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Dry Land Fruit Culture: A way of Sustainable Farming

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SUMMARY

Dry land fruit culture a way of farming system which is productive, profitable and will help to bring up the economic level of the farmers. In dry land areas, availability of moisture and nutrient are the essential constraints that limit the crop growth and production. As moisture is limiting factor which affects the initial survival of fruit trees, by adopting advance techniques of soil, moisture conservation and by selecting proper species like custard apple, ber, aonla, tamarind, marking nut etc., unproductive lands in dry land region can be brought under profitable production.

INTRODUCTION

Indian agriculture is predominately rainfed in nature, only 30% of total cultivable area is under irrigation. The greatest challenge facing mankind in 21st century is to produce basic necessities of food, feed, fiber and raw materials. In order to keep pace with needs of growing population and diminishing per capita land and energy resources, agriculture has to be knowledge intensive to be a sustainable agriculture. The ultimate goal of sustainable agriculture is to develop farming system that are productive and profitable, conserve the natural resource base, protect environment and enhance health and safety. The land: man ratio is already very low in India and there is no scope to increase the land under plough. The increase in food production has therefore, to come from increased productivity from dry land farming.

Following points should be considered while selecting the fruit species under rain fed conditions.

- The fruit crops to be selected for dry regions should have maximum growth period coinciding with the period of maximum water availability.
- Flowering and fruit setting period should also coincide with the above period.
- Fruit ripening and harvesting period must complete before soil moisture starts reducing. Example: ber, custand apple, phalsa etc.
- The fruiting period should be adjusted during maximum moisture availability period by manipulating the bahar in crops like guava, pomegranate. This possible by taking *Mrig bahar* in these fruit crops.
- The dry land fruit trees should have drought tolerance mechanism like deep root system, leaf-shedding mechanism during summer period like in ber and water binding mechanism as in fig.
- The plant should have xerophytic character like wax coating on leaves, hairiness, and sunken stomata. These characters minimize the water loss through transpiration as in fig, phalsa and ber.
- Dry land areas have saline and alkaline soils. The fruit crops to be grown in these areas should have tolerance to salinity and alkalinity; fruits like aonla, ber have great tolerance to high pHl range of 9.2 to 10.2. They can tolerate dry atmosphere and high heat.
- Varieties of dry land fruit crops should be of short duration eg in ber varieties like Gola, Seb and in pomegranate like Ganesh.
- The crop should require less training, pruning, water and should be resistant to pest and diseases.

Selection of proper species is perhaps the most important consideration, which will be helpful in increasing the survival percentage and further growth and productivity of fruit species. Once the proper species is selected, then by adopting some soil and crop management techniques as described below a rainfed fruit orchard can be established which yield up to 100 years or more.

Soil considerations: The depth of soil and its chemical composition are two important soil considerations, which should be taken into account. The distribution soils in rainfed region are given in Table 1.

Table-1: Soil distribution in rain fed region.

Sr. No.	Soil type	Soil depth (cm)	% area covered
1	Very shallow	<10	10
2	Shallow	10-22.5	20

3	Medium	22.5-90	45
4	Deep	> 90	25

As soils in this region have very low water holding capacity, it will be advisable to add pond silt, green manure, FYM and 5 kg gypsum in the pits prepared for planting of fruit trees. As regards the chemical composition of soils in this region, as the soils are saline and alkaline in nature, crops selected for planting should have tolerance to salinity and alkalinity. The tolerance limit to salt in respect of few dry land species is given in Table-2.

Table-2: Salt tolerance limit of some fruit species.

Sr. No.	Fruit crop	Salt tolerance (ECE mm hos/cm)	pH/ ESP
1	Aonla	15	40 ESP
2	Ber	14	30 ESP
3	Guava	8	9.0 pH
4	Karonda	-	10.0 pH
5	Mulberry	-	9.0 pH

Depending upon salt sensitivity fruit crops are grouped into three groups as shown in Table-3.

Table-3: Salt sensitivity of certain fruit crops.

Salt sensitive fruits (1-3 mm hos/cm)	Moderately sensitive (3-6 mm hos/cm)	Salt-tolerant (>6 mm hos/cm)
Peach Apricot Almond Avocado	Fig Mango	Ber Pomegranate Custard apple Aonla Guava Phalsa Date

Selection of suitable species and planting material: proper species should be selected for planting in rain fed conditions. It determines the success or failure of fruit farming. On the basis of flowering time and harvesting period the rain fed fruit frees are grouped into two groups.

First group: fruit crops included in this group are deep rooted, short flowering period, fruit set on commencement of monsoon and complete fruit development before soil moisture stress. eg. Custard apple, ber, tamarind, aonla and marking nut etc.

Second group: This group includes those fruit crops, which starts flowering after monsoon season and harvesting during summer season. Such crops are very hardy. e.g. Mango, jamun, cashew nut, jack fruit, wood apple, bael, karonda, kokum etc.

Planting: The selected soil should have good drainage capacity, if not provision should be made to provide effective drainage. Digging of test pit should be done up to 10 ft depth in order to know the sub soils status. The soil samples at various depths (0-1, 1-2, 2-3 ft) should be collected and analyzed for different nutrients. The soils containing high calcium carbonate should not be used for mango plantation. The layout of orchard should be made as per the selected species and digging of pit should be done summer months. As regards to the time of planting, the planting should be done at the onset of monsoon. As monsoon is confined to 3 to 4 months in arid region that to within 20 to 25 rainy days, the plant should utilize each and every drop of rain water for its growth and development. Late planting leads to more mortality. Hence time of planting has very much importance in rain fed fruit culture..

Plantation of wind breaks: windbreak is narrow strip of trees planted along field margins to have protective barriers against hot and cold winds. The breaks are raised by planting two close rows of fast growing deciduous and one parallel row of slow growing, longer living ever greens (Tamarind). They are effective in reducing the wind velocity and maintaining the humidity. This ensures water saving and create microclimate for good growth.

The tree species like eucalyptus, moringa, teak, sesbania etc can be effectively grown as effective wind breaks. Planting of windbreaks should be done at least two years before the planting of orchard trees to ensure the protection to the orchard trees since beginning.

Fencing: In order to avoid the damage from stray animals, it is necessary to provide effective fencing to the orchard trees. The fencing should be either live i.e. planting thorny species like cactus or dead fencing of barbed wire or by constructing stone wall around the orchards.

Application of manure and fertilizers:

To have better growth of fruit trees, it is highly essential to apply organic and inorganic manure in sufficient quantity at the beginning of monsoon season as per the recommendations. During vegetative phase of the trees the requirement of nitrogen is more and hence nitrogenous fertilizers are given in recommended quantity. Nitrogenous fertilizer should be mixed with neem cake and they should be applied in split doses to have effective utilization. Micronutrient's needs can be fulfilled through foliar application of that particular nutrient element or in combination with other nutrients during active vegetative growth period.

Training and pruning: In order to have straight growth of main stem in early years of growth, it is essential to give support by staking for newly planted seedling/grafts. For better distribution of sunlight and air to the different branches of fruit trees it is essential to train the trees in proper fashion. Pruning is scientific art of cutting away undesirable portion of the plant. In some fruit trees pruning is done for flowering. These operations will help in convenience in various orchard operations like inter cultivation spraying, dusting, thinning, and harvesting of fruits. They will also help to improve quantity as well as quality of fruits.

Application of bordo paste/ white wash:

There is possibility of damaging the stem of the tree due to strong sunlight during summer season, during early years. Hence it is advisable to apply white wash i.e. $CaCo_3$ paste to the trunk of newly planted trees. During advance period the application of bordo paste twice, before and after monsoon season will also prevent the damage from fungal diseases like collar rot and gummosis.

Pest and disease management: There is possibility of attack of sucking pests like aphids. thrips, white flies, jassids and leaf eating caterpillars and few diseases like anthracnose, powdery mildew etc. during early stages of crop on new shoots. This damage is more during rainy season, which result in stunted growth and ill appearance of the trees. Hence it will be advisable to take appropriate control measures against respective pests and diseases. In order to obtain better growth and production of trees.

Mulching: Mulching refers to the covering the soil surface with organic or inorganic material as an aid to soil moisture conservation. It not only helps in conserving moisture by reducing water losses through evaporation but keep the weed population under control. Mulches reduce evaporation by breaking of f direct radiation falling on the soil surface and thus delays drying and reduce soil heat during daytime. It also prevents soil erosion, by adding organic matter to the soil and increases its infiltration capacity. Material such as hay, straw, dry grasses, dried leaves, saw dust, peanut hulls etc. could be used. Plastic films (polyethylene) can also be used as mulch. Mulching should be done immediately after monsoon ends. A layer of 8 to 10 cm thickness of organic mulch should be added around the tree trunk.

Use of Antitranspirants: Anti-transpirants are chemicals, which when sprayed on plants form a film and thus reduces transpiration losses of water. Several anti-transpirants have been successfully used on fruit crops e.g. Acropyl in grape vines, polycot and kaolinite (3.8%) in banana and several other fruit plants. Their uses can be extended on arid fruits to overcome water stresses particularly during summer season. About 6-8 sprays at 15 days interval during summer can save the trees at initial stage.

Provision of shade: In arid region during summer season many times temperature goes above 42°C. This temperature is harmful to the young fruit trees. Therefore it is necessary to protect them from direct sunray's. Hence it is essential to provide shade, in rainfed fruit trees like mango. The shade can he made either live or dead. Sowing sunhemp seeds in the basins of the fruit trees in the month of October may provide live shade. Sunhemp will grow faster and it will create microclimate and avoid the damage of direct sunrays in summer months. The castor seeds can be sown (3-4 seeds) around the fruit tree in the month of November. It will also grow faster and shade during summer. Dead shade may be provided by using gunny bags or by preparing a bower with sticks and sugarcane trash. The shade made by above method will also help in reducing transpiration as well as evaporation losses in shaded areas.

Supply of water: Scarcity of water is an important feature of arid region. Though water is available in limited quantity it can be used effectively in increasing the survival % of rainfed fruit trees by adopting some techniques. Rainfed fruit trees once established can survive on rain water itself, as their root system is not strongly developed during initial years and they are not capable of absorbing moisture from the deeper soil strata. Hence it is essential to provide water during summer months up to 2-3 years of age. Once these trees get established then there is no need to give water artificially Available water can be used effectively by various methods *viz.,* Earthen pots, saline method, drip irrigation etc.

Use of growth regulators: Use of plant growth regulators has become very popular in irrigated fruit crops like grape, citrus and banana. In rainfed fruit trees it is necessary to make use of these chemicals for propagation, flowering, controlling fruit drop and in fruit ripening. Growth regulators like 2,4-D, 2,4,5-T, Ethylene can be successfully used in rainfed fruit trees like ber, mango, custard apple etc.

CONCLUSIONS:

In nutshell, it can be concluded that by adopting proper technology in dry land fruit crops, the survival percentage and productivity of these fruits can be increased. This will be certainly helpful in improving economic level of the farmers in arid region in sustainable manner which will lead to the prosperity of the nation.

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