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Climatic water balance, probable rainfall, rice crop water requirements and cold periods in AER 12.0 in India

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Abstract

In this study an analysis was made on spatial variation of climatic water balance, (water surplus, actual evapotranspiration), probabilistic monthly monsoon rainfall and mapping of cold periods in agro-ecological region (AER) 12.0 of India using GIS and models. Since, rice is the dominant crop of the region, crop water requirements of rice was also spatially analyzed in different agro-ecological subregions (AESRs) of the AER 12.0 using CROPWAT 4.0 model and GIS. Study found that as per climatic water balance, large to moderate water surplus (520–70 mm) was available in AESR 12.1. The rainfall surplus of 220–370 mm was computed in AESR 12.2 and 370–520 mm in AESR 12.3 mm. Since winter rainfall is meagre and erratic, this amount of rainfall may be harvested and utilized for providing supplemental irrigation to winter crops or during dry spell of rainy season crops. Study also reveals that at 80% probability level (highly assured) in first month of southwest monsoon (June) 98–156 mm rainfall occurs in AESR 12.1, 103–144 mm in AESR 12.2 and 93–132 mm in AESR 12.3. These amounts of rainfall are sufficient to prepare land and sowing of direct seeded crops like maize, groundnut, blackgram, greengram, pigeonpea, cowpea, etc. that may be done from 24th standard week onwards (11th–7th June) after onset of southwest monsoon in the region. Based on existence of favorable temperature, among different AESRs, cold requiring crops may be tried in the districts of AER 12.1, but before cultivation of these crops, economic feasibility should be properly assessed. In normal rainfall year 450–550 mm, 600–720 mm and 775–875 mm crop water requirement was computed using CROPWAT

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4.0 model for autumn rice, winter rice and summer rice, respectively in different AESRs of AER 12.0.

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Keywords: Agro-ecological region; Climatic water balance; Water requirement; GIS; Rice

1. Introduction

Any pragmatic crop planning needs a thorough understanding of the climate and in particular, the rainfall (its variability in the amount, distribution and probability of occurrence), evaporative demand and atmospheric temperature. The rainfall and evapotranspiration ultimately determine water balance, crop water and irrigation requirements of different crops of the region. Studies of such climatic parameters are thus helpful in defining risk levels in arable agriculture, characterizing length of growing period and cropping system in different agro-ecological regions (AER), especially in rainfed area. The AER 12.0 of India (falls under eastern part of India, Fig. 1) receives higher annual average rainfall, varies from 900 to 2000 mm, but due to lack of appropriate water and soil management, the region has one of the lowest agricultural productivity of the country.

Interfacing output of models with geographic information system (GIS) increases the scope of applicability of the models for regional level planning and policy analysis

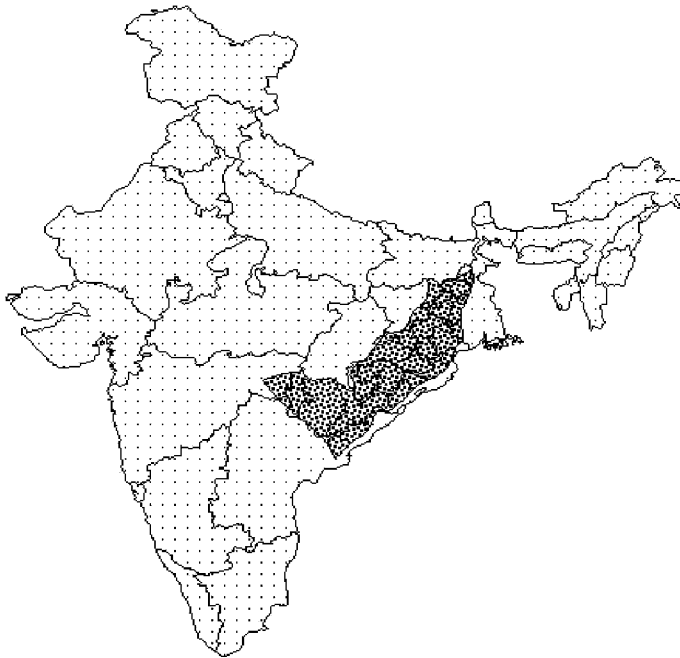


Fig. 1. Location of agro-ecological region (AER) 12.0 of India.

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