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Water Harvesting and Its Role in Rain fed Farming System

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Introduction

Significance of rain fed agriculture is increasing day by day, approximately eighty percent of the world's agricultural land is rain fed, nearly sixty percent of global food production is comes from these rain fed area. It is out of discussion that irrigation is playing a vital role in stable food production year after year, but most countries of world are facing an acute food gap and the potential for increasing water withdrawals for expanding irrigated area is quite limited. Thus, for irrigated agriculture, increasing food production to achieve the food gap is basically depending on our capability in increasing crop water productivity and water use efficiency to produce more biomass per unit of water already withdrawn for irrigation purpose (more crops per drop of irrigated water). Hence, to reduce the gap we have to boost the productivity of non-irrigated area. This confirms that the greatest potential increase in yields is in rain fed areas. The fact that nearly over 60% of the cereals production is provided in rain fed agriculture give the evidence that the foreseeable future world food will be very difficult to achieve unless further efforts are directed to improve rain fed agriculture from the perspective of water productivity and the water management spectrum to upgrade rain fed farming system. India ranks first among the rain fed agricultural countries of the world in terms of both extent (80 mha) and value of produce. India has total waste land area of 638518 km^2 which is 20% of its geographical area where as Bihar has 20998 km^2 of wasteland.

The word "watershed" introduced in 1920 was used for the "water parting boundaries". Watershed is defined as any surface area from which rainwater is collected and drains through common outlet/point. Watershed is defined as a geo-hydrological unit draining to a common point by a system of drains. All lands on earth are part of one watershed or

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other. Watershed is thus the land and water area, which contributes runoff to a common point. It is synonymous with a drainage basin or catchment area. In fact, watershed is a biological, physical, economic and social system. Supplementary irrigation based on water harvested; of runoff water during heavy rainfall is one of the most auspicious approaches for upgrading rain fed agriculture. A noteworthy increased in crop production in rain fed agriculture have witness from small scale harvesting of water in combination with proper irrigation scheduling.

Water harvesting is most suitable in arid and semi-arid regions where rainfall is either not sufficient to sustain a good crop and pasture growth or where, due to the erratic nature of precipitation, the risk of crop failure is very high. Water harvesting can significantly increase plant production in drought prone areas by concentrating the rainfall/runoff in parts of the total area. Water harvesting is based on the efficient harvesting of surface runoff; therefore it requires runoff producing and runoff receiving areas.

Method of Water Harvesting

There are three method of harvesting and recycling of runoff water.

i) **Inter plot water harvesting: -**

In this method harvested water is directed to the main field to irrigate the crop. This method is suitable for area where rainfall is scanty (< 500 mm) and even there is difficulty of maturing a single crop i.e. monocropping. In this system a portion of the main field is cultivated & remaining area is used for harvesting excess of water (runoff). Usually the uncultivated area is managed or treated in such a way that runoff would be induced. In many situations surface modification may be required to get runoff. Such method is suitable for arid regions. Runoff may be induced by using cover films (plastic or rubber) preparing hydrophobic layer (wax) compacting surface or spreading sodic soil on surface or leveling the catch area towards the slop.

ii) **Inter row water harvesting: -**

This method of rain water harvesting is more suitable to those areas where there is no enough rain to support a crop & therefore by conserving more water in

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furrows and planting the crop in furrows may give some more yields compared to field did not adopted this method.

iii) **Water harvesting in farm Ponds: -**

A portion of the excess runoff water after allowing maximum in situ moisture conservation is collected in farm ponds. As much as possible the pond should be positioned in the lower patches of the field to facilitate better storage,less seepage and comparatively less evaporation losses. The size of the farm pond should be worked out considering annual rainfall probable runoff and the catchments area. Generally, 10 to 20 per cent of the seasonal rainfall is considered as runoff in medium and deep black soils. A farm pond of 150 m^3 capacity with side slopes of 1.5: 1 is sufficient for each hectare of catchments area in black soils. The farm ponds may be circular square or rectangular. However eared or rectangular ponds are more convenient for harvesting of runoff water. CRIDA has been promoting Farm Pond Technology in the rain fed areas in the country as a drought proofing measure. Considering the slopes of the fields, an appropriate location should dug out pond of variable size depending on farm area (17m x 17 m x 5 m).

Under low rainfall situations to increase the runoff from catchments area the soil surface should treated with sodium salt betonies clay hydrophobic compounds like sodium ciliolate, sodium rosinate etc. asphalt bitumen and water proofing membranes like paraffin. Some mechanical measures to increase runoff can be adopted such as land surface smoothening reducing surface depressions compacting the soil surface by rollers of spreading the clay blanket before rolling in sandy soils.

Role of water harvesting in rain fed farming system

Water harvesting is low-external-input technology, particularly advantageous in the following situations:

1. In arid and semi-arid areas where rainfall is low and unevenly distributed, WH makes farming possible on part of the land, provided other production factors such as climate, soils and crops are favorable. Much of the economy of arid lands depends upon livestock, so it is not surprising that most of the work that has been accomplished in WH has been aimed at providing water for livestock. This is

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generally WH not requiring any pumping or input of energy for water conveyance and/or application.

2. In rain fed areas, WH systems can provide additional water to supplement rainfall to increase and stabilize crop production. Furthermore, it can alleviate the risk associated with the unpredictability and uneven distribution of rainfall in these areas. For this case, the WH system is usually equipped with a facility (above or underground type) to store the harvested water for later use in supplemental or lifesaving irrigation during moisture stress periods.
3. In areas where public water supply for domestic and animal production is not available, inducing run-off from a treated area and storing it in a cistern or other type of reservoir for later use is a common practice in remote areas where no other water resources are available.
4. In arid lands suffering from desertification WH would improve the vegetative cover and can help to halt environmental degradation and its ill effect. Water harvesting has been found to be effective in recharging groundwater aquifers. Restoring the productivity of land which suffers from inadequate rainfall.
5. Increasing yields of rain fed farming system.
6. Minimizing the risk.
7. Combating desertification by forest tree cultivation.
8. Supplying drinking water for animals.

Conclusion

In spite of the rain fed lands having the highest unexploited potential for growth, the risk of crop failures, low yields and the insecurity of livelihoods are high due to random behaviour of the rainfall. The most potential strategy to realize the potential of rain fed agriculture in India (and elsewhere) appears to harvest small part of available surplus runoff and reutilize it for supplemental irrigation at different critical crop growth stages.