WATER HARWESTING:

The process of runoff collection during period of peak rainfall in storage tanks, ponds etc is usually referred to as water harvesting. Rainwater harvesting is an effective water conservation tool ecause it provides "free" warwe that is not from the muResults of experiments is dryland areas indicated feasibility of harvesting and storing excess runoff in small farm ponds and reusing the same for supplemental (protective) irrigation to crops during periods of prolonged drought.

Importance of rain water harvesting: The water harvesting benefits the farmers through providing life saving irrigation. Improve soil health, better drainage and more efficient use of rainwater with the possibility of excess water being stored in suitable structures for use during scarcity period and fish cultivation also may be done. Water harvesting not only reduces dependence on ground water and the amount of money spent on water, but also reduces off-site flooding and erosion by holding rainwater on the site. Rainwater is a clean, salt free source of water for plants. Rainwater harvesting can reduce salt accumulation in the soil which can be harmful to root growth. When collected, rainwater percolates into the soil, forcing salts down and away fro the root zone area. This allows for greater root growth and water uptake, which increases the drought tolerance of plants.In rainfed areas off season vegetables production is one such option where farmers can fetch high returns. This water has also been successfully and eneficially used in raising other crops such as medicinal and aromatic plants, orchards and fores nurseries, which are the additional sources of income for rainfed farmers. Therefore, it is very clear that proper planning and anagement of availale water resources can sole the prolem of water shortage and greatly enhance the crop productivity of large rainfed areas.

Techniques of water harvesting: In rainfed areas one or two occasional heavy rainfall occurs which creates runoff, hence efforts should be made for proper utilization of the run off after taking measures for in situ soil moisture conservation.

- Water harvesting structures, such as farm ponds, check dams and nalla bunds are constructed wherein water can be stored and used for supplemental irrigation.
- Traditional tanks where large amount of water is collected from ig catchment areas. The tanks should be desilted once in thee years and path way leading to the commond area should also be cleared. The water is irrigated to lands situated in the lower reaches
- Percolation tank are used for saving the land overflow and to reachrge the water table.

FARM POND:

Farm ponds are small storage structures for collecting and storing runoff water. Depending on their construction and suitability to different topographic conditions farm ponds could be classified into:

Excavated pond suitable to flat topography,

Embankment pond for hilly and rugged terrains with frequent wide and deep water courses, and Excavated-cum-embankment ponds.

Excavated farm pond are ideal for soils with mild to moderate slope. There are tree types of excavated farm ponds : Squire, rectangular and circular. Circular ponds have the geometrical advantage that they have higher storage capacity with least circumferential length for a given surface area and side slopes. However, their curved shape is disadvantageous substantial area is lost for agriculture operations.

PERCOLATION PONDS/WELLS:

Percolation ponds/wells are constructed across a natural water course having permeable formations to impound from streams for a longer time with the object of effecting charge of ground water. Percolation wells encourage digging of well downstream of recharge area for irrigation purpose. These are provided with emergency spillways for safe disposal of flow during floods.

Check Dams:

These are permanent engineering structure constructed in gullies which are not stabilised or lack vegetation on their sides or coarse particles on the surface. All gullies encountered within a sub catchment have to be protected with a suitable check dam. These are also effective in recharging the downstream wells.

Minor Irrigation Tanks

These are constructed across the major stream with low earthen dams. A narrow gorge should be preferred for making the dam in order to keep the ratio of earthwork to storage as minimum. These tanks are provided with well designed regular and emergency spillways for safety against side cutting.

Efficient utilization of harvested water:

Rain water has been efficiently used for agriculture as rain water harvested over a large area can yield considerable amount of water. Contour farming is an example of such harvesting technique involving water and moisture control at a very simple level. If often consists of rows of rocks placed along the contour of steps. Runoff captured by these

barriers also allows for retention of soil, therey serving as erosion control measure on gentle slopes.

Drip or Micro-irrigation: Drip irrigation distributing water slowly and regularly and conserve 50-70 % more water than traditional methods while increasing crop production by 20 -40%. The water and fertilizers are also more easily absorbed by the soil and plants, reducing the risk of erosion and nutrient depletion.

Runoff water collected in the form pond or similar structure is of immense use for the protecting the dryland crops from soil moisture stress at time of prolonged dry spells during the crop season. Harvested water can also be used for rabi crops grown in vertisols on stored soil moisture. Result of experiments at ICRISAT and other dryland research centers have clearly proved the yield advantage due to one or two supplemental irrigations. Time of application, depth of irrigation, method of application and fertilizer use determine the efficiency of supplemental irrigation.

- Time and Depth of Irrigation:

In kharif regions, supplemental irrigation may be given to save crops from cyclic stress during July and August. In potentially double cropped areas, it may be used for crop establishment, as the surface soil is dry enough to affect stand establishment. Depths of water application influence the response of dryland crops to supplemental irrigation. Application of 1 to 2 cm depth may increase the yield of shallow rooted crops. At least 3 to 5 cm depth of application is essential for deep rooted crops.

- Method of Application

Application method to minimize unproductive can losses can improve water use efficiency. Alternate furrow irrigation to shallow rooted crops increases water use efficiency. At Bijapur, drip irrigation saved 50 per cent of pond water compared to surface methods. Sprinkler irrigation is more effective than contour furrow irrigation to rabi sorghum at Sholapur.

- Fertilizer Use:

One of the limiting factor in fertilizer use for dryland crop is poor response of crops to applied fertilizer due to soil moisture stress during the crop period. Supplemental irrigation increases the yields by two to tree times even with moderate rates of fertilizer application.

Since water harvesting in farm ponds involve considerable expenditure, it must be used judiciously for realizing maximum returns. This could be achieved by using the water for high value crops than seasonal/annual crops.

In situ – soil & moisture conservation techniques:

1. Contouring across the slope:

Contouring is practiced on the lands with 3-5% slope. This system consists of constructing earthen bunds and the distance between the two bunds ranges from 30-50 m depending on the degree of slope. This is carried out with an *object to provide a check to the flow of run-off water which* then gets accumulated in the bunded area and is absorbed by the soil. Thus, contour bunding conserves moisture and prevents soil erosion.

2. Deep summer Ploughing:

Before onset the monsoon deep summer ploughing in dryland areas help to harvest the water of first rain. It increases the infiltration rate and water holding capacity of the soil. Plants roots efficiently develop deep layers into the soil. Deep ploughing during summer also helps in destroying weeds and suppressing insect pests and diseases.

3. Opening of ridges and furrows

In this practice, the entire land is laid out into ridges and furrows across the slope. The ridges and furrows are opened before onset of monsoon so that the flow of water may be reduced and erosion may be controlled to the minimum. During rainy season, crops like maize, jowar, bajra, etc. may be grown in the furrows and legumes like soybean, arhar, urd, mung, cowpea, etc. may be grown on the ridges. After the monsoon is over the land is again leveled. This way the furrows are used to accumulate maximum water which will supply moisture for winter season crops.

4. Broad-based bunding (check dams):

This method is especially suitable for heavy **black soil.** Water is allowed to spread over a vast area by constructing a broad- based bund on a sloppy side. The water stays for a longer time because of high water holding capacity, lower leaching and seepage losses. The stored water may be used for fish culture and also for providing life saving irrigation grown in surrounding areas of catchment portion. These bunds are also called check dams and are I given a regulated drain or outlet for protecting the bunds from breaking.

5. Broad beds and furrows method:

This method developed by ICRISAT. In this system, small furrows are opened and the soil from the furrows is uniformly spread in space left between the furrows. Thus, inter furrow spaces form the raised beds of about 4-5 metres width. This method helps in the **conservation of soil**, moisture and checking the excess run-off of water. The raised beds, in this practice, are used for growing such crops which need less water like legumes and oil seed crops, while the furrows are used for the crops which need more water.