**BOTH IN THEORY AND PRACTICAL**

**RESOURCE USE EFFICIENCY:**

Efficiency in any system is an expression of obtainable output with the addition of unit amount of input.

Resource use efficiency (fertilizer, water etc) is the output of any crop or anything else per unit of the resource applied under a specified set of soil and climatic conditions. Few examples are as follows:

1. **Cultivated land utilization index (CLUI)**
2. **Fertilizer use efficiency (FUE)**: FUE is the output of any crop per unit of the nutrient applied under a specified set of soil and climatic conditions. It is also known as NUE (nutrient use efficiency).There are 4 agronomic indices to describe NUE are:
	* 1. Partial factor productivity (PFP)-It is crop yield in kg per kg of input applied.
		2. Agronomic efficiency (AE) – It is kg crop yield increase per kg nutrient applied.
		3. Apparent recovery efficiency (RE) - It is kg nutrient taken up per kg nutrient applied.
		4. Physiological efficiency (PE)-It is kg yield increase per kg nutrient taken up.

3) **Crop removal efficiency** -Removal of nutrient in harvested crop as % of nutrient applied.

4) **Energy Efficiency**- Energy output (MJ/ha) / Energy input (MJ/ha).

 MJ- mega joule

5) **Water use efficiency**-

 a) **Crop water use efficiency**: Crop water use efficiency is a ratio between marketable crop yield and water used by the crop in evapotranspiration.

 WUE (kg/ha-mm) = Y/ETc

Where, WUE = Water use efficiency in kg/ha-mm

Y = Marketable crop yield in kg/ha

ETc = Crop evapotranspiration in mm

* 1. **Field water use efficiency**: Field water use efficiency is a ratio between marketable crop yield and field water supply which includes water used by the plant in metabolic activities, ET and deep percolation losses.

FWUE (kg/ha-mm) = Y/WR

Where,

FWUE = Field water use efficiency in kg/ha-mm

Y = Crop yield in kg/ha

WR = Water used in metabolic activities, ET and deep Percolation losses in mm

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| CROP | WUE (kg/ha-mm) |
| Finger millet | 13.4 |
| Wheat | 12.6 |
| Groundnut | 9.2 |
| Sorghum | 9.0 |
| Pearl millet, maize | 8.0 |
| Rice | 3.7 |

6) **Resource use efficiency**: Resource use efficiency in agriculture is defined to include the concepts of technical efficiency, allocative efficiency and environmental efficiency.

 **Technical efficiency** is the ability of a firm to produce a given level of output with minimum quantity of inputs under a given technology.

 **Allocative efficiency** is a measure of the degree of success in achieving the best combination of different inputs in producing a specific level of output considering the relative prices of these inputs.

 **Economic efficiency** is a product of technical and allocative efficiency.

7) **Crop removal efficiency:** Removal of nutrient in harvested crop as % of nutrient applied.