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Full Length Research Paper

The land suitability classification of choice of treesspecies in District Rahim Yar Khan, Punjab, Pakistan

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Pakistan especially in Province Punjab has a narrow forest resource. More than 90% of the fuel wood and almost 50% of timber requirements are being met from trees being growing on the private farm lands, based on agroforestry as compared with the state forests. It is obvious that trees have to be grown in conjunction with agricultural crops on private farm lands. The main objectives of the study pertain to prepare the land suitability classification in Punjab especially the District of Rahim Yar Khan along with the identification of the agroecological zones of province. The area was surveyed according to its total extent, component soils series and their proportion, spotting characteristics of each soil series, their major limitations/hazards for tree plantation and suitability for specific tree species were identified and tree species were recommended according to soil characteristic, then land suitability map of choice of trees species was prepared by using Geographic Information Systems (GIS) software and marked the area according to the soil types and species. This classification would help the agroforester and all those interested in planting on their farm lands in matching suitable species of trees for different soils in the Punjab. The resources available to the agroforester would be used properly and diligently without wastage of the time and money. It would help him in identifying the land management alternatives and he shall evaluate the land uses for a meaningful assessment.

Key words: Agroforestry, land suitability classification, agroecological zones, soil profile.

INTRODUCTION

The country has a narrow forest resource base extending over only about 4.8% (4.59% excluding farmland plantations) of its area, which is insufficient to provide the material needs of the growing population and expanding industry, and to retard and arrest the ongoing environmental and ecological degradation process. The situation is further aggravated by the natural, but uneven distribution of the forest resources. Almost 80% of the productive forests are located in the north (Hazara, Malakand, Azad Kashmir and Northern areas, whereas 80% of the population and wood based industry is located in the southern and central parts of Pakistan (Rahim et al., 2010; Baig et al., 2008). Pakistan's fast growing population of about 152.53 million is dependent for its wood and wood products requirement on a meager forest resource base of 4.2 million hectares (Ahmed et al., 2010; Hussain et al., 2003). The per capita forest area thus is only 0.0265 ha (Rahim et al., 2010), compared to the world average of one hectare. Only 1/3rd of the total forest area is productive, while the rest is of environmental and protective value only (Ahmad, 1998; Anon, 2000; Naz et al., 2010). It is becoming increasingly difficult to meet the demands of the growing population for fuel wood, fodder, agriculture implements and raw material required for wood based industries (Caviglia and Kahn, 2001). There is no doubt that scanty tree cover is the result of the gross mismanagement of forests in the past (Kalinganire et al., 2008). The constantly growing population and the changing human needs is a great challenge for the agricultural / forest land use planners (Ahmad, 1993). It results in the competition of different land uses for the same tract of land and has led to an increasing need for systematic national agricultural land use planning. Land evaluation is a comprehensive approach and a best possible tool for

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system influence the hydrology of the area. The abandoned channel of Hakra River provides natural drainage to the area. More than 60% of the tehsil area is irrigated by the network of Panjnad Canal system. Rest of the area is either out of the reach of canal command or sandy ridges. A negligible area (about 2.5%) is under annual flooding by the Indus River. Almost entire area has brackish ground water except a narrow strip along the river Indus where it is of good quality

Present land use /natural vegetation

Irrigated cropping of wheat, gram, oilseed, and pulses in Rabi and cotton, sugar-cane rice and millets in Kharif with perennial/seasonal canal supplies supplemented by tube wells is the main land use in major part of the area. Remaining area is lying uncultivated and is mostly used as poor grazing land. Natural vegetation includes *Prosopis spicigera* (jand), *Acacia jacquemontii* (jandi), *Salvadora oleoides* (wan), *Capparis aphylla (*karir*), Tamarix articulata* (frash), *Tamarix* sp. (lai), *Calotropis procera* (ak), *Desmostachya bipinnata* (dab), *Alhagi camelorum* (jawan), *Acacia arabica* (kikar), *Zizyphus jujuba* (ber) and *Tamarix diocia*. (pilchi). (Reconnaissance Soil Survey Reports of Rahim Yar Khan, 1972; Cholistan, 1974 and Dera Ghazi Khan, 1974).

RESULTS

Land suitability for forest trees

The soil mapping units mentioned above were further grouped on the basis of similarity in suitability and management requirements of their component soils for planting forest trees. Such groups, called as ‗land suitability mapping units', are described in Table 1 with respect to their component soil mapping units, spotting characteristics and proportion of the important component soils, suitability of each soil for selected tree species and specific soil management requirements/improvement suggestions. The proportion of the component soil series is described in terms of ‗dominant', ‗major', ‗considerable' and ‗minor' which represent >80%, 51 to 80%, 20 to 50% and <20% of the total area under the unit respectively. The terms used for describing the soils and their proportions are the same as done for Table 1. The land suitability is described in terms of classes as defined:

S1: Highly suitable for planting the relevant tree species; no or a minor limitation; highly responsive to improved management and inputs; good for nurseries.
S2: Moderately suitable for planting the relevant tree species; moderate limitation(s) of inadequate rooting depth, low water availability, salinity/sodicity or impeded drainage etc; fairly responsive to improved management and inputs.
S3: Marginally (or poorly) suitable for planting the relevant tree species; severe limitations of too shallow rooting depth, low water/nutrients availability, salinity/ sodicity or impeded drainage etc; not much responsive to improved management/ inputs or requires too high inputs to be economical for improvement.
N: Not suitable for planting the relevant tree species; may support the plants with special techniques involving high inputs but not economic to do so.

It may also be clarified that the land suitability for various forest species has been assessed with the assumption that the species would be planted and grown for wood production on commercial basis, rather than as a common practice. The species rated as ‗N' (not suitable) or as ‗S3‖ (marginally suitable) simply imply that their planting is not economically feasible or is going to give very low return because of slow growth rate and/or low quality of wood obtained, or special care/high investment is needed in terms of water, fertilization, amendments etc. for its planting which may not be practical (Table 1). Following species are proposed for this area according to the site quality and soil characterization; *Dalbergia sissoo* (Shisham), *Bombax ceiba* (Simal), *Populus deltoid s*(Shisham), *Acacia nilotica*(Babul),, *Eucalyptus camaldulensis* (Sufeda), *Melia azedarach* (Dhrek), *Salix spp* (Willow), *Albizzia lebbeck* (Kala siris), *Mangifera indica*(Mango), *Zizyphus jujuba* (Ber), *and Azadirachta indica* (Neem). (Figure 2 and Table 1)

DISCUSSION

A suitable site is a prerequisite for successful agroforestry as did Brady and Weils (2002). Forest trees have traditionally been grown in the Punjab province without adopting any scientific and systematic inputs. As such, maps of land suitability are very important in order to build up an efficient tree production network. In the present study, land evaluation has been performed through suitability classification by using the data of soil characteristic in relation to land inundation type, soil toxicity and ground water level under a Geographic Information System (GIS) environment by Hossain et al. (2007). A suitability map has been produced that shows the suitable area for forest trees species in various district of the Punjab province. An efficient Agro forestry system requires proper planning and timely management of available agricultural land areas under appropriate requirements of the trees of those areas. Obviously such a practice includes an evaluation of land capability and determination of suitability of each of these areas for forestry species suited to that soil. The role of land characteristics is extremely important in tree / wood production activities. Such characteristics are determined by a number of issues namely site quality, water table, water source and marketing etc. All these factors collectively determine the suitability of a given area for a particular type of afforestation as mentioned by Dawes and Goonetilleke (2003).

Furthermore, it would facilitate the achievement of acceptable land use suitability and/or capability through the use of appropriate land resource assessment techniques on agriculture land for afforestation and it will ensure that adequate land resource data is collected to

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