CHAPTER – 2
IDENTIFICATION OF DRY ZONE OF SANGLI DISTRICT

2.1. Introduction

Sangli District is one of the drought-hit districts of Maharashtra. Drought is a natural hazard that differs from other hazards since it has a slow onset, evolves over months or even years, affects a large spatial extent, and cause little structural damage. Its onset and end and severity are often difficult to determine. Like other hazards, the impacts of drought span economic, environmental and social sectors and can be reduced through mitigation and preparedness. Because droughts are a normal part of climate variability for virtually all regions, it is important to develop plans to deal with these extended periods of water shortage in a timely, systematic manner as they evolve. Experience has shown that the democratic form of governance has handled droughts more efficiently than others, as demonstrated by the situation in India before and after independence. In order to solve the problems along with other problems of drought prone areas, it is very important to identify such area in Sangli District. In this chapter it has been attempted to identify Drought (Dry) prone area of Sangli District.

2.2. Drought

The term ‘Drought’ is of meteorological origin. The term drought is used differently by different persons depending upon the context and purpose. To the agronomist it is a shortage of moisture for the crop. The hydrologist defines it as when surface and underground water level are depressed and there is diminution of stream flows. According to economist drought means a situation where water shortage ultimately affects the established economy of the region. To the meteorologist drought represents the absence of rainfall. Thus, drought is not understood as any absolute condition but as relative terms. Its representation depends upon the context in which the term is used.

2.2.A. Definition

The meaning of drought is a complex phenomenon, and the formation and development of its strength go through a process in gradual accumulation, which is so slow that it is difficult to detect during initial period. Drought can be understood as shortage of water supply or imbalance between the demand and supply of water.
1. Drought as a week with actual rainfall equal to half the normal rainfall or less. - Ramdas and Mallik.

2. Drought as a prolonged period of abnormal moisture deficiency and drought severity as a function of moisture demand as well as moisture supply. - Palmer

3. Drought as a situation when annual rainfall over the area or place is less than 75 percent of the normal. - Indian Metrological Department.

4. Drought is a period of abnormally dry weather sufficiently for the lack of precipitation to cause a hydrological imbalance and carries connotations of a moisture deficiency with respect to mains usage of waters. - M.Mohan and Diaz Arena (1982)

5. Drought is considered by many to be the most complex but least understood of all natural hazards affecting more people than any other hazards. – Hangman (1984)

In short, drought is a condition of moisture deficit sufficient to have an adverse effect on vegetation, animals, and man over a sizeable area. However, from a practical standpoint, drought may be regarded as a period of abnormal dry weather sufficiently prolonged for lack of water to cause serious hydrological imbalance in the affected area. In India not only the tropical situation but also its entire dependence on the monsoon rainfall aggravates the situation of drought even more. Drought prone areas in India are generally associated with low level of development, and when drought strikes, the condition of toiling people becomes miserable. Drought affected people have to lead the life of destitute. Moreover, the scope of agricultural growth in these areas is limited by low and uncertain moisture conditions.

2.2.B. Types of Drought

A general survey of definitions of drought indicates that drought can be classified in four types according to the criteria in use either alone or in combination of rainfall, temperature, humidity, evaporation from free water, transformation from plants, soil moisture, wind, stream flow and plant condition. These types are follows-

a) Meteorological drought

The meteorological droughts are defined mainly on the basis of the amount of rainfall and the period of the lack of rain. According to Huschke, R.E., "A period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic imbalance in the affected area." Meteorological drought is simple absence/deficit of rainfall from the normal. It is the least severe form of drought and is often identified by sunny days and hot weather. According to Blumen stock, “Drought
is a period of 48 hours during which precipitation is less than 0.10 inch. Indian Meteorological Department has classified below normal rainfall as slight, moderate and severe droughts in intensity when the deficiency of rainfall is -11 to -25 percent, -25 to -50 percent and below -50 percent respectively.

b) Hydrological drought

Hydrological drought often leads to reduction of natural stream flows or groundwater levels, plus stored water supplies. Main impact is on water resource systems. According to Yevjevich Vujica, "A period of below average water content in streams, reservoirs, Groundwater aquifers, lakes and soils." Hydrological drought is a situation in which insufficient water availability affects human beings either directly or indirectly in all disciplines.

c) Agricultural drought

According to Thornwait, “Drought does not begin when the rain causes but only when plant roots can no longer obtain soil moisture.” Rosenberg, N.J. defined drought as “A climatic excursion involving a shortage of precipitation sufficient to adversely affect crop production or range production." This form of drought occurs when moisture level in soils is insufficient to maintain average crop yields. Initial consequences are in the reduced seasonal output of crops & other related production. An extreme agricultural drought can lead to a famine, which is a prolonged shortage of food in a restricted region causing widespread disease and death from starvation.

d) Socio-economic drought

Socio-economic drought correlates the supply and demand of goods and services with the three above-mentioned types of drought. When the supply of some goods or services such as water and electricity are weather dependant then drought may cause shortages in supply of these economic goods.

2.3. Sangli District

Sangli district is almost an epitome of the whole Maharashtra, except for seashore. It also represents almost every aspect of Maharashtra’s geographical, historical, industrial and cultural status.

2.3.A. Historical background

Sangli District derives its name from it’s headquarter ‘Sangli’ town which was erstwhile princely state and now forms a part of the district. District forms a part of Deccan plateau. Its history is essentially linked with the southern Maratha territories also referred to as the Kuntala during the ancient period. After the death of Emperor
Ashoka in 236 B.C. this region witnessed the rise and fall of the dynasties of Satavahanas, Vakatakas, Rashtrakutas, Chalukyas and Bahamani Kings. After the invasion of Devagiri by Al-ud-din Khilaji, the Deccan passed under the overlordship of Delhi emperors. The first Moghal invasion in Deccan began in 1593 during the region of Akbar. The successive history of the region is marked by prolonged struggle for domination among the forces of Moghal, Adilsahi’s Kingdom and the Marathas. Maratha chieftains belonging to Patawardan Family are said to have been the rulers of small principalities such as Sangli, Miraj and Tasgaon which came under the domination of British in 1818-19 and finally these were merged with the state of Bombay during the post independence period in 1948. In this way Sangli District was formed in 1949.

**2.3.B. Location and Geographical Area**

Sangli District is one of the southern most districts of Maharashtra state. It is situated between the latitudes of 16° 45’ N to 17° 33’ N and the longitudes of 73° 42’ E to 75° 40’ E. The average height of Sangli district from mean sea level varies from 500 meters to 1100 meters. The district is bounded by Satara District on the north western side. On the northeastern side it is bounded by Solapur district. On the southern side it is bordered by the Belgaum and Bijapur district of Karnataka state at the centre and east and Kolhapur district is in the west. The Ratanagiri district lies on the west of Sangli district. The total area of Sangli District is about 8601.5 square kilometer.

**Table 2.1**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahsils</th>
<th>Area in Hect.</th>
<th>Percentage to total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shirala</td>
<td>63417</td>
<td>7.36</td>
</tr>
<tr>
<td>2</td>
<td>Walwa</td>
<td>78781</td>
<td>9.14</td>
</tr>
<tr>
<td>3</td>
<td>Palus</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>4</td>
<td>Khanapur</td>
<td>132602</td>
<td>15.39</td>
</tr>
<tr>
<td>5</td>
<td>Atpadi</td>
<td>87171</td>
<td>10.12</td>
</tr>
<tr>
<td>6</td>
<td>Tasgaon</td>
<td>111259</td>
<td>12.92</td>
</tr>
<tr>
<td>7</td>
<td>Miraj</td>
<td>92624</td>
<td>10.76</td>
</tr>
<tr>
<td>8</td>
<td>Ka.Mahakal</td>
<td>70673</td>
<td>8.20</td>
</tr>
<tr>
<td>9</td>
<td>Jath</td>
<td>224538</td>
<td>26.07</td>
</tr>
<tr>
<td>10</td>
<td>Kadegaon</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Sangli District</td>
<td>861065</td>
<td>100</td>
</tr>
</tbody>
</table>

Source:- Sangli District socio-economic abstract in 2010/11.
Location
Sangli District

Fig. 2.1
The Sangli district has an irregular shape. The average length of the Sangli district is 126 k.m. and it spread into East Jath taluka to west Shirala taluka and roughly, squarish width 122 K.m. is spread between Miraj taluka in the South to Atpadi taluka in the North. The total geographical area of Sangli District is 861065 hectors.

According to geographical area, Sangli district is the 17th number district in Maharashtra State .This area is divided into urban area and rural area. According to area Jath taluka is the largest taluka (26.07 percent) and Shirala taluka is the smallest tahsil (7.36 percent) in Sangli district.

2.3. C. Administrative Evolution

The present areas of Sangli district were up to 1948 partly included in old Satara district and partly in the former States of Aundh, Jath, Sangli, Kurundwad (senior), Miraj (senior), Miraj (Junior) and Wadi Estates. In 1949, the district was named as South Satara district which included four talukas of Tasgaon, Khanapur, Walwa and Shirala transferred from old Satara district and two new talukas of Miraj and Jath formed out of the erstwhile Princely States. In 1960, the name of South Satara district was changed to Sangli district with its headquarters at Sangli in Miraj taluka. On 1st August 1964 Khanapur and Miraj talukas were reconstituted into Khanapur taluka & Atpadi taluka and Miraj taluka & Kavathe Mahankal Mahal, respectively. Palus taluka came into existence 26 Jun 1999. Kadegaon is last taluka declared by Govt. of Maharashtra on 6th April 2003.

Presently, the land of the district is distributed in 10 talukas and 5 towns. Among these, Jath lies isolated in the east, Shirala is west, Atpadi, Khanapur and Kadegaon in the Middle North, Miraj in the middle south, and Palus, Tasgaon, K.Mahankal in the Center.
2.4 Method of Delimitation of Dry Zone Area

There have been many methods developed of delimitation of drought prone areas. Ravindranath (1978) has given an account of various methods of drought studies. The methods used by geographers and various committees are also many, and these methods are follows.

1. Rainfall and irrigation based
2. Rainfall and potential evapotranspiration based.
3. Water balance analysis based
4. Physical factors based

These methods are used for delimitation of drought prone area. Each of these methods has some limitations, demerits and merits. However, the nature and purpose of study, the rainfall and irrigation based method is selected for delimitation of drought prone area.

Rainfall and Irrigation based method

Drought is no longer mere scarcity or the absence of rainfall, but related to inefficient water resource management. Requirement of over 80-90 percent of the drinking water and over 50 percent for irrigation is met from groundwater. Maharashtra Government has appointed several committees for the drought from time to time. The fact finding committee for the survey of scarcity survey areas in Maharashtra has considered weekly rainfall as a major criterion for identification of drought areas in Maharashtra. Beside, taking into account a 25 percent annual rainfall deficiency and the data furnished by other reports, the committee has used deficient rainfall weeks as the main agro-climatic parameter to determine drought prone areas. A week is defined as a deficient week when the rainfall was 50 percent less than the average rainfall for the week. The committee has considered weeks of S.W. monsoon season. If 50 percent of these weeks were deficient, the year was considered as a drought hit year. The weekly rainfall data 15 years is considered for all stations. According to Dikshit the agro-climatic significance of deficient week is limited.

The second Irrigation Commission (1972) has used the criteria suggested by Indian Meteoro logical Department i.e. if in any area the rainfall of a year is 75 percent
or less than the normal annual rainfall, then the area is considered as drought prone in that particular year. If in such area, such damage is 20 percent or more than the total 60 years for the study, then the area is called as drought area.

Swaminathan Committee appointed by the Government of India, has used two criteria namely, annual rainfall and irrigation facilities for drought studies. According to Sahtri have used annual rainfall anomaly to study and a year receiving a rainfall of 50 percent or less than that of annual normal is the in the drought year.

2.4.A. Rainfall

Rainfall, as a primary ecological parameter, has created a variety of farming enterprises, types or systems of agriculture. It is the dominant single weather element influencing the intensity and location of farming system and the farmers’ choice of enterprises. It also becomes a climatic hazard to farming when it is characterized with scantiness, concentration, intensity, variability and unreliability.

Table 2.2

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahsils</th>
<th>Rainfall in mm.</th>
<th>Sr. No.</th>
<th>Tahsils</th>
<th>Rainfall in mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shirala</td>
<td>1005</td>
<td>7</td>
<td>Miraj</td>
<td>629</td>
</tr>
<tr>
<td>2</td>
<td>Walwa</td>
<td>680</td>
<td>8</td>
<td>Ka.Mahakal</td>
<td>549</td>
</tr>
<tr>
<td>3</td>
<td>Palus</td>
<td>597</td>
<td>9</td>
<td>Jath</td>
<td>558</td>
</tr>
<tr>
<td>4</td>
<td>Khanapur</td>
<td>581</td>
<td>10</td>
<td>Kadegaon</td>
<td>459</td>
</tr>
<tr>
<td>5</td>
<td>Atpadi</td>
<td>565</td>
<td></td>
<td>Sangli District</td>
<td>620</td>
</tr>
<tr>
<td>6</td>
<td>Tasgaon</td>
<td>597</td>
<td></td>
<td>Maharashtra State</td>
<td></td>
</tr>
</tbody>
</table>

Source: Socio-economic Abstract of Sangli District, 1989 and 2009
Sangli District roughly 80 percent rainfalls is received from the south west monsoon. Rainfall starts sometime in the last week of June and lasts till end of September because Sangli District is located in rain shadow area of Western Ghats. This scanty and uneven rainfall are drastically affecting on agriculture of the region. But Shirala tahsil records heavy amount of rainfall with average of 1005 mm. This perhaps, is due to close vicinity of this tahsil with Western Ghats. From Shirala tahsil eastwards rainfall decreases which is evident from the table 2.1. Expecting Shirala (1005mm) and Walwa tahsils (680mm) the rainfall range of 450 to 620 mm are observed in Palus, Khanapur, Atpadi, Tasgaon, Miraj, Kadegao, Jath and K. Mahakal tahasils of Sangli district.

2.4.B. Irrigation

Irrigation is considered one of the most important and basic factors in process of transformation of agriculture, where rainfall is inadequate, and irrigation played an important role in transforming the rural landscape of the study region. The canal, tube-well, well and tanks are major source of irrigation used in India, which can change landuse pattern dominantly. However, the intensity of irrigation is useful to delimitation of dry zone area. For the measurement of irrigation intensity the following formula are used.

\[
\text{Intensity of Irrigation} = \frac{\text{Net Irrigated area}}{\text{Gross cropped area}} \times 100
\]

The intensity of irrigation is the proportion of net irrigated area to net shown area of the aerial unit. The spatial pattern is revealed by Fig 2.4. High proportion of the intensity of irrigation is observed in Walwa taluka (37.30), where canal and well irrigation has been developed during the last two decades. This has been followed by Shirala (29.62) and Miraj taluka (28.51percent). These tahsils have also availability of water from either canals or wells for irrigation purpose.
Table No 2.3
Sangli District: Irrigation Intensity (2009-10)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tahsils</th>
<th>Gross cropped area</th>
<th>Net irrigated area</th>
<th>Irrigation intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shirala</td>
<td>45036</td>
<td>13440</td>
<td>29.62</td>
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<tr>
<td>2</td>
<td>Walwa</td>
<td>95054</td>
<td>35456</td>
<td>37.30</td>
</tr>
<tr>
<td>3</td>
<td>Palus</td>
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<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>4</td>
<td>Khanapur</td>
<td>115370</td>
<td>21664</td>
<td>18.77</td>
</tr>
<tr>
<td>5</td>
<td>Atpadi</td>
<td>48972</td>
<td>12152</td>
<td>24.81</td>
</tr>
<tr>
<td>6</td>
<td>Tasgaon</td>
<td>92667</td>
<td>20527</td>
<td>22.15</td>
</tr>
<tr>
<td>7</td>
<td>Miraj</td>
<td>108013</td>
<td>30798</td>
<td>28.51</td>
</tr>
<tr>
<td>8</td>
<td>K.Mahankal</td>
<td>50594</td>
<td>11425</td>
<td>22.58</td>
</tr>
<tr>
<td>9</td>
<td>Jath</td>
<td>154886</td>
<td>31038</td>
<td>20.03</td>
</tr>
<tr>
<td>10</td>
<td>Kadegao</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>District</td>
<td></td>
<td>712592</td>
<td>176500</td>
<td>24.76</td>
</tr>
</tbody>
</table>

Source: Socio-economic Abstract of Sangli District, 2009-10
(NA- Data is Not Available)

Expecting these (Walwa, Shirala, Miraj) tahasils, remaining all tahasils of district have recorded low intensity (below 25) of irrigation giving a way to rain fed agriculture. The intensity of irrigation is very low in Khanapur (18.77) and Jath (20.03).

The average irrigation intensity district is 24.76. That is low compare to other neighboring district like Kohlapur, Pune and Satara district. The Palus and Kadegao tahasils irrigation data are not available but Sukthankar committee identified drought prone areas these tahasils excludes.
2.5. Identification of Dry Zone Area of Sangli District (DZSD)

The study based on rainfall and irrigation based methods indicates that Shirala, Walawa, Kadegao and Palus all other six tahasils are included in drought prone area. The result of above discussed methods are related to rain gauge station and intensity of irrigation but for want of data related to tahsil boundary has to be accepted as a separating line between drought prone area and non drought prone area. The problem of western boundary may be raised. This problem does not raise in case of boundary line on northern, southern and eastern sides of area because stations on these sides are located in well-defined drought prone areas.

The rainfall and irrigation based method is used to identify the drought prone area of Sangli District. These identify same six tahasils of Sangli District in drought prone area of district and with help of choropleth method, the western boundary of drought area of Sangli District is demarcated. Rainfall of Palus and kadegao Tahsil is low and moderate, but they are not included in drought prone region. The Palus and Kadegao tahasils irrigation data are not available but Sukthankar committee identified drought prone areas these tahasils are excludes.

Thus the six tahasils namely Jath, Atpadi, Tasgao, Khanapur, K. Mahankal and Miraj tahsils. (Fig. 2.5). The 445 villages and seven towns are included in DZSD. The total area of these six tahsils is 718867 hect. which is about 83 % of total area of Sangli District.
References

11. India Meterology Department : The climate of Maharashtra 2007

