

## Necessity of Irrigated and Rainfed Agriculture in the World

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A reliable and suitable irrigation (as surface or pressurized) can be improved agricultural production and irrigation efficiency. There are many studies to increase and manage irrigation efficiency [1-14]. A large number of considerations must be taken into account in the selection of an irrigation system. These will vary from location to location, crop to crop, year to year, and farmer to farmer. Table 1 shows a list of advantages and disadvantages of irrigation methods.

Figure 1 shows global precipitation and the Reference evapotranspiration ( $ET_0$ ) [15]. The values of  $ET_0$  for the Arabian Peninsula, Sahara, Gobi Desert, and the major areas in Australia range up to three meters per day. At latitudes greater than 40°S and 40°N, amounts of one meter and lower values can be found.

Figure 2 shows total potential for rainfed agriculture [15]. According to the Figure 2, 46% of the world is not suitable for rainfed agriculture because of climate changes and other meteorological conditions.

However, Figure 3 shows that 80% of agricultural production is form rainfed areas [16].

The results show that 54% of the world is suitable for rainfed agriculture whereas 80% of agricultural production is form rainfed areas. Therefore, increasing irrigated agriculture is necessary. But, why tendency to irrigation is low? In many areas of the world, water resources are limited and irrigation is not economical. In pressurized irrigation, although irrigation efficiency is high but amount of required water is lower than surface irrigation but cost of pressurized method is very high. Agricultural integration is an affordable approach. Moreover, increasing irrigation efficiency led to use of surface irrigation in small farms. However, selection of an appropriate method for irrigation is more important than other mentioned cases. In some conditions, deficit irrigation is sufficient to achieve to maximum of production. In other conditions, notifying to all effective factors (to choose irrigation system) include compatibility, economics, topographical characteristics, soils, water supply, crops, social influences, external influences and awareness of advantages and disadvantages of different irrigation systems (Table 1) led to maximizing efficiency and finally increasing tendency to irrigated agriculture.

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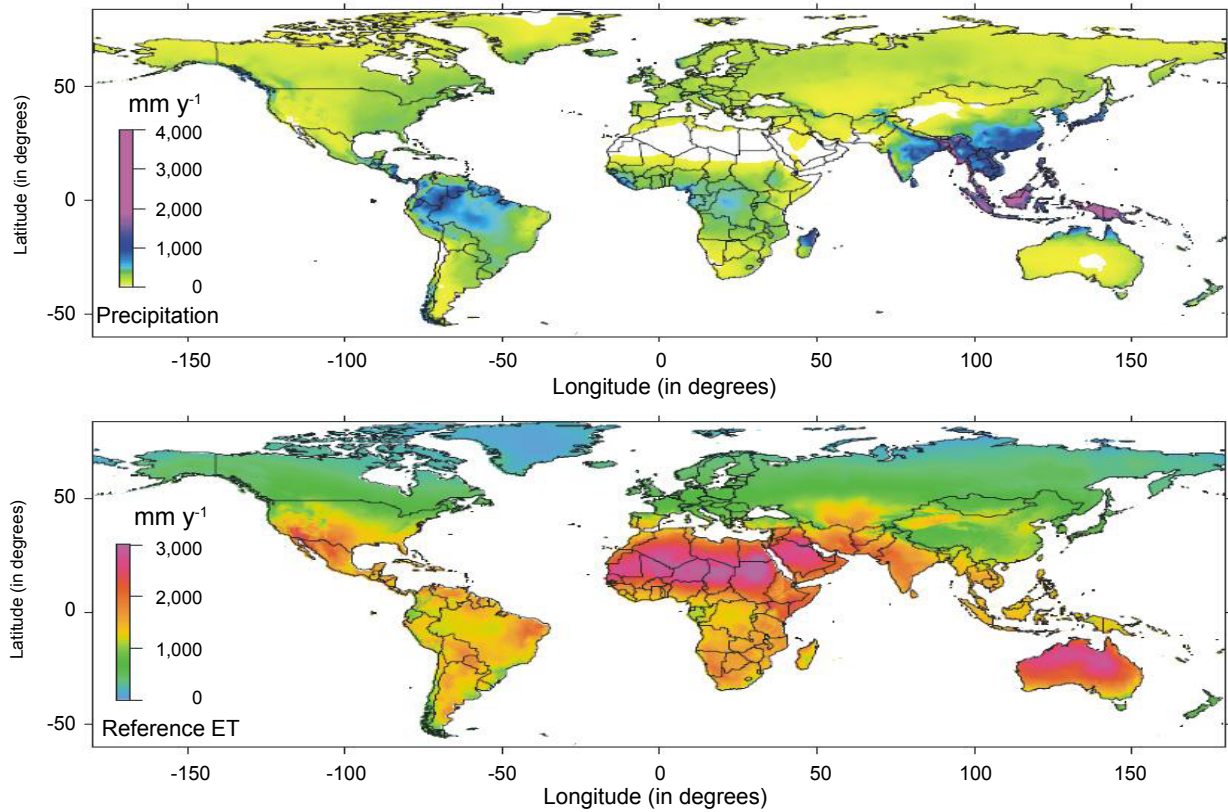


Figure 1: Annual global precipitation and reference evapotranspiration rates from IWMI's Climate Atlas.

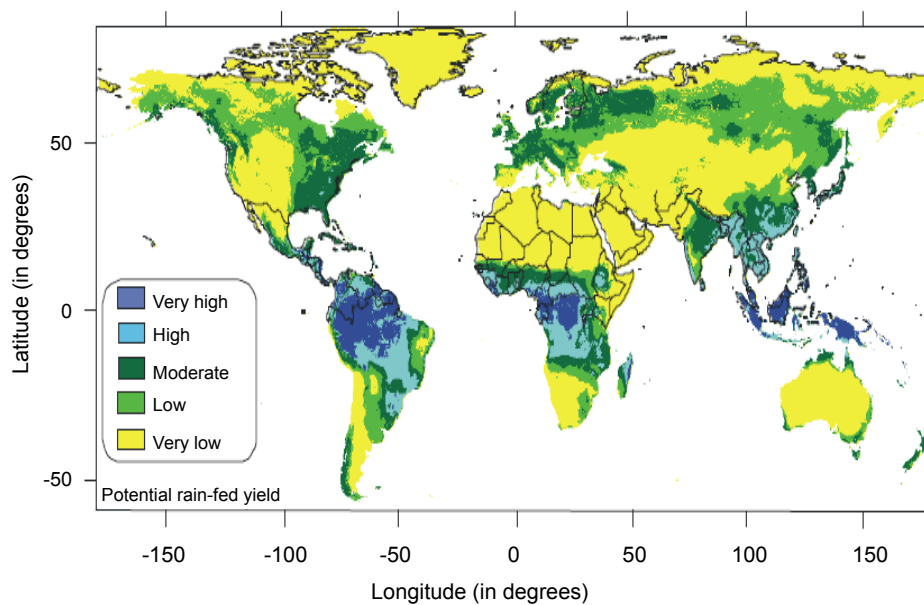


Figure 2: Potentials for rainfed agriculture.

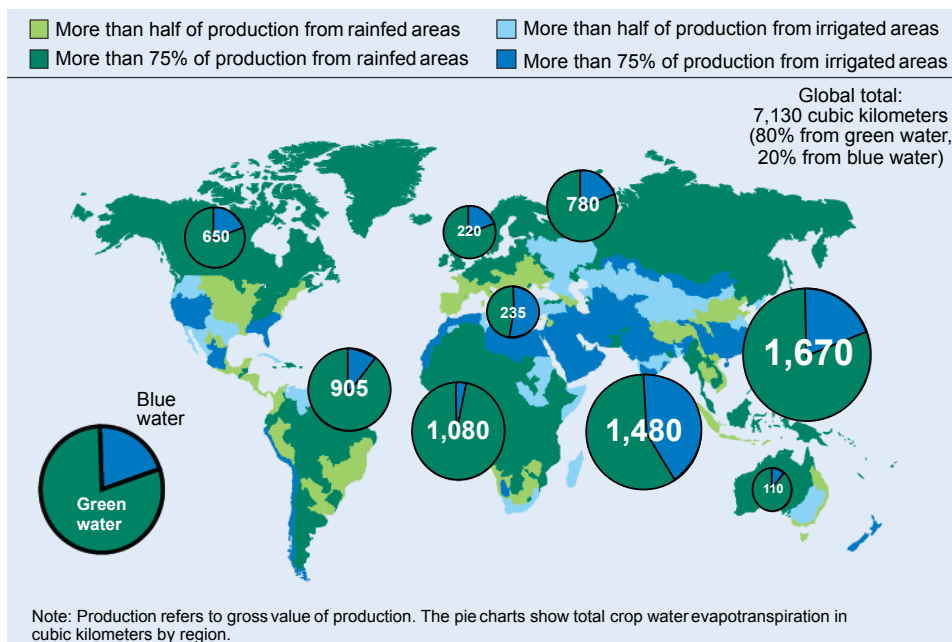


Figure 3: Regional variation according to the irrigated and rainfed areas.

Method	Advantages	Disadvantages
<b>Surface irrigation (Flooding)</b>	1) Usable on shallow soils, 2) Usable if expense of leveling is great, 3) Low cost, 4) Resistant to livestock	1) Runoff and deep percolation are high, 2) soil erosion is high on step farms, 3) Fertilizer is eroded from soil
<b>Surface irrigation (Border)</b>	1) Usable for growing crops	1) Large amount of water is needed, 2) Land leveling is required, 3) Usable for soils with low disperse, 4) Drainage is necessary
<b>Surface irrigation (Basin)</b>	1) Varying amount of water, 2) No runoff, 3) Usable for rapid irrigation, 4) No loss in fertilizers conditions, 5) providing satisfaction	1) Costs may be high if no land leveling, 2) Usable for rice, orchids, jute, etc., 3), Not usable for soils that disperse easily from a crust (except rice)
<b>Surface irrigation (Furrow)</b>	1) High irrigation efficiency, 2) Usable for row crops, 3) Easy installation, 4) Easy to maintain, 5) Usable for most soils.	1) Skilled labor is required, 2) It is not suitable for operation of machinery, 3) Drainage is necessary
<b>Pressurized irrigation (Trickle)</b>	1) Minimum losses, 2) Amount of water is applied for optimum crop growth, 3) System enables the application of fertilizers to plant root system 4) maintenance of a low moisture tension in the soil	1) Costs of the trickle irrigation are very high
<b>Pressurized irrigation (Sprinkler)</b>	1) Uniform distribution of water, 2) Usable for the most kinds of soil, 3) No hindrance for use of land implements, 4) Fertilizers are usable through the sprinklers, 5) The minimum of irrigation water losses, 6) More agricultural land can be irrigated, 7) Land leveling is not necessary, 8) Controlling of water for young seedling or the mature plants	1) Costs are very high, 2) Additional cost to provide pressure, 3) The wind interferes with increasing application rate near lateral pipe, distribution pattern, and reducing spread, 4) There is often trouble from failure of sprinklers to revolve, 5) Costs of operations, maintenance and labor are very high, 6) The water free slit and suspended matter is required, 7) Usable for high value crops

Table 1: Advantages and disadvantages of irrigation methods.

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