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Improved Dry-Farming Practices

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Introduction:

Growing of crops entirely under rainfed conditions is known as dryland agriculture. The dry-farming areas mostly include arid and semi-arid tropical zones (with 500-1500 mm annual rainfall and little or low irrigation) account for 43% of the total geographical area and contributing about 31% of India's rural population. Rainfed agriculture occupies 67 percent of net sown area, contributing 44 percent of food grain production and supporting 40 percent of the population. Even after realization of full irrigation potential of the country, 50 percent of net sown area will continue as rainfed (CRIDA, 1997). At present 95 percent of area under coarse cereals, 91 percent under pulses. 80 percent under oilseeds, 65 percent under cotton and 53 percent under rice is rainfed (Government of India, 1994).

Types of Dry land agriculture:

Depending on the amount of rainfall received, dryland agriculture can be grouped into three categories:

- **Dry farming** is cultivation of crops in arid regions with annual rainfall less than 750 mm. Crop failure is most common due to prolonged dry spells.
- **Dry land farming** is cultivation of crops in regions with annual rainfall more than 750 mm less than 1150 mm. In spite of prolonged dry spells crop failure is relatively less frequent.
- **Rainfed farming** is crop production in regions with annual rainfall more than1150 mm. Crops are not subjected to soil moisture stress during the crop period

Importance of dry farming in Indian agriculture

- Farmers in irrigated areas earn 60 per cent of their income from agriculture, their counterparts in rainfed areas earn only 20-30 per cent from farm-related activities
- Average yield in rain-fed areas is about 1.1 tonnes per hectare, that in irrigated areas is about 2.8 tonnes per hectare

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- Rain-fed areas support 64 % of cattle, 74 % of sheep and 78 % of goat population in the country.

Major Constraints associated in dry land areas:

Climatic constraints-The prime factors in this unstable production are high variability of ago-climatic factors, particularly spatial and temporal variability of rainfall. Instability in weather makes it difficult to carry out every farm-related activities. The problems are as follows:

a. **Inadequate and uneven distribution of rainfall:** In general, the rainfall is low and highly variable which results in uncertain crop yields. Besides its uncertainty, the distribution of rainfall during the crop period is uneven, receiving high amount of rain, when it is not needed and lack of it when crop needs it.
b. **Late onset and early cessation of rains:** Due to late onset of monsoon, the sowing of crop are delayed resulting in poor yields. Sometimes the rain may cease very early in the season exposing the crop to drought during flowering and maturity stages which reduces the crop yields considerably
c. **Prolonged Dry spells during the crop period:**Long breaks in the rainy season is an important feature of Indian monsoon. These intervening dry spells when prolonged during crop period reduces crop growth and yield and when unduly prolonged crops fail.
d. **High atmospheric temperature:** High atmospheric temperature causes an increase in rate of evaporation of water from soil surface as well as increase in transpiration which will eventually restrict plant growth and yield.

Soil constraint-

Soils are highly diverse in the drylands of India. In semiarid regions, the alfisols and vertisols predominate, whereas in river basins inceptisols and entisols(alluvial soils) are seen and in desert regions, aridisols (Peterson *et al*, 2012). Alluvial soils of arid regions have low soil fertility, but respond well to inputs and are highly productive under irrigated conditions.

Table 1: Soil related constraints to advancing agricultural production in dryland agriculture of South Asia (Rao and Ryan, 2004)

Constraints	Aridisol	Alfisol	Inceptisol	Vertisol
Water erosion	2	3	2	3

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Wind erosion	3	1	3	0
Compaction	3	3	3	3
Crusting	2	3	3	1
Salinization	2	1	3	3
Nutrient depletion	1	2	1	2
High soil temperature	3	2	3	2
Drought stress	3	3	1	2
Organic matter depletion	3	3	3	3

0= none, 1= low, 2= moderate, 3= severe

Socio-economic constraints:Few of the socio economic constrains which are hindering the productivity and growth in dry land areas are-

1. Less access to inputs
2. Non availability of credit in time
3. The risk bearing capacity of dryland farmer is very low
4. Knowledge base and farmer centric agriculture is needed

Technologies adopted in dry farming areas

- **Reduce evaporation and transpiration loss**
    a. **Mulching**- Mulching is the technique of covering of the soil surface around the plants with an organic or synthetic mulch to create favorable conditions for the plant growth and proficient crop production (Chakraborty *et al*., 2008).
    b. **Anti-transpirants**- Materials or chemicals which can be used to decrease the water loss from plant leaves.
        - ✓ **Stomatal closing type**:Some fungicides like phenyl mercuric acetate (PMA) and herbicides like Atrazine in low concentration serve as antitranspirants by inducing stomatal closing.
        - ✓ **Film forming type**:Plastic and waxy material which form a thin film on the leaf surface and result into physical barrier.eg. ethyl alcohol.

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- ✓ **Reflectance type:** They are white materials which form a coating on the leaves and increase the leaf reflectance (albedo). eg. 5% kaolin spray, diatomaceous earth product (Celite), hydrated lime, calcium carbonate, magnesium carbonate, zincs sulphate etc.
- ✓ **Growth retardant:** These chemicals reduce shoot growth and increase root growth and thus enable the plants to resist drought. eg.Cycocel

c. **Windbreak and Shelterbelts**

Windbreaks are such structures which break the wind flow and reduce the wind velocity and shelterbelts are row of trees or shrubs planted for protection of crop against wind.Generally, shelterbelts give protection from desiccating winds to the extent of 5 to 10 times their height on windward side and up to 30 times on leeward side.

Rain water conservation measure

Efficient conservation of rainwater is the central issue in successful dryland farming.Farmers have not widely adopted mechanical measures like contour bunds, graded bunds, grassing of waterways and construction of farm ponds without the government support due to financial constraints.

Timely planting of crops

Timely sowing is essential for getting good plant population, higher yield and optimum utilization of rainfall and reduction in the incidence of pests and diseases. A number of demonstrations have been taken up in farmers fields through ORPs, KVKs and IVLP programmes in different rainfed regions of the country.

Adoption of improved varieties

A number of improved varieties and hybrids were evaluated in the farmers fields to identify suitable ones for matching growing periods for inter and sequence rainfed cropping systems. For example, farmers gained additional benefit ranging from Rs. 2000-4000/ha by adopting improved varieties of sorghum, castor and sunflower in Alfisols of Hyderabad. Few examplesof improved varieties are given below-

Black gram: Vamban 4,5,6, ED 9, CO 5, ADT 5

Green gram: Vamban 3, CO 6, ADT 3

Red gram: Vamban 2, 3, CO 7, APK. 1

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Efficient crops and cropping system

Four dry land cereal crops – sorghum, sweet sorghum, pearl millet, and the small millets (primarily finger millet) are primarily cultivated in dryland areas. Sweet sorghum is an "opportunity crop" for resource-poor farmers.The studies at CRIDA, Hyderabad indicated that

i) Farmers of karnataka adopted (2:1) ratio of sorghum-pigeonpeaand finger millet + pigeonpea system (8:1) ratio in Alfisols region.

ii) Maize + soybean system (2:2) was accepted by Ranchi farmers. Groundnut + pigeonpea (7:1) was widely accepted by the farmers in Rayalseema of Andhra Pradesh.

Nutrient management

Fertilizer recommendations in rainfed crop production have been made primarily for NPK along with the conjunctive use of chemical, organic and bio-fertilizer (Vishnumurthy, 1995). Conjunctive use of fertilizer N with FYM, croppings of luecaena and gliricidia help in reducing the requirement of fertilizer by 50 percent (Singh*et al.*,2004).

Integrated Pest Management

Pests and deceases constitutes a major constraint to increased food production. Crop losses due to pest attack range from 10-30 percent depending on the crop and environment. Integrated pest management is one of the alternatives which encourages the most comfortable and ecologically sound combination of available pest suppression techniques to keep the pest population below economic threshold level.

Alternate land use system

Despite evolving a number of production technologies, arable cropping in drylands continues to suffer from instability due to aberrant weather. To provide stability to farm income and also utilize the marginal lands for production of fodder, fuel wood and fibre, a number of alternative land use systems were evolved based on location specific experimentation and cafeteria studies (Singh, 1988).

Conclusion

During times of the year when heat and drought conditions are not extreme, drought-evasive crops grow the most. Crops that are adapted to dry farming typically require more land and mature more quickly than crops cultivated in humid environments.

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