

IMPACT OF SOUTH-WEST MONSOON RAINFALL-TREND ON CROPPING PATTERN : A CASE STUDY OF SEMI-MALNAD REGION IN DHARWAD DISTRICT

S.I. HUGAR, Dharwad

Abstract : In the present paper an attempt has been made to analyse the recent trend of decreasing South West monsoon rainfall, over the semi-malnad region of Dharwad District and its importance on cropping pattern. The study also aims at investigating the probable causes for decreasing trend of South West monsoon rainfall by considering the environmental degradations that have been caused by human intervention.

It is observed that the South West monsoons are being less frequent, unreliable and uncertain during recent years. The total amount of rainfall received from the South West monsoons is presently considerably lower as compared to the earlier years, affecting adversely, the traditional cropping pattern. This has given rise to a modified cropping pattern better suited to the present rainfall conditions.

There is a profound influence of climatic changes of malnad (Western ghats) over the adjacent eastern semi-malnad and maidan regions of Karnatak. The semi-malnad region of Dharwad district receives much of its annual rainfall from south-west monsoons during which Kharif crops are cultivated. In the early years, the South-west monsoons rains used to heavy and continuous that allowed the growth of dense lofty evergreen forests over many parts of the study region. The ecological damages and environmental degradation caused by men during recent years over the forest environment of malnad and semi-malnad regions have tended to affect the south-west monsoon rains also. Hence, the South-west monsoons are becoming less frequent, unreliable and uncertain during recent years. The total amount of rainfall received from South-west monsoons is considerably lower as compared to earlier years. Further the lofty evergreen forests of the

earlier period have become more open, scrubby that have been considerably damaged or altered.

FOREST ECOLOGY AND CLIMATIC CHANGES :

The forest ecosystem occupies a large volume of atmosphere and soil due to massive biomass. The removal of forest biomass at a greater rate than its renewal has two major consequences. The first is soil nutrients depletion due to soil erosion; and extensive and intensive agricultural practices gives rise to climatic modification resulting into changed micro-climate. Thirdly, whether forest areas have also affected the humidity and rainfall characters is still a matter of speculation and considerable debate. However, the forest areas tend to create orographic effect to lift the unstable airmasses and help the process of condensation by absorbing temperature of the cloud. (Dansereau 1957)

The ecological damages and environmental degradations introduced by man, may considerably affect the hydrological cycle due to increased proportions of temperature effectiveness and rate of evaporation of moisture. Further, these changes indirectly affect the hydrological cycle.

The main objective of the present study is to trace out the trend of south-west monsoon rains during recent years. The attempt also has been made to assess the impact of changing character of south-west monsoon rains over the cropping pattern during the period under study. The monthly rainfall data of 1955 and 1990 forms the basis of the analysis. The available rainfall data has been quantitatively analysed and cartographically represented by means of suitable diagrams.

ECOLOGICAL AND ENVIRONMENTAL CHARACTERS OF SEMI-MALNAD

The semi-malnad is a physico-climatic region situated in between malnad landscape on the west and maidan in the east, consisting of five taluks which are located on the western-margin of Dharwad District as shown in figure-1. The study area lies between $14^{\circ} 17'$ and $15^{\circ} 30'$ north latitudes and between $74^{\circ} 48'$ and $75^{\circ} 40'$ east longitude. It has an area of 38.841 sq. km and has a population of 8,54,501 as per 1991 census. The term malnad is used to describe the forested hilly country of Western Ghats in Karnatak. The semi-malnad is sometimes referred as a transitional belt sharing the physiographic characters of maidan and climatic characters of malnad. The transitional belt is the contact zone largely affected and governed by the ecological and environmental conditions of malnad proper (Learmonth, 1962).

The semi-malnad is a typically rolling plateau more dissected than the rest of maidan with

varying width ranging from 20-40 kms. This narrow belt has amplitude of relief 60 m and gently sloping valley sides between conical or flat topped hills. The landscape is dominated by the lofty forests and patches of deciduous woodlands in Kalaghatagi and Hangal taluks. Further the forests and woodlands have become more scrubby and open that have been either altered or considerably damaged in Hirekerur, Shiggaon and Dharwad taluks. The rainfall regime is a medium type being wetter in the western margin with multiple peaks in July and October.

This region is dominated by paddy fields of normally single rainfed crop with terraced cultivation on gentle slopes of the valleys. The paddy was supposed to be main crop but on dry lands other cereals such as ragi, savi etc., were common. Further it appears that the importance of paddy is considerably decreasing as a result of lesser reliability of kharif rains (Learmonth, 1962).

Environmental Degradation : Man's ability to exploit and modify the forest environment is much more than the other organisms. He has depleted the wild growth forms at the cost of the domesticated plants and animals. This process has been accelerated during the past 4 to 5 hundred years due to the increase of human population and technological developments (Tivy, 1983).

The present form of flora and fauna is in ecological response to the climatic conditions edaphic influences and human interferences (Polande, 1958). The present forests are managed by regular working plans. Some of these forests have been very badly damaged and destroyed by the so called administrative agents of British governments such as Jahagirdhars and Inamdars. The destruction of the forests was so rigorous that many of the valuable trees such as sandal wood, teak etc.,

were totally lost in certain taluks of the District. The forests were also destroyed for many purposes related to either cultivation of crops or construction of dams, reservoirs and roads. The type of altered land use of the recent years disturbed the natural ecological balance resulting into environmental degradation (Singh 1973)

TREND OF RAINFALL

The distribution of rainfall mainly depends on the causes related to the environmental conditions, and direction of maritime air masses that pass over the study region. The region under study receives rainfall from both SW monsoons from June to September and retreating monsoons in October and November. It is a noteworthy fact that major portion of the annual rainfall is received from SW monsoons in kharief rainy season on which the whole agricultural activity depends.

The rainfall rhythm is undergoing a considerable change during recent years. Such change may normally be attributed to the causes related to ecological damages and environmental degradation introduced by man as explained earlier. The study of figure indicates that there is a considerable decrease of kharief rainfall from 1955 to 1990 which need to be explained.

The SW monsoon rainfall system is the dominant rainy season over the study region. There is a decrease in monthly rainfall that occurs during June to September in 1990 as compared with the monthly rainfall of the same period in 1955. Such decreasing tendencies of kharief rainfall is also observed in individual taluks as depicted in figures 3 and 4. However, it is a common experience in the study region as well as other areas of state where the environmental degradation introduced by man must be one of the main causes for lowering of

rainfall which in turn helps change the micro-climates.

CROPPING SEASON AND CLIMATIC CHANGES

The concept of cropping season is based on the assumption that the two main factors limiting the growth of crops are moisture and temperature. Although this concept is basically based of environment to support the plant is also another important consideration (Tivy, 1983). However the physiological growing season is distinct from that of either thermal or humid regimes where climatic conditions are favourable. The combined seasonal distribution of the temperature and rainfall is of greatest importance in affecting the growth of any plant life in the study region.

The climatic characters of the study area denote two main cropping seasons based on natural rains. Kharief and Rabi. The kharief cropping is dominant season in which 80% of annual harvests take place. Hence kharief rains and their regularity determine the whole agricultural and economic activities of the study region. Further, the delay, failure or lowering of kharief rains which are happening during recent years has brought in the adoptability of new crops to grow in adverse conditions of climate and environment of kharief cropping season.

The development occurred in selecting different crops which could adopt and tolerate the environmental conditions. The original crops were few in number of undocumented origin and they were mainly of subsistence type. The important cereals cultivated in the study region as early as 1884 were paddy, Ragi and Jowar (Campbell, 1894). Paddy was a major crop, cultivated almost over the entire semi-malnad region in varying proportions based on natural rains over the hill slopes, terraces and lowlands as shown in figure-3 followed by sugarcane,

Jowar, Green grams, millets etc., (Frowde 1908)

Even as early as 1955 the real semi-maland taluks such as Kalaghatagi and Hangal contributed considerable higher percentages of area under paddy cultivation varying from 75% to 83% as depicted in figure. 4. This leads us to conclude that paddy was monocrop in the earlier years. The other crops cultivated were sugarcane and millets such as ragi, Savi etc., The other taluks such as Dharwad, Hirekerur, Shiggaon where rainfall was little less, were also noted for cultivation of crops such as sugarcane, greengrams and millets in addition to traditional paddy as a major crop.

There is another cropping season namely Rabi which takes the help of retreating monsoons of October and November. These rains only help the growth of crops such as wheat, jowar and cotton which require rainfall in growing season followed by dry weather, clear sunshine. This helps the maturity and outbursts of cotton pots in subsequent months.

KHARIEF CROPPING SEASON IN 1990.

The study of figure-3 of 1990 exhibits a considerable lowering of kharief rains from June to September over the study region. Such changes have tended to restrict the cultivation of traditional crops such as paddy, sugarcane and millets, but favoured the cultivation of several other new commercial crops. The new crops that have been introduced are either crops cultivated in dry environmental conditions of rabi season or brought from elsewhere.

The study of cropping pattern of 1990 indicates a remarkable change where many new crops grown in rabi season have been introduced into

the traditional paddy lands as a kharief crop. They are mainly cotton, pulses, oil seeds, vegetables, chillies, onions etc. The traditional crops such as paddy, sugarcane, millets are considerably reduced in their percentage of area under cultivation in the entire semi-maland as depicted in figure-3. Further, many of the traditional crops especially sugarcane and millets such as Savi, Ragi, Boraga etc. are disappearing from the natural scenery of semi-malnad either due to inadequacy of rainfall or less demand for crops.

The true semi-malnad taluks such as Hangal and Kalaghatagi still indicate 45% - 50% of area under paddy followed by newly introduced crop namely-cotton as a second ranking crop. The other taluks where rainfall is considerably lowered have indicated 13% - 20% area under paddy cultivation. These taluks in addition to cotton cultivation also provide excellent dry environmental conditions to cultivate several other types of crops such as pulses, vegetables and oil-seeds like ground nut, sunflower etc., as shown in fig. 4. Thus the altered climatic and environmental conditions of the study region have totally affected the cropping pattern.

Now-a-days the common practice among the farmers is that whenever kharif rain fails or is delayed the hybrid long staple cotton "DCH" shall invade the paddy lands. During recent years cotton is becoming a popular commercial crop in all malnad taluks and providing excellent yields. The bumper harvests of cotton and competitive high prices, have totally changed the economic conditions of the farmers. Thus, "Cotton" once the so called rabi crop of maidan, got itself adjusted to the altered environmental conditions of semi-malnad region in kharif season.

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ADDRESS OF THE AUTHIOR

Dr. S.I. Hugar

Reader in Geography,
Karnatak University,
Dharwad.