Climate is one of the basic physical environmental components. The term climate implies the collective expression of individual weather elements like temperature, precipitation, humidity, air pressure and wind etc. Specific climatic assemblages on particular geological settings have been acting to evolve a set of landform assemblages, soilscape and biotic assemblages. The particular bio-climatic settings, in turn, provide the basic framework to evolve the particular types of landuse practices which are best suited to them. Therefore, a detailed analysis of visible and invisible climatic parameters of Southwest Birbhum District is essential to determine potential landuse capabilities of the study area. The area specific landuse practices not only provide economic sufficiency, but also ensure ecological susceptibility of the area.
3.1. CLIMATIC CHARACTERISTICS

The Southwest Birbhum District is characterised by subhumid subtropical climatic belt with a hot summer (March-June), a good rainy season (July-September) and a cold winter (October-February).

Table 3.1: Climatic parameters in SWBD (1931-1960)

<table>
<thead>
<tr>
<th>Months</th>
<th>Temperature (°C)</th>
<th>Pressure (in mb.)</th>
<th>Relative Humidity (in %)</th>
<th>Rainfall (mm)</th>
<th>No. of rainy days</th>
<th>Mean wind speed (in km. p. h.)</th>
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<td>1.6</td>
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Source: Deputy Director General of Observatory, Poona, 1971

3.1.1. Temperature

A specific range of temperature is one of the prerequisites for successful germination of seeds and consequent plant growth. The mean monthly temperatures of the study area are guided by locational proximity, seasonality, tropical disturbances and surface configuration (Mukherjee, A.). The mean monthly temperature in the study area has remained more or less same throughout the years (1986-2007). However, the diurnal and annual range of temperature is high, resulting in two or more cropping seasons (Table 3.2).

Temperature in the study area begins to rise abruptly from about the beginning of March. May is the hottest month with mean daily maximum temperature at 37.9°C and the mean daily minimum temperature at 25.5°C (Table 3.1). Rapid rate of evapotranspiration caused by intense
heating in the study area creates scarcity of water. Lack of irrigation facilities aggravates the agronomic situation during this period. Moreover, the ground vegetations are practically burnt up and almost no pasture is left for the cattle to graze on. With the onset of monsoon by about the early June, the day temperature begins to drop but the night temperature remains as high as in the summer months. With the withdrawal of monsoon (first week of October) the temperature begins to drop.

The highest maximum temperature of 48°C was recorded in 1972, May and the lowest minimum temperature of 5°C was recorded in 2003, January.

Table 3.2: Average monthly temperature in SWBD (1986-2007)

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</tbody>
</table>

Source: District Statistical Handbooks (1986-2007)
3.1.2. Humidity

High temperature and very low relative humidity during summer months (March to May) is one of the most important ecological constraints of agriculture in the study area (Fig. 3.2). The air is highly humid during the monsoon season (June-September). During this period the mean seasonal relative humidity remain 81%. The month of July is marked by maximum relative humidity with 84%. Thereafter, relative humidity decreases progressively. The driest month of the study area is March with relative humidity of 47% (Table 3.1).

**TEMPERATURE AND RELATIVE HUMIDITY**

![Trend in Temperature Variation in Last Three Decades](image1)

![Temperature and Relative Humidity](image2)
3.1.3. Rainfall

Like relative humidity, rainfall in Southwest Birbhum District also acts as an ecological constraint to agricultural landuse with its variability and unreliability. The cumulative impact of high evapotranspiration facilitated by high air temperature, rapid surface runoff caused by undulating bare land and rapid percolation of coarse textured soil have reduced the rainfall effectiveness in the northern, middle and western parts of the study area. Moreover, low ground water potential of hard granite-gneissic landscape in this part provides hindrance to artificial watering in the agricultural field. The region is thus agriculturally drought prone.

The average annual rainfall of the study area varies from 1300-1420 mm. About 78% of total annual rainfall is concentrated during southwest monsoon season (June-September). On an average there are 69 rainy days in a year in the study area. Monthly rainfall in the study area varies from 2 mm in the month of December to 307 mm in the month of August.

During the last three decades (1986-2007) there has been observed great year to year variability of rainfall. The mean annual rainfall is 1493 mm with a standard deviation of 229.99 mm. The average trend line of rainfall, based on linear regression of time series, is given by $Y_c=a+bx$, where $x$ represents the base year and $Y_c$ represents the expected rainfall. Thus, there is an increasing trend of rainfall during the last three decades (Table 3.3, Fig. 3.3).

In the absence of adequate irrigation facilities, agricultural landuse of the study area are totally dependent on the variability of rainfall. Except the southern and southeastern parts, drought is the only climatic hazard in the rest of the study area with undulating land and rolling land
Table 3.3: Total monthly rainfall in SWBD (1986-2007)

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<th>March</th>
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<th>May</th>
<th>June</th>
<th>July</th>
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<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>Total</th>
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<td>0</td>
<td>2015</td>
</tr>
<tr>
<td>2001</td>
<td>0</td>
<td>0</td>
<td>22</td>
<td>50</td>
<td>138</td>
<td>332</td>
<td>194</td>
<td>181</td>
<td>231</td>
<td>190</td>
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<td>0</td>
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</tr>
<tr>
<td>2002</td>
<td>17</td>
<td>02</td>
<td>40</td>
<td>99</td>
<td>159</td>
<td>238</td>
<td>317</td>
<td>308</td>
<td>268</td>
<td>61</td>
<td>13</td>
<td>0</td>
<td>1522</td>
</tr>
<tr>
<td>2003</td>
<td>02</td>
<td>36</td>
<td>54</td>
<td>52</td>
<td>69</td>
<td>203</td>
<td>153</td>
<td>231</td>
<td>112</td>
<td>260</td>
<td>0</td>
<td>11</td>
<td>1183</td>
</tr>
<tr>
<td>2004</td>
<td>07</td>
<td>0</td>
<td>26</td>
<td>91</td>
<td>65</td>
<td>288</td>
<td>170</td>
<td>303</td>
<td>288</td>
<td>233</td>
<td>0</td>
<td>01</td>
<td>1472</td>
</tr>
<tr>
<td>2005</td>
<td>41</td>
<td>17</td>
<td>66</td>
<td>26</td>
<td>59</td>
<td>148</td>
<td>454</td>
<td>454</td>
<td>160</td>
<td>200</td>
<td>0</td>
<td>05</td>
<td>1264</td>
</tr>
<tr>
<td>2006</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>43</td>
<td>75</td>
<td>303</td>
<td>567</td>
<td>186</td>
<td>378</td>
<td>12</td>
<td>0</td>
<td>1605</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>0</td>
<td>50</td>
<td>60</td>
<td>45</td>
<td>80</td>
<td>230</td>
<td>462</td>
<td>264</td>
<td>459</td>
<td>52</td>
<td>09</td>
<td>0</td>
<td>1711</td>
</tr>
</tbody>
</table>

Source: District Statistical Handbooks (1986-2007)

Fig. 3.3
3.1.4. Atmospheric Pressure and Wind
In Southwest Birbhum District atmospheric pressure varies from one month to other. The highest atmospheric pressure in the study area has been observed in the month of January (1000.3 mb) and December (1000.2 mb). The lowest value (983.5 mb) of atmospheric pressure has been recorded in the months of June and July (Table 3.1).

Except during summer and monsoon seasons, winds are generally light or moderate in the study area. During southwest monsoon season winds blow mostly from the direction between south and east. During winter winds blow mainly from the direction between west and north. Light norwesterlies are found during winter and early summer months. On bare dry land, wind plays an important role in removing top soil of the study area.

3.1.5. Cloud Amount and Rainy Days
In the study area, the skies are moderately clouded in May and heavily clouded to overcast in the southwest monsoon season. Cloudiness decreases in October and the skies are clear or lightly clouded in the rest of the year (District Census Handbook, 1961, p. 13).

The amounts of rainy days are directly related to the cloud cover of the study area. However, there is a great variability of the amount of rainy days in the study area. Maximum rainy days are observed in the month of July (18.4) and minimum rainy days (0.1) are observed in the month of November (Table 3.1).

3.1.6. The Seasons
On the basis of meteorological data the study area has been divided into four principal seasons.
Table 3.4: Principal Seasons

<table>
<thead>
<tr>
<th>Seasons</th>
<th>Months</th>
<th>Season-wise mean temperature (°C)</th>
<th>Season-wise total rainfall (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The summer</td>
<td>March to mid-June</td>
<td>29.4</td>
<td>170.5</td>
</tr>
<tr>
<td>The rainy</td>
<td>Mid-June to September</td>
<td>28.9</td>
<td>1195.4</td>
</tr>
<tr>
<td>The season of retreating monsoon</td>
<td>October to November</td>
<td>25.35</td>
<td>69.0</td>
</tr>
<tr>
<td>The winter</td>
<td>December to February</td>
<td>19.5</td>
<td>45.2</td>
</tr>
</tbody>
</table>

3.1.7 Climate and Landuse

i) Climate determines the length of growing period in the study area. On the basis of monthly rainfall and potential evapotranspiration (PET) distribution, the study area has been divided into three moisture availability zones: the Moist (starts in the 4th week of May and continues up to the 2nd week of June and it again appears at the 2nd week of October and continues up to the end of October); the Humid (starts in the 2nd week of June and ends almost in the 2nd week of October); and the Moderately dry (throughout the November). The length of growing period in the study area is 180-210 days (Velayutham et al., 1999, p. 372).

ii) Due to lack of adequate irrigation facility, agriculture in the study area entirely depends on rainfall. Inadequate effective rainfall as well as erratic nature of rainfall aggravates the agro-ecological condition of the study area.

iii) The subhumid, subtropical climatic condition in the study area plays a significant role in the formation of laterites, mainly in the eastern part of Dubrajpur block of the study area. In the absence of profitable agriculture during rabi season, the red soil in the study area are being used as raw material for brick kiln.

iv) Agricultural drought, caused by inadequate and uncertain rainfall distribution, indulge many agricultural labourer to switch to the illegal mining activities in the study area.

3.2 VEGETATION

Natural vegetation, one of the biotic components of environment, has both direct as well as indirect impact upon landuse practices. Forests directly supply raw material for forest based industries. Forests act as a soil former as well as soil conservator. Thus, under a given geo-
lithological and physiographic set up, forest determines the agro-
ecological potentiality of the area. Therefore, a detailed appraisal of
forest resource of the study area has been necessitated to analyse the
diversity as well as sustainability of landuse practices of Southwest
Birbhum District.

3.2.1 Diverse Species of Forest

The common species of plants and trees found in the study area are
listed below (Table 3.5).

<table>
<thead>
<tr>
<th>Plants</th>
<th>Local name</th>
<th>Botanical name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aam</td>
<td>Mangifera indica</td>
</tr>
<tr>
<td>2</td>
<td>Aswatha</td>
<td>Ficus religiosa</td>
</tr>
<tr>
<td>3</td>
<td>Babul</td>
<td>Acacia arabica</td>
</tr>
<tr>
<td>4</td>
<td>Bans</td>
<td>Dendrocalamus strictus</td>
</tr>
<tr>
<td>5</td>
<td>Bat</td>
<td>Ficus benghalensis</td>
</tr>
<tr>
<td>6</td>
<td>Bel</td>
<td>Aegle marmelos</td>
</tr>
<tr>
<td>7</td>
<td>Bija sal</td>
<td>Pterocarpus marsupium</td>
</tr>
<tr>
<td>8</td>
<td>Imli</td>
<td>Tamarindus indica</td>
</tr>
<tr>
<td>9</td>
<td>Jamun</td>
<td>Syzigium cumini</td>
</tr>
<tr>
<td>10</td>
<td>Jangla jabri</td>
<td>Acacia melybuma</td>
</tr>
<tr>
<td>11</td>
<td>Kanthal</td>
<td>Artocarpus heterophyllus</td>
</tr>
<tr>
<td>12</td>
<td>Khejur</td>
<td>Phoenix sylvestris</td>
</tr>
<tr>
<td>13</td>
<td>Palas</td>
<td>Butea monosperma</td>
</tr>
<tr>
<td>14</td>
<td>Neem</td>
<td>Azadirachta indica</td>
</tr>
<tr>
<td>15</td>
<td>Sal</td>
<td>Shorea robusta</td>
</tr>
<tr>
<td>16</td>
<td>Sisoo</td>
<td>Dalberzia sisoo</td>
</tr>
<tr>
<td>17</td>
<td>Simul</td>
<td>Bombax ceiba</td>
</tr>
<tr>
<td>18</td>
<td>Teak</td>
<td>Tectona grandis</td>
</tr>
<tr>
<td>Grasses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Dhub</td>
<td>Cynodon dactylon</td>
</tr>
<tr>
<td>2</td>
<td>Kash</td>
<td>Saccharum spontanimum</td>
</tr>
<tr>
<td>3</td>
<td>Nutgrass</td>
<td>Cyperus rotundus</td>
</tr>
<tr>
<td>4</td>
<td>Shama</td>
<td>Penicium frumentaseus</td>
</tr>
</tbody>
</table>

Source: All India Soil Survey and Landuse Planning, Kolkata

Table 3.6: Temporal variations of forest coverage of the study area

<table>
<thead>
<tr>
<th>Sources</th>
<th>Year</th>
<th>Forest coverage (sq.km.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toposheet</td>
<td>1972</td>
<td>53.60</td>
</tr>
<tr>
<td>District Census Handbooks</td>
<td>1971</td>
<td>67.39</td>
</tr>
<tr>
<td></td>
<td>1981</td>
<td>62.62</td>
</tr>
<tr>
<td></td>
<td>1991</td>
<td>62.25</td>
</tr>
<tr>
<td></td>
<td>2001</td>
<td>54.42</td>
</tr>
<tr>
<td>Satellite imagery</td>
<td>2009</td>
<td>48.29</td>
</tr>
</tbody>
</table>
3.2.2 Present Status of Forest Cover

From Table 3.6, it has been observed that, there is much discrepancy regarding the amount of forest cover in three different sources. This is due to the fact that in topographical map only the protected forest cover had been taken into account; whereas the other two sources include extension of forest and social forestry by different governmental and non-governmental organisations. However, there is no ambiguity in the fact that there is declining trend of forest coverage in the study area. The fact become very much clear if individual source is considered. From Census data it has been observed that from 1971 to 2001 there has been 12.97 sq. km. (19.25%) net decrease of forest coverage in the study area (Fig.3.4).

As per assessment of 2001 Census report (Fig. 3.5, 3.6 & 3.7) it is found that most of the forest coverage lies in the northern, eastern and some patches of western parts of the study area. Forest coverage in these parts ranges between 20-70% of total mouza area. Existing physical limitations influenced by hard granite-gneissic basement, rugged topography, patches of highly acidic red laterite soil, moderate to severe soil erosion hinder the smooth development of agricultural activity in this region. In most of the mouzas in this part of the study area, cultivated land varies between 20-50% to total mouza area. For example, Kalasona (79), Radhamadhabpur (88), and Raghunathpur (101) mouzas of Dubrajpur block have forest coverage of 60.51%, 66.88%, and 68.67% of the total mouza area respectively; whereas these mouzas occupy...
31.85%, 27.62% and 28.82% of cultivated land to total mouza area respectively. Lack of adequate communication system hinders the development of secondary and tertiary activities. Such kinds of physico-cultural set up make possible to sustain the forest coverage in this part of the study area over the years.

Massive deforestation has been identified in the southwestern, southern and southeastern parts of the study area (Photo 1 & 2). Here the amount of forest coverage varies between 0 and 10 percent. Comparatively better physico-cultural set up with flat alluvial terrain, deep surface soil, fine to very fine soil texture provide ease to agricultural activities in this part of the study area. Mouzas under 0-10% forest coverage are also distributed sporadically in the northern portion of the study area (Fig. 3.5, 3.6 & 3.7). However during field observations considerable amount of afforestation has been observed mainly surrounding the water bodies, canal, roads and bare uncultivable waste land.
Photo 1: This is a view of rugged terrain with degraded forest in Gangpur mouza (61), about 6 kms. northwest of Khoyrasole block.

Photo 2: The photo shows vast areas of deforested land in Gnagarampur mouza (62), about 6 kms. northwest of Khoyrasole block.
Source: Raw data obtained from SOI toposheets (1972) and complied by the researcher

Fig. 3.5
Fig. 3.6

% of forest area to total mouza area

Source: Raw data obtained from District Census Handbook (1971), Birbhum District and compiled by the researcher

Fig. 3.7

% of forest area to total mouza area

Source: Raw data obtained from District Census Handbook (2001), Birbhum District and compiled by the researcher
### 3.2.3 Relation between land unit and forest

The study area is characterised by three distinct land units with diverse forest cover. Land unit-wise percentage of forest coverage to total forest area gives a misleading picture with minimum concentration of forest coverage (16.38%) in undulating land followed by rolling land (50.21%) and nearly level land (33.41%). However, the percentage of forest coverage to individual land unit reveals the fact that nearly 5% undulating land contains 19.74% forest area, 39% rolling land contains 8.06% forest area and 56% nearly level land contains only 3.78% forest area (Table 3.7). This statistics perfectly match with the usual notion of massive devastation of forest in nearly level land.

### Table 3.7: Land unit-wise distribution of forest area in SWBD

<table>
<thead>
<tr>
<th>Land units</th>
<th>Area (sq.km.)</th>
<th>Forest area (sq.km.)</th>
<th>% of forest area to total forest area</th>
<th>% of forest area to individual terrain unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undulating land</td>
<td>44.48</td>
<td>8.78</td>
<td>16.38</td>
<td>19.74</td>
</tr>
<tr>
<td>Rolling land</td>
<td>333.86</td>
<td>26.91</td>
<td>50.21</td>
<td>8.06</td>
</tr>
<tr>
<td>Nearly level land</td>
<td>473.52</td>
<td>17.91</td>
<td>33.41</td>
<td>3.78</td>
</tr>
<tr>
<td>Total</td>
<td>851.86</td>
<td>53.60</td>
<td>100.00</td>
<td>---</td>
</tr>
</tbody>
</table>

*Source: Raw data obtained from SOI Toposheets (1972) and compiled by the researcher*

### 3.2.4 Relation between Slope and Forest

The average slope of the study area is not so significant. Nearly 96% of the study area is characterised by gentle slope. As against the usual notion, it appears that there is an inverse relationship between the amount of slope and forest coverage in the study area (Table 3.8). Percentage of forest coverage increases with decreasing amount of slope. This is due to the fact that the existing adverse agro-ecological situation of the already deforested gentle land compels the rural farmers to depend on forest resources. Illegal cutting of forest has now become a regular phenomenon in some mouzas of the western and northern parts of the study area (Photo 2). Only 4.76% of the moderately steep zone is covered by forest areas (Table 3.9). This bare moderately steep zone is characterised by rapid surface runoff with severe soil erosion.
### Table 3.8: G.P.-wise distribution of slope and forest

<table>
<thead>
<tr>
<th>Name of Gram Panchayet(G.P.)</th>
<th>Slope categories with % to total G.P. area</th>
<th>% of forest area to total G.P. area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1971</td>
<td>2001</td>
</tr>
<tr>
<td>Balijuri</td>
<td>Gentle</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>Gentle (93.13%)</td>
<td>4.01</td>
</tr>
<tr>
<td></td>
<td>Moderately gentle (6.87)</td>
<td>1.54</td>
</tr>
<tr>
<td>Hetampur</td>
<td>Gentle</td>
<td>7.85</td>
</tr>
<tr>
<td></td>
<td>Gentle</td>
<td>2.88</td>
</tr>
<tr>
<td></td>
<td>Gentle</td>
<td>0</td>
</tr>
<tr>
<td>Jashpur</td>
<td>Gentle</td>
<td>11.16</td>
</tr>
<tr>
<td>Loba</td>
<td>Gentle</td>
<td>14.15</td>
</tr>
<tr>
<td>Poduma</td>
<td>Gentle</td>
<td>26.32</td>
</tr>
<tr>
<td></td>
<td>Moderately gentle (5.42)</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>Steep (1.06)</td>
<td>0.28</td>
</tr>
<tr>
<td>Gohaliara</td>
<td>Gentle</td>
<td>18.19</td>
</tr>
<tr>
<td></td>
<td>Gentle</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2001</td>
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<td></td>
<td>26.32</td>
<td>21.04</td>
</tr>
<tr>
<td></td>
<td>0.42</td>
<td>0.42</td>
</tr>
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<td></td>
<td>0.28</td>
<td>1.15</td>
</tr>
<tr>
<td></td>
<td>18.19</td>
<td>17.37</td>
</tr>
<tr>
<td></td>
<td>0.18</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Gentle</td>
<td>1.01</td>
</tr>
<tr>
<td>Kendore</td>
<td>Gentle</td>
<td>0.33</td>
</tr>
<tr>
<td>Hazratpur</td>
<td>Gentle (78.76)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Moderately gentle (21.24)</td>
<td>0</td>
</tr>
<tr>
<td>Barhra</td>
<td>Gentle (92.80)</td>
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</tr>
<tr>
<td></td>
<td>Moderately gentle (7.20)</td>
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</tr>
<tr>
<td>Parsundi</td>
<td>Gentle</td>
<td>0</td>
</tr>
<tr>
<td>Babuizore</td>
<td>Gentle (83.64)</td>
<td>6.21</td>
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<tr>
<td></td>
<td>Moderately gentle (14.23)</td>
<td>0.05</td>
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<tr>
<td></td>
<td>Steep (2.13)</td>
<td>0</td>
</tr>
<tr>
<td>Nakarakonda</td>
<td>Gentle (89.67)</td>
<td>12.43</td>
</tr>
<tr>
<td></td>
<td>Moderately gentle (9.67)</td>
<td>1.33</td>
</tr>
<tr>
<td></td>
<td>Steep (0.66)</td>
<td>0</td>
</tr>
<tr>
<td>Khoyrasole</td>
<td>Gentle (95.95)</td>
<td>2.47</td>
</tr>
<tr>
<td></td>
<td>Moderately gentle (4.05)</td>
<td>0</td>
</tr>
<tr>
<td>Rupuspur</td>
<td>Gentle</td>
<td>10.43</td>
</tr>
<tr>
<td></td>
<td>Gentle</td>
<td>4.27</td>
</tr>
<tr>
<td></td>
<td>2.47</td>
<td>2.47</td>
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<td>6.84</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>11.62</td>
<td>11.62</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>4.76</td>
<td>4.76</td>
</tr>
</tbody>
</table>

Source: Raw data obtained from SOI toposheets (1972) and District Census Handbook, Birbhum, 1971 & 2001 and complied by the researcher

### Table 3.9: Slope category and forest in SWBD

<table>
<thead>
<tr>
<th>Slope category</th>
<th>Area (sq.km.)</th>
<th>Forest area (sq.km.)</th>
<th>% of forest to individual slope unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gentle</td>
<td>812.29</td>
<td>50.72</td>
<td>6.24</td>
</tr>
<tr>
<td>Moderately gentle</td>
<td>37.05</td>
<td>2.76</td>
<td>7.45</td>
</tr>
<tr>
<td>Moderately steep</td>
<td>2.52</td>
<td>0.12</td>
<td>4.76</td>
</tr>
</tbody>
</table>

Source: Raw data obtained from SOI Toposheets (1972) and complied by the researcher
3.2.5 Relation among Population Growth, Extension of Cultivated Area and Forest Area

There is a negative correlation between change of forest area and population growth in the study area. The correlation coefficient is -0.96. However, there is not any direct relationship between change of forest area and change of cultivated land in the study area. The correlation coefficient is 0.42 (Table 3.10). Therefore, it can be concluded that increasing population pressure is responsible for shrinkage of forest area in the study area. But forest loss in the study area has not been occurred at the cost of cultivated land.

Table 3.10: Relation among population growth, extension of cultivated area and forest area

<table>
<thead>
<tr>
<th>Years</th>
<th>Population (X)</th>
<th>Forest (sq.km.) (Y)</th>
<th>Cultivated area (sq.km.) (X₁)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>239356</td>
<td>67.39</td>
<td>573.74</td>
</tr>
<tr>
<td>1981</td>
<td>268580</td>
<td>62.62</td>
<td>554.51</td>
</tr>
<tr>
<td>1991</td>
<td>318008</td>
<td>62.25</td>
<td>563.89</td>
</tr>
<tr>
<td>2001</td>
<td>362903</td>
<td>54.76</td>
<td>563.25</td>
</tr>
</tbody>
</table>

∑X=1203486, mean(X)=300871.5, SD(X)=52397.51, ∑Y=247.02, mean(Y)=61.76, SD(Y)=5.22, ∑XY=73534017.22, n=4, r=-0.96
∑X₁=2255.39, mean(∑X₁)=563.85, SD(∑X₁)=7.86, ∑Y=247.02, mean(Y)=61.76, SD(Y)=5.22
∑X₁Y=139333.48, n=4, r=0.42


3.2.6 Forest and Landuse

Forests have both direct and indirect impact upon the landuse of the study area.

i) The land capability for agricultural landuse in the northern and western parts of the study area is very low. The villagers of mouzas like Dhaka, Asna, Ramnagar etc. of Rajnagar block and Palasbuni, Bataspur, Kese of Khoyrasole block are depended on surrounding forest resources. The villagers collect firewood for fuel and timber for making agricultural implements.

ii) During intense heat of the summer, the grasses on the bare land are practically burnt out. The villagers use forest as grazing land to graze their cattle.

iii) The deforested bare uplands have become severely affected by gully erosion. The top soils of the region are washed away and the
soils become highly acidic. Thus, considerable portion of this bare land has become cultivable waste land.

iv) One of the most important ecological constraints of agriculture is soil nutrient. Only 5-10% of plant’s dry weight consists of minerals derived from the soil. However, these are crucial for plant’s healthy growth. Excessive soil erosion caused due to deforestation, mainly in the northern and western parts of the study area, has resulted in huge amount of loss of soil nutrients. This phenomenon has caused lowering of agricultural production in this part of the study area.

v) In 1998-1999 the construction of Brakeshwar Dam and Thermal Power Plant, in the middle portion of the study area (Dubrajpur block) has caused destruction and submergence of vast tract of forest coverage. About four *mouzas* of Dubrajpur block have been inundated by this project. It has caused severe social impact in the study area by displacing a large number of inhabitants resulting in various types of social disorder.