

## Promotion of Horticulture through Watershed Approach

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The arid region of India is spread over 38.7 m ha area out of which 31.7 m ha is under hot arid region with 7.0 m ha in cold region. The hot arid region occupies a major part of northwestern India (28.7 m ha). The arid region receives low rainfall (100-300 mm /year) has high evapo-transpiration and high temperature regimes. Over 70 per cent soil of arid zone of Rajasthan is covered by sandy soils in form of either sand dunes or hummocky plains. The high wind erodibility, low water holding capacity and poor fertility are main causes of low productivity of these soils. These soils contain 0.1-0.3 per cent organic carbon with 11-22 kg/ha of phosphorus and 130-340 kg/ha of potassium. Under these adverse and high climatic variability circumstances, rainfed cropping is very difficult and due to long dry spell and onset of drought during the cropping season, crops generally failed at one or another stage of their growth. Therefore, the growing of perennial nature and drought hardy crops is only the way for sustainable production as well as environmental conservation. In arid regions, the large area is under wasteland and non-culturable waste lands which can be utilized for production of fruit crops with judicious management. The land use pattern of Rajasthan is given in table 1 (Gupta *et al.*, 2000).

**Table 1 :** Land use pattern in Rajasthan

| Year | Net sown area (%) | Cultivable waste land + trees (%) | Fallow land (%) | Non-culturable area (%) | Forest (%) |
|------|-------------------|-----------------------------------|-----------------|-------------------------|------------|
| 1960 | 39.42             | 26.03                             | 19.41           | 14.28                   | 0.78       |
| 1990 | 49.56             | 26.36                             | 13.67           | 8.55                    | 1.86       |
| 2000 | 51.56             | 24.06                             | 13.15           | 8.72                    | 2.50       |

The water resources in arid regions are very scarce because of low and erratic rainfall and the replenishment of these water resources is also very poor. The major part of rainwater is lost through evaporation or leaching due to high temperature and sandy soils respectively. The ground water is very deep and poor both in quality as well as in quantity. Therefore, the judicious use and management of rainfall, surface and ground

water may only give some basis for making agriculture sustainable in this region.

The horticultural crops have high resistance to drought in comparison to the food grain crops and other ground vegetation such as annual grasses. The fruit production in arid region is about 0.7 m tonnes, which is much below the existing requirement of the region. The arid fruit crops can be grown in these regions with the adoption of some site-specific management practices as developed by Central Institute for Arid Horticulture, Central Arid Zone Research Institute as well as Rajasthan Agricultural University, Bikaner scientists. Therefore, the introduction of arid fruit crops in these watershed areas have high prospects due to availability of large area, genetic variability among the fruit plants and diversity of the region. The typical fruit quality i.e. high storage characteristics, good nutritive value and its location specific nature of growth again proved its importance for its promotion in watershed areas of arid zone.

### Watershed approach

Watershed is a manageable hydrological or geographical unit that drains into a common point. This natural unit is carved out through the interaction of rainwater with arable and non-arable lands and natural drainage lines. It is an approach for bringing the green revolution in desert. The main approach to watershed management calls for an integrated efforts on many counts viz., resource identification, area development and planning of development programmes, their implementation, evaluation and also the integration of different disciplines and the functionaries involved in it.

An integrated approach of watershed management does not only cover the development of agriculture in that area but it ensures the overall development of entire area covering the highest point (ridgeline) of watershed to the out let, involving all natural resources such as water, land, vegetation, livestock, wildlife etc. Water resource development remains the principal objective of the watershed management, which if assumed would trigger the overall development of the area but there should be the synchrony in water and land development. The integrated watershed management is a bottom-up approach and the main feature is that the beneficiaries are themselves involved at all the stages of planning, implementation, monitoring and feedback without any involvement of middleman.

### Need

The stable and growing economy of any drought prone or rainfed area depend on the optimum utilization of natural resources like land and water. Watershed approach helps in an integrated development of different parts of watershed in accordance with their nature, problem and potential with the best interactions. In rainfed condition, the maximum efficiency of modern technology could only be achieved through the adoption of suitable soil and water conservation techniques. The integrated watershed development

programme include the following points i.e. (i) Development of agricultural land, (ii) horticulture, (iii) grassland, (iv) forest, (v) soil and water conservation and (vi) creation of water resources. Thus, in watershed development programme, the major emphasis should be given on development of horticultural plants because if once established become permanent source of income by providing fuel, fruit and fodder, thereby providing stability in agriculture. They can also be grown on sub-marginal lands where agricultural crops cannot be grown profitably. Thus, through watershed approach the promotion of horticulture can be done successfully.

The cultivable wasteland and fallow land can be exploited with the inclusion of woody perennials (fruit trees) with the adoption of suitable water harvesting and soil moisture conservation practices. There are two possibilities to increase the cultivated area viz. (i) horizontal increase in area – by improving the waste land for making the available resources for converting the non cultivable land to cultivable land or (ii) vertical increase in area- through multistoried cropping using different alternate land use system specially using fruit trees for more income and as per availability of resources. The land shortage is due to increase in urbanization it is not possible to increase the area on horizontal basis. The only way remains to go for intensive multistoried cropping.

### The Principle

Horticulture based cropping i.e. horti-pastoral and agri-horti-system are based on very specific principle of zonal water and nutrient extraction pattern. During the orchard development period due to different land preparation activities, causes severe soil erosion due to speedy winds from field. In arid western Rajasthan it has been seen that a layer of 6" of surface soil sheet is lost during summer. Therefore, the surface land cover is must to reduce the soil erosion through winds. The sowing of annual crops/ grasses can reduce the soil loss during summer by minimizing the wind velocity on land surface. The fruit trees and crops/ grasses under agro-horti or horti-pastoral system enforce double storied moisture and nutrient extraction pattern from the surface and sub surface soil layers (Fig.1). It has been reported that in arid western Rajasthan condition about 25-40 per cent water penetrates into *murram* sub-stratum during rainfall or irrigation. This water is

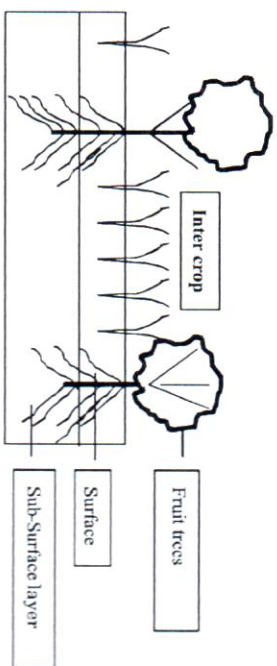


Fig 1 : Water and nutrient extraction pattern under horti-pastoral and agri-horti system