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Management and control of desertification

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Abstract: ***There are several agro-forestry systems for different locations of semi-arid areas. In alley cropping, the perennial component is grown as hedge rows largely on contour lines, and the annual crops in alleys. The pruning from the tree component can be used as fodder during drought years or applied in the cropped field as mulch cum manure. Although the tree component competes with the annual crop for moisture and nutrients leading to decreased crop yields in drought years, the fodder from the tree supports the livestock. Moreover, by cutting the hedge rows, competition with the crop can be minimised. More studies on geometry and distance between edge and crop strips to minimise the competition are warranted.***

Keywords: agro-forestry systems, annual crops

1. Introduction

In areas where supplemental irrigation is possible, agri-horticulture provides significantly greater income than arable cropping. This system is suitable for several areas. A number of fruit trees and the crop combinations have been identified and the water management techniques standardised.

Management and Control Measures:

a) **Agri-silviculture** The excessive competition for moisture between the tree component and arable crops did not make this system popular with the farmers. However, green gram works well with other trees. These trees being erect and relatively slow growing did not compete with associated arable crops especially in the initial 8-10 years. Therefore, these two tree species hold promise for development of agri-silviculture systems. Nevertheless, more research is required to find out ideal tree crop combination across Sirsa district.

b) **Silviculture** This system is recommended for marginal soils. It involves integrating a tree component with a perennial legume or grass species as pasture. Some grass species were extensively evaluated in different soil types and rainfall zones. The varieties of improved pasture legume that can be raised on marginal lands and on field boundaries. For planting, seed @ 5 Kg ha-1 can be broadcast by mixing it with sand with the onset of monsoon. The system can produce 3-5 t ha of dry fodder, second year onwards. Cutting of the fodder is recommended after seed setting to ensure self-seeding. Cenchrus ciliaris is widely adopted non-legume grass forage which comes up successfully in marginal lands.

c) **Agri-horticulture** In medium deep soil areas receiving annual rainfall of more than 750mm, agri-horticultural systems consisting of a fruit tree intercropped with annual arable crop is recommended. Ber with clusterbean, cowpea, horse-gram or other grain legumes has been widely adopted in the dry tracts of Haryana. Aland treatment for collection of runoff and water harvesting techniques to provide supplemental irrigation during the summer months are critical to the success of this practice. Apart from prudent use of stored soil moisture, the water needs of fruit trees have to be effectively modulated by pruning.

d) **Alley cropping** In this practice, arable crops are grown in alleys formed by the trees or shrubs, established generally on contours. This system is recommended for land capability class II to III which receive moderate rainfall. Trees or bushes grown in alleys act as live bunds and control runoff. Width of the alley and management of the tree crops are the key to success with this system. Long duration crops, however, suffer from yield loss due to competition. Therefore, the system could not become popular with farmers. Permanent alleys provide fodder during drought. However, there is a need to work out a suitable combination of alleys and crops in terms of choice of tree and crop species and spacing etc.

Technologies for Soil and Water Conservation
Degradation of soil has many direct and indirect ill effects. Accelerated run-off, sedimentation of rivers and reservoirs, disruptions of nutrient cycles, alterations in water and energy balances, pollution of water bodies, and emission of greenhouse gases into the atmosphere are some of the off-site impacts. Through its impact on agricultural productivity and environment, soil degradation leads to food shortage, which in turn leads to political and social instability. Thus, it affects the very fabric of society. Therefore, there is an urgent need to arrest, check, and reverse the process of soil degradation and comprehensive information about soils are also required for better land use planning, proper management and development of land. The knowledge of characterization, classification and

distribution of soils is very useful for proper appraisal of their productivity and assessment of input requirements. The information about soil types and their occurrence can be obtained through systematic and standard soil survey on a required scale.

Arid areas are the important largest agriculturally potential districts of the country has wide variation in soils, landforms and land degradation-desertification, wind erosion, water logging, salinity, alkalinity, soil fertility etc. For identifying and mapping of different kinds of soils and their problems, reconnaissance soil survey is needed.

The Aeolian plain is undulating in topography and occurs mainly in southern part of the block. These plains are covered with Aeolian sand transported from the adjacent states. The Ghaggar River flowing from east to west in the northern part of the block forms the flood plain. The areas under this part of the plain are moderately to intensively cultivate due to favourable moisture and soils conditions. The Aeolian plain has been further divided into plain, very gently undulating and dunes, partially stabilized.

Contour bunding In cultivated lands, it intercepts the runoff, reduces soil loss and provides increased opportunity time for water intake. This practice is useful in low rainfall areas having soils with high infiltration or permeability rates. In alfisols, contour bunding helps not only in controlling runoff but also increases crop yields, while it is not suitable for deep black soils due to prolonged water stagnation. Graded bunding is recommended for areas having higher rainfall for safe runoff disposal. Adoption of these practices by the farmers has been dismal due to inherent limitations of small holders and in fact that such bunds cut across their field boundaries or holdings. As an indigenous system, the farmers may install small holder bunds and mud cum pebble bunds across the slope to control moisture and to control erosion.

Inter-terrace Land Treatment Inter-bund land treatments are of semi-permanent nature, primarily useful to minimise the velocity of overland flow. These practices have a significant role in checking of soil loss and ensure better utilisation of rain-water for crop growth. Land treatments like ridging, compartmental bunding, conservation furrows, broad-bed and furrows widely tried across the country are some such examples. While the advantages of such practices in resource conservation are demonstrated unequivocally, the yield gains depend on the quantum and distribution of rainfall in a particular year. Compared to the seed based technologies, the acceptance of these practices by farmers has been much less.

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