Appendix A

Photo Plates

Preparing Land

Traditional method of weeding

Spraying pesticides on vegetables

Bankua for carrying harvested paddy from field

Traditional Land Preparation

Flour mill
Use of Pump set for Irrigation

Switch gate for Irrigation

Boro Paddy field

Dhan after threshing

Harvesting Boro Paddy

Jute crop in young stage
Brinjal field

Stem Amarnath in the field

Malabar Spinach in the field

Elephant ear yam in the field

Bitter gourd in the field

Pointed gourd in the field
## Appendix B

**List of Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBD</td>
<td>Central Business District</td>
</tr>
<tr>
<td>CD</td>
<td>Community Developmental</td>
</tr>
<tr>
<td>SOI</td>
<td>Survey of India</td>
</tr>
<tr>
<td>G.P.</td>
<td>Gram Panchayat</td>
</tr>
<tr>
<td>HYVs</td>
<td>High Yielding Variety Seeds</td>
</tr>
<tr>
<td>Ha</td>
<td>Hectare</td>
</tr>
<tr>
<td>GCA</td>
<td>Gross Cropped Area</td>
</tr>
<tr>
<td>GIA</td>
<td>Gross Irrigated Area</td>
</tr>
<tr>
<td>NCA</td>
<td>Net Cropped Area</td>
</tr>
<tr>
<td>NSA</td>
<td>Net Sown Area</td>
</tr>
<tr>
<td>RLI</td>
<td>River Lift Irrigation</td>
</tr>
<tr>
<td>DTW</td>
<td>Deep Tube Well</td>
</tr>
<tr>
<td>STW</td>
<td>Shallow Tube Well</td>
</tr>
<tr>
<td>ODW</td>
<td>Open Dug Well</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>USGS</td>
<td>U. S. Geological Survey</td>
</tr>
<tr>
<td>DIP</td>
<td>Digital Image Processing</td>
</tr>
<tr>
<td>ETM+</td>
<td>Enhanced Thematic Mapper Plus</td>
</tr>
<tr>
<td>EARDAS</td>
<td>Earth Resources Data Analysis System</td>
</tr>
</tbody>
</table>
# Appendix C

## Glossary of the terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bankua</strong></td>
<td>Carrier for agricultural commodities on shoulder</td>
</tr>
<tr>
<td><strong>Danga</strong></td>
<td>High land</td>
</tr>
<tr>
<td><strong>Dhan</strong></td>
<td>Paddy</td>
</tr>
<tr>
<td><strong>Gom</strong></td>
<td>Wheat</td>
</tr>
<tr>
<td><strong>Haal</strong></td>
<td>Wooden plough</td>
</tr>
<tr>
<td><strong>Kharif</strong></td>
<td>Crops grown during the rainy season</td>
</tr>
<tr>
<td><strong>Masur</strong></td>
<td>Lentil</td>
</tr>
<tr>
<td><strong>Mug</strong></td>
<td>Greengram</td>
</tr>
<tr>
<td><strong>Pykars</strong></td>
<td>Local mahajans</td>
</tr>
<tr>
<td><strong>Rabi</strong></td>
<td>Crops grown in winter</td>
</tr>
<tr>
<td><strong>Terai</strong></td>
<td>Foothill zones</td>
</tr>
<tr>
<td><strong>Jola</strong></td>
<td>Low land</td>
</tr>
</tbody>
</table>
Appendix D

List of Publications


Appendix E
Copy of Publications
CHANGING AGRICULTURAL LAND USE PATTERN OF SILIGURI SUBDIVISION, DARJILING DISTRICT: A GEOGRAPHICAL ANALYSIS

Chandana Singha* and Dr. Ranjan Roy**

Abstract

The present paper attempts to study the changes in agricultural land use pattern at subdivision as well as block level. The term “Agricultural Land use” denotes the extent of the gross cropped area during the agricultural year under various crops. It is the result of the decision made by the farmers regarding the choice of crops and methods for production. For the purpose of this study researcher has analyzed the area under cultivation for each of the 14 crops individually at the block level for the period of 1990-91 to 2010-11. To make a comment in the cropping pattern of the subdivision and its blocks researcher has considered the area under cultivation for each crop at block level for the period 1990-91 to 2010-11(20 years). We find that, area under cultivation of cereals, cash crops and other crops including vegetables and sugarcane is on the rise, but drop in area of pulses and oilseeds are seen in the study area.

Keywords: Agricultural Land use; Gross Cropped area, Cropping Pattern

Introduction

Agricultural land use is the result of inter-action between man and environment. The variety of cropping pattern is the result of physical economic and social factors. Thus cropping pattern gives an indication of the relative importance a region gives to any particular crop. It is important to analyze cropping pattern as farmers in each agro-climatic region try to follow the cropping pattern to match geographical condition and also invite new technology to introduce a new pattern, to maximize farm income. For the purpose of this paper researcher has analyzed the area under cultivation for each of the 14 crops individually at the block level for the period of 1990-91 to 2010-11. To make a comment in the cropping pattern of the subdivision and its blocks researcher has considered the area under cultivation for each crop at block level for the period 1990-91 to 2010-11(20 years).

*Research Scholar, Department Of Geography and Applied Geography, University of North Bengal, Raja Rammohanpur, Darjiling District, West Bengal

**Professor, Department Of Geography and Applied Geography, University of North Bengal, Raja Rammohanpur, Darjiling, West Bengal
Cropping pattern change is a great concern to the agricultural geographers for its significant contribution to agricultural output. Different crops of the district have to experience a normal shift and the causes are being of:

- Irrigation facilities
- Increase in returns of any particular crop
- Change of preference
- Technological feasibility
- Use of HYVs, chemical fertilizers and pesticides.

Study area

The study area, Siliguri subdivision, is located in Darjiling district of West Bengal. It is the northern most districts West Bengal. The study area lies between 26° 27' N to 26° 57'N of latitude and 88° 07' E and 88° 31' E of longitude. The subdivision contains of Siliguri Municipal Corporation and four community developmental blocks: Matigara, Naxalbari, Phansidewa and Kharibari. The four blocks contain twenty two Gram Panchayats and two census towns: Bairatisal and Uttar Bagdogra. The study area excludes the Siliguri Municipal Corporation being predominantly urban area. The subdivision is bounded in the eastern side by Jalpaiguri district, in the northern side by Kurseong and Mirik Police stations of Darjeeling district, in the southern side by Chopra block of Uttar Dinajpur district and partly by Bangladesh and western side by Nepal.

Objectives

- To study the changes in agricultural land use pattern at subdivision as well as block level from 1990-91 to 2010-11.
- To identify the reasons for the changes in the agricultural land use pattern.

Methodology

To determine the pattern of shift at block level the area under cultivation for each crop is considered. The analysis made at the crop group level viz., cereals (Aus, Aman, Boro and Wheat), Pulses (Masur, Maskalai, Khesari), Oil seeds (Mustard, Linseed, Til), Cash Crops (Potato, Jute, Maize) and other crops (Vegetables, Sugarcane) as breaking these crop groups to individual crops makes the analysis complex and inappropriate to draw conclusions. This analysis makes a comparative study between Period I (1990-91) and Period II (2010-11). By applying the area under crops of Period I as base (=100), the area under crops of Period II is calculated.
Source: Siliguri Mahakuma Parishad, 2004
Results and Findings
For all crop groups as the index for Period I is equated to 100, so the index value for Period II gives an indication whether the average area in absolute terms have increased or decreased at the block level.

Figure show the changing cropping pattern using radar diagram for the Siliguri subdivision as a whole and each block individually, wherein the axes of the radar diagram represents the cereals, pulses, oil seeds, cash crops and others. The “blue” shade represents the base period while the “maroon red” shade indicates the index for Period II.

Table No. 1. Changes in Cropping Pattern of Siliguri Subdivision (Area in Ha)

<table>
<thead>
<tr>
<th>Crops</th>
<th>1990-91</th>
<th>2000-01</th>
<th>2010-11</th>
<th>% Change in 1990-2001</th>
<th>% Change in 2001-2011</th>
<th>% Change in 1990-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cereals</td>
<td>27792</td>
<td>25666</td>
<td>28649</td>
<td>-7.65</td>
<td>11.62</td>
<td>3.08</td>
</tr>
<tr>
<td>Total Pulses</td>
<td>150</td>
<td>209</td>
<td>136</td>
<td>39.33</td>
<td>-34.93</td>
<td>-9.33</td>
</tr>
<tr>
<td>Total Oilseeds</td>
<td>914</td>
<td>330</td>
<td>259</td>
<td>-63.89</td>
<td>-21.52</td>
<td>-71.66</td>
</tr>
<tr>
<td>Total cash crops</td>
<td>2450</td>
<td>4870</td>
<td>5192</td>
<td>98.78</td>
<td>6.61</td>
<td>111.92</td>
</tr>
<tr>
<td>Others</td>
<td>251</td>
<td>269</td>
<td>288</td>
<td>7.17</td>
<td>7.06</td>
<td>14.74</td>
</tr>
</tbody>
</table>

Table No. 2. Changes in Cropping Pattern in Siliguri Subdivision for Cereals (Area in Ha)

<table>
<thead>
<tr>
<th>Blocks</th>
<th>1990-91</th>
<th>2000-01</th>
<th>2010-11</th>
<th>% Change in 1990-2001</th>
<th>% Change in 2001-2011</th>
<th>% Change in 1990-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matigara</td>
<td>4544</td>
<td>2920</td>
<td>965</td>
<td>-35.74</td>
<td>-66.95</td>
<td>-78.76</td>
</tr>
<tr>
<td>Naxalbari</td>
<td>7956</td>
<td>5480</td>
<td>4748</td>
<td>-31.12</td>
<td>-13.36</td>
<td>-40.32</td>
</tr>
<tr>
<td>Kharibari</td>
<td>11467</td>
<td>11790</td>
<td>9396</td>
<td>2.82</td>
<td>-20.31</td>
<td>-18.06</td>
</tr>
<tr>
<td>Phansidewa</td>
<td>3825</td>
<td>5476</td>
<td>13540</td>
<td>43.16</td>
<td>147.26</td>
<td>253.99</td>
</tr>
</tbody>
</table>

Table No. 3. Changes in Cropping Pattern in Siliguri Subdivision for Pulses (Area in Ha)

<table>
<thead>
<tr>
<th>Blocks</th>
<th>1990-91</th>
<th>2000-01</th>
<th>2010-11</th>
<th>% Change in 1990-2001</th>
<th>% Change in 2001-2011</th>
<th>% Change in 1990-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matigara</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>-14.29</td>
<td>-83.33</td>
<td>-85.71</td>
</tr>
<tr>
<td>Naxalbari</td>
<td>3</td>
<td>5</td>
<td>14</td>
<td>66.67</td>
<td>180.00</td>
<td>366.67</td>
</tr>
<tr>
<td>Kharibari</td>
<td>10</td>
<td>90</td>
<td>59</td>
<td>800.00</td>
<td>-34.44</td>
<td>490.00</td>
</tr>
<tr>
<td>Phansidewa</td>
<td>10</td>
<td>70</td>
<td>62</td>
<td>600.00</td>
<td>-11.43</td>
<td>520.00</td>
</tr>
</tbody>
</table>
Table No. 4. Changes in Cropping Pattern in Siliguri Subdivision for Oilseeds (Area in Ha)

<table>
<thead>
<tr>
<th>Blocks</th>
<th>1990-91</th>
<th>2000-01</th>
<th>2010-11</th>
<th>% Change in 1990-2001</th>
<th>% Change in 2001-2011</th>
<th>% Change in 1990-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matigara</td>
<td>90</td>
<td>10</td>
<td>7</td>
<td>-88.89</td>
<td>-30.00</td>
<td>-92.22</td>
</tr>
<tr>
<td>Naxalbari</td>
<td>72</td>
<td>40</td>
<td>39</td>
<td>-44.44</td>
<td>-2.50</td>
<td>-45.83</td>
</tr>
<tr>
<td>Kharibari</td>
<td>40</td>
<td>150</td>
<td>86</td>
<td>275.00</td>
<td>-42.67</td>
<td>115.00</td>
</tr>
<tr>
<td>Phansidewa</td>
<td>712</td>
<td>130</td>
<td>127</td>
<td>-81.74</td>
<td>-2.31</td>
<td>-82.16</td>
</tr>
</tbody>
</table>

Table No. 5. Changes in Cropping Pattern in Siliguri Subdivision for Cash Crops (Area in Ha)

<table>
<thead>
<tr>
<th>Blocks</th>
<th>1990-91</th>
<th>2000-01</th>
<th>2010-11</th>
<th>% Change in 1990-2001</th>
<th>% Change in 2001-2011</th>
<th>% Change in 1990-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matigara</td>
<td>615</td>
<td>240</td>
<td>94</td>
<td>-60.98</td>
<td>-60.83</td>
<td>-84.72</td>
</tr>
<tr>
<td>Naxalbari</td>
<td>175</td>
<td>260</td>
<td>718</td>
<td>48.57</td>
<td>176.15</td>
<td>310.00</td>
</tr>
<tr>
<td>Kharibari</td>
<td>594</td>
<td>1770</td>
<td>2264</td>
<td>197.98</td>
<td>27.91</td>
<td>281.14</td>
</tr>
<tr>
<td>Phansidewa</td>
<td>1066</td>
<td>2600</td>
<td>2116</td>
<td>143.90</td>
<td>-18.62</td>
<td>98.50</td>
</tr>
</tbody>
</table>
Table No. 6. Changes in Cropping Pattern in Siliguri Subdivision for Others (Area in Ha)

<table>
<thead>
<tr>
<th>Blocks</th>
<th>1990-91</th>
<th>2000-01</th>
<th>2010-11</th>
<th>% Change in 1990-2001</th>
<th>% Change in 2001-2011</th>
<th>% Change in 1990-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matigara</td>
<td>61</td>
<td>56</td>
<td>42</td>
<td>-8.20</td>
<td>-25.00</td>
<td>-31.15</td>
</tr>
<tr>
<td>Naxalbari</td>
<td>49</td>
<td>53</td>
<td>61</td>
<td>8.16</td>
<td>15.09</td>
<td>24.49</td>
</tr>
<tr>
<td>Kharibari</td>
<td>50</td>
<td>64</td>
<td>73</td>
<td>28.00</td>
<td>14.06</td>
<td>46.00</td>
</tr>
<tr>
<td>Phansidewa</td>
<td>91</td>
<td>96</td>
<td>112</td>
<td>5.49</td>
<td>16.67</td>
<td>23.08</td>
</tr>
</tbody>
</table>

For the subdivision as a whole it is observed that area under cereals have slightly increased in Period II (3.08% of Period I). Similarly increase of 111.92 % and 14.74 %, for cash crops and others crops respectively, is noticed. For pulses and oilseeds the areas under cultivation in Period II have decreased to 9.33% and 71.66% of Period I respectively. Hence, it may be said that the nature of crops of the subdivision has shifted towards the cash crops and other crops.

We now analyse the changing cropping pattern at the block level. Following figure 1 provide the nature of changing agricultural land use pattern at the block level:

From the above figure it is clear that Matigara block shows the decreasing trend for all crop groups during the study period. For cereals, pulses, oilseeds, cash crops and other crops the area under cultivation has declined to 78.76%, 85.71%, 92.22%, 84.72% and 31.15% respectively. This is because conversion of agricultural land into constructional purpose as it is adjacent to the CBD of Siliguri Town. On the other way it can be said that the cause behind this is the urbanization of this block.

The agricultural land use pattern of Naxalbari block experience the moderate increase in pulses (366.67%), cash crops (310.00%) and low increase in other crops (24.49%). On the other hand this block shows the low declining trend in cereals (40.32%) and oilseeds (45.83%).

In Kharibari agricultural land use pattern changes negatively in respect of only cereals (18.06%) and rising trend is observed for pulses (490.00%), oilseeds (115.00%), cash crops (281.00) and others (46.00%).

Phansidewa block shows increase in the amount of area under cultivation in case of cereals (253.99%), pulses (520.00%), cash crops (98.50%) and others (23.08%). Only for oilseeds it is declined to 82.16%. Thus we find that area under oilseeds has been significantly hit. And the increase of four crop groups is mainly due to effective use of multiple cropping.
We have analyzed the changing agricultural land use pattern for Period II and tried to group the blocks based on the commonality of change. For this, ranks have been applied ranging 1 to 5. For the purpose of ranking, the indices for each block vs crop is categorized in a scale of 1 to 5. The scale has been assigned as follows:

![Figure 1: Block-wise changing agricultural land use pattern](image-url)
### Table No. Scale used for Index Range

<table>
<thead>
<tr>
<th>INDEX RANGE</th>
<th>SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;100</td>
<td>1</td>
</tr>
<tr>
<td>100-200</td>
<td>2</td>
</tr>
<tr>
<td>200-300</td>
<td>3</td>
</tr>
<tr>
<td>300-400</td>
<td>4</td>
</tr>
<tr>
<td>&gt;400</td>
<td>5</td>
</tr>
</tbody>
</table>

### Table No. Block-wise Index of area under crop groups for 1990-91 to 2010-11

<table>
<thead>
<tr>
<th>Blocks</th>
<th>Cereals</th>
<th>Pulses</th>
<th>Oilseeds</th>
<th>Cash crops</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Index</td>
<td>Scale</td>
<td>Index</td>
<td>Scale</td>
<td>Index</td>
</tr>
<tr>
<td>Matigara</td>
<td>78.76</td>
<td>1</td>
<td>85.71</td>
<td>1</td>
<td>92.22</td>
</tr>
<tr>
<td></td>
<td>Naxalbari</td>
<td>40.32</td>
<td>1</td>
<td>366.67</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Kharibari</td>
<td>18.06</td>
<td>1</td>
<td>490.00</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Phansidewa</td>
<td>253.99</td>
<td>3</td>
<td>520.00</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>3.08</td>
<td>1</td>
<td>9.33</td>
<td>1</td>
<td>71.66</td>
</tr>
</tbody>
</table>

If we consider the blocks as well as district, the changing cropping pattern of cereals scaled 1 and 3, Matigara, Naxalbari, Kharibari and the subdivision as a whole ranked 1 and only Phansidewa block ranked 3. For pulses it is observed that one block, Matigara and the subdivision as a whole ranked 1; Naxalbari ranked 4 and two blocks, namely Phansidewa and Kharibari ranked 5. In case of oilseeds, Matigara, Naxalbari, Phansidewa and subdivision total ranked 1 and only Kharibari ranked 2. For cash crops Matigara and Phansidewa ranked 1; subdivision as a whole ranked 2; Kharibari ranked 3 and Naxalbari ranked 5 for the other crops, all the blocks as well as the subdivision fall under rank 1.

**Conclusion**

Thus to conclude this section we find that, area under cultivation of cereals, cash crops and other crops including vegetables and sugarcane is on the rise. But the drop in area of pulses and oilseeds needs to be considered the policy makers seriously as this goes against the theory that with modernization in agriculture, multiple cropping is more prevalent resulting in general rises of net area under cereals to produce more varied crops. Thus we may deduce that the farmers are very much interested to cultivate cash crops and other crops.
References


A SPATIO-TEMPORAL ANALYSIS OF CROP RANKING REGIONS IN SILIGURI SUBDIVISION, DARJILING DISTRICT, WEST BENGAL

Chandana Singha¹ & Dr. Ranjan Roy²

¹Research Scholar, Department Of Geography and Applied Geography, University of North Bengal, Raja Rammohanpur, Darjiling District, West Bengal.
²Professor, Department Of Geography and Applied Geography, University of North Bengal, Raja Rammohanpur, Darjiling, West Bengal.

Received: May 19, 2018 Accepted: July 12, 2018

ABSTRACT The present paper attempts to study the changes in crop ranking region in Siliguri subdivision of Darjiling district. Crop ranking helps for understanding the geographical character of the area. This has been examined by ranking the principal crops of the region according to the relative significance of each crop. Ranking of crops indicates the nature of economy i.e. whether the farmers of a particular areal unit are intensive subsistent farmers, commercial, market oriented or partly intensive subsistence and partly commercial. The ranking of crops of the district have been studied for the two periods: (i) the period I (1990-91) and the period II (2010-11). The time series analysis has been attempted for identifying the relative significance of individual crop in cropping pattern for eight principal crops. The first fifth ranking crops in Period-I and sixth ranking crops in Period-II have been identified.

Keywords: Crop ranking, Relative strength, Rank frequency

Introduction
Crop ranking is the most elementary method for studying crop associations but it helps one to understand the overall spatial pattern of crop distribution. The relative strength of individual crop could be assessed from the actual share of total harvested land that a crop occupies. Ranking of crops have been carried out by ranking the principle crops of the region according to the relative significance of each crop. The ranking of each crop immediately provides the best measure of the areal significance of individual crops. The ranking obtained for eight crops in the subdivision to identify the relative significance of individual crop in cropping pattern. The first fifth ranking crops in Period-I and sixth ranking crops in Period-II have been identified.

Study area
The study area, Siliguri subdivision, is located in Darjiling district of West Bengal. It is the northern most districts West Bengal. The study area lies between 26°27’N to 26°57’N of latitude and 88°07’E and 88°31’E of longitude. The subdivision contains of Siliguri Municipal Corporation and four community developmental blocks: Matigara, Naxalbari, Phansidewa and Kharibari. The four blocks contain twenty two Gram Panchayats and two census towns: Bairatisal and Uttar Bagdogra. The study area excludes the Siliguri Municipal Corporation being predominantly urban area. The subdivision is bounded in the eastern side by Jalpaiguri district, in the northern side by Kurseong and Mirik Police stations of Darjeeling district, in the southern side by Chopra block of Uttar Dinajpur district and partly by Bangladesh and western side by Nepal.

Objectives
I. To present areal strength of the crops grown in the study area by ranking.
II. To analyze the spatio-temporal changes in crop ranking during the period 1990-91 to 2010-11.

Methodology
Ranking of crops for the study area have been studied for two time periods: Period I (1990-91) and Period – II (2010-11). The secondary data have been collected for two time periods from the Agricultural offices of each block and it is supplemented by various spot-inquiries. The ranking regions of different crops have been calculated by considering the relative strength of percentage share to GCA of the gram panchayat for each crop. The crop areas have been arranged into descending order of magnitude and termed first, second, third, fourth and fifth ranks. Table.2 display gram panchayats and ranking of crops in the study area. The rank grouping may be useful to identify the major crop or crops in the study area.
Results

**Period – I: (1990-91)**

**First Ranking**

Only one crop has been identified occupying first rank namely Paddy in all the gram panchayat. Paddy is found to have largest coverage in the study area in period-I. Paddy being the dominant crop in the area occupied 32520 hectares area (100% to GCA).

**Table No.1 Gram Panchayat-wise area (hectare) under principle crops (1990-91)**

<table>
<thead>
<tr>
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<th>GRAM PANCHAYATS</th>
<th>PADDY</th>
<th>WHEAT</th>
<th>PULSES</th>
<th>OIL SEEDS</th>
<th>POTATO</th>
<th>JUTE</th>
<th>MAIZE</th>
<th>OTHER CROPS</th>
<th>TOTAL</th>
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<td>77</td>
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<td>-</td>
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<td>-</td>
<td>963</td>
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<tr>
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<td>3</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
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<td>-</td>
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<td>24</td>
<td>7</td>
<td>-</td>
<td>4</td>
<td>1033</td>
</tr>
</tbody>
</table>

Source: Siliguri Municipal Corporation, 2004
Second Ranking
Two crops, i.e. Wheat and Jute ranked second in 1990-91. Wheat was more dominant than Jute and it was found in sixteen GPs. It covered 26274 hectares area (80.79% to GCA). In 1990-91 Jute was another second ranking crop which was found in six GPs covering 6246 hectares (19.21% to GCP) in the subdivision.

Third Ranking
The third ranking crops of the study area in Period-I were Jute, Potato and Wheat. Jute occupied dominant position covering 14479 hectares (44.52% to GCA) in nine GP. Potato held third rank in the subdivision and observed in seven GPs covering 11795 hectares (36.27% to GCA). Wheat, another third ranking crop, occupying 6246 hectares (19.21% to GCA) was found in six GPs of the area.

Table No.2 Crops Rank Frequency for Period-I: (1990-91)

<table>
<thead>
<tr>
<th>SL NO</th>
<th>CROPS</th>
<th>CROP RANKS AND NUMBER OF GRAM PANCHAYATS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I</td>
</tr>
<tr>
<td>1</td>
<td>PADDY</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>WHEAT</td>
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</tr>
<tr>
<td>3</td>
<td>POTATO</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>JUTE</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>OTHER CROPS</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
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<td>22</td>
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</tbody>
</table>

(Compiled by the Researcher)

Fourth Ranking
Three crops have been identified as fourth ranking crops during the Period-I (1990-91) namely Potato, Jute and Other crops. Among them Potato occupied largest areal coverage having 20725 hectares (63.73% to GCA) comprising fifteen GPs. Jute occupying 7550 hectares (23.22% to GCA) area found in four GPs. Other crops including vegetables, sugarcane, etc. were found in three GPs covering 4245 hectares (13.05% to GCA) area of the study region.

Table No.3 Ranking of crops, area coverage and distribution in Siliguri Subdivision Period-I: (1990-91)

<table>
<thead>
<tr>
<th>CROPS</th>
<th>NO. OF GRAM PANCHAYATS</th>
<th>GRAM PANCHAYATS IN %</th>
<th>AREA IN HECTARE</th>
<th>AREA IN %</th>
</tr>
</thead>
<tbody>
<tr>
<td>PADDY</td>
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<td>100</td>
<td>32520</td>
<td>100</td>
</tr>
<tr>
<td>WHEAT</td>
<td>16</td>
<td>72.73</td>
<td>26274</td>
<td>80.79</td>
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</table>
Fifth Ranking

Other crops and Jute ranked fifth during 1990-91 and observed in nineteen and three GPs respectively. Other crops including vegetables, sugarcane, etc. were cultivated in GPs covering 28275 hectares (86.95% to GCA). Jute cultivation observed in GPs covering 4245 hectares (13.05% to GCA) area of the study region.

Period – II: (2010-11)

First Ranking

During 20 years of study there is no change in first ranking crop. In Period-II (2010-11), same as the earlier period, Paddy has ranked first and spreads throughout all 22 GPs of the subdivision covering 100% areal strength of the GCA.

Table No.4 Gram Panchayat-wise area (hectare) under principle crops (2010-11)

<table>
<thead>
<tr>
<th>SL NO.</th>
<th>GRAM PANCHAYATS</th>
<th>PADDY</th>
<th>WHEAT</th>
<th>PULSES</th>
<th>OILSEEDS</th>
<th>POTATO</th>
<th>JUTE</th>
<th>MAIZE</th>
<th>OTHER CROPS</th>
<th>TOTAL</th>
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<td>2</td>
<td>8</td>
<td>198</td>
</tr>
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<td>3</td>
<td>MATIGAR- II</td>
<td>188</td>
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<td>-</td>
<td>-</td>
<td>12</td>
<td>9</td>
<td>2</td>
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<td>94</td>
<td>229</td>
<td>491</td>
<td>99</td>
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<td>2270</td>
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<td>99</td>
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<td>6</td>
<td>1807</td>
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</tbody>
</table>

Source: Agricultural Block Office of Matigara-Naxalbari and Kharibari-Phansidewa Block
Second Ranking

There were two crops, which ranked second in Period-1, namely Wheat and Jute while this number increased into four crops in Period-II including Jute, Potato, Wheat and Other crops. The relative significance of Jute increased from six GPs to fourteen GPs covering 28230.7 hectares (81.81% to GCA) area of the subdivision. Potato is the second dominant crop and was found in four GPs occupying 3234.6 hectares (9.37% to GCA). The areal coverage of Wheat declined from sixteen GPs in Period-I to only two GPs covering 2248.4 hectares area (6.53% to GCA) in Period-II. Hence the dominance of Wheat replaced by the other three crops in Period-II. Another second ranking crop namely Other crops including vegetables, sugarcane, etc. cultivated in two GPs only which occupied hectares 441 (1.29% to GCA) area of the subdivision.

Table No.5 Crops Rank Frequency for Period-II: (2010-11)

<table>
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<tr>
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<th>CROP RANKS AND NUMBER OF GRAM PANCHAYATS</th>
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<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
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<td>-</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>1</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>POTATO</td>
<td>-</td>
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<td>10</td>
<td>7</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>JUTE</td>
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<td>14</td>
<td>4</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
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<td>MAIZE</td>
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<td>3</td>
<td>1</td>
</tr>
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<td>1</td>
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<td>13</td>
<td>13</td>
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<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>

(Compiled by the Researcher)

Third Ranking

Four crops have been identified as third ranking crops during Period-II which consists of Wheat, Potato, Jute and Other crops. Wheat is the dominant crop among the third ranking crops which covers 15710 hectares (45.52% to GCA) comprising six GPs. The second important crop in third ranking is Potato which cultivated in ten GPs occupying 14993 hectares (43.45% to GCA). Jute comes to next in third ranking covering 3369 hectares (9.76% to GCA) area including four GPs in the study area. Other crops have been identified as fourth ranking in third ranking crop consists of two GPs which occupy 436.7 hectares area (1.27% to GCA) in the subdivision.

Fourth Ranking

There were three crops, which ranked fourth in Period-I, namely Potato, Other crops and Jute while this number increased into five crops in Period-II including Potato, Wheat, Jute, Maize and Other crops. The crop distributional pattern in this ranking has been found fragmented and diversified throughout the subdivision. Among these Potato is the principal crops and found in seven GPs covering 15485.7 hectares (44.87% to GCA). Wheat is cultivated in seven GPs which covers 14103.8 hectare area (40.87% to GCA) of the subdivision. Jute is cultivated in four GPs covering 2909 hectares (8.43% to GCA) while Maize is cultivated in three GPs covering 1794.2 hectares (5.20% to GCA) in the study area. Other crop is the least significant crop in fourth ranking found only in one GPs covering 216 hectares (0.63% to GCA).

Table No.6 Ranking of crops, area coverage and distribution in Siliguri Subdivision Period-II: (2010-11)

<table>
<thead>
<tr>
<th>CROPS</th>
<th>NO. OF GRAM PANCHAYATS</th>
<th>GRAM PANCHAYATS IN %</th>
<th>AREA IN HECTARE</th>
<th>AREA IN %</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST RANKING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paddy</td>
<td>22</td>
<td>100</td>
<td>34508.7</td>
<td>100</td>
</tr>
<tr>
<td>SECOND RANKING</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>2</td>
<td>9.09</td>
<td>2248.4</td>
<td>6.53</td>
</tr>
<tr>
<td>Potato</td>
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<td>18.18</td>
<td>3234.6</td>
<td>9.37</td>
</tr>
<tr>
<td>Jute</td>
<td>14</td>
<td>63.64</td>
<td>28230.7</td>
<td>81.81</td>
</tr>
<tr>
<td>Other crops</td>
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<td>441</td>
<td>1.29</td>
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<td>THIRD RANKING</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>6</td>
<td>27.27</td>
<td>15710</td>
<td>45.52</td>
</tr>
</tbody>
</table>
Fifth Ranking
Four crops namely Maize, Other crops, Potato and Wheat have been identified as fifth ranking crop during Period-II while there were only two crops in Period-I including Jute and Other crops. Maize holds the largest coverage of 25641.5 hectares (74.30% to GCA) among fifth ranking crops. It is cultivated in sixteen GPs in the subdivision. Next to this come other crops which observed in four GPs occupying 7521.2 hectares (21.80% to GCA). Wheat and Potato having least a real strength is found in one GP of each crop. Wheat and Potato have the coverage of 550.6 hectares (1.60% to GCA) and 795.4 hectares (2.30% to GCA) respectively.

Sixth Ranking
There are three crops in Period-II which emerged as sixth ranking in Siliguri subdivision. The crops are Wheat, Maize and Other crops. Sixth rank crops indicate diversity in number and crop distribution in the area under study. Other crops including vegetables, sugarcane, etc. is the principal crop in sixth ranking covering 25893.8 hectares area (75.03% to GCA) in thirteen GPs. The next one is Maize which covers 7073 hectares (20.50% to GCA) in three GPs. Wheat is the another sixth ranking crop which cultivated in six GPs covering 1541.9 hectares (4.47% to GCA) in the area under study.

Conclusion
To attempt an explanation of agricultural landuse pattern in the region the gram panchayat has been taken unit for study to throw light on crop ranking. The areal strength of individual crop has been discussed by ranking. This falls into five descending order in Period-I and six orders in Period-II. For both the time period Paddy hold the first rank in all twenty two GPs. There is no change in first ranking crop for 20 years in the subdivision. Remaining crops such as Wheat, Potato, Jute, Maize and Other crops have been ranking below Paddy in the descending order. The sixth rank in Period-II indicates diversity in number and crop distribution in the area under study.

Bibliography
1. Crop Forecast Circular For The Agricultural Year 2010-2011, 2011-2012, Evaluating Wing, Director of Agriculture, Govt. of West Bengal, Kolkata.