			Traditional	SWMR saving about 25 %
India	37-46	32 - 40	8 - 10	6 - 7.5
South East Asia States	48	41.5	10.4	7.6
Global Area	132.84	114.85	28.78	21

SWMR will save about 10 (US \$ billion) of global paddy nutrients costs

