

# CHAPTER IV

## CHANGING AGRICULTURE PATTERN AND IT'S IMPACT ON LAND USE

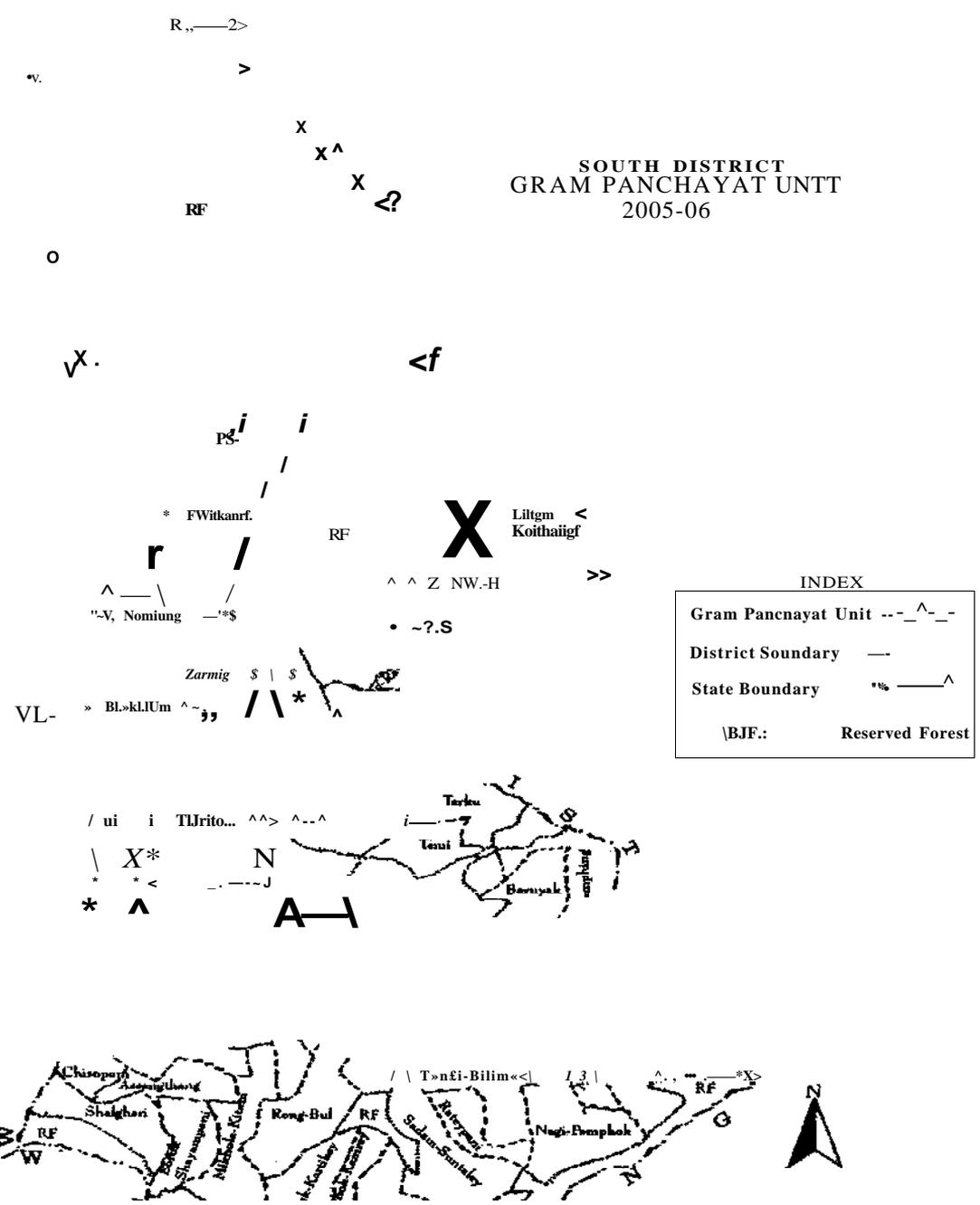
### INTRODUCTION

Agriculture and allied activities constitutes 80% of the occupational structure and 90% me GDP of the South District of Sikkim. This facts leads to study of changes in cropped coverage, cropping pattern, crop rotation, crop efficiency and agricultural development as well as suggestions for future planning for the economic development of the district. But one of the hurdles for studying fo<sup>i</sup> ^tudj'ing the above mention parameters can be done only for Gram Panchayat level as the available of the data is limited for the Gram Panchayat level, and these Gram Panchayat units will be connoted as "GPU" where ever necessary. The changes have been studied for the period of 1990-92 to 2004-05. (fig 4.1)

Agriculture in the South District is practice under the diverse conditioned. The district is characterized by large variation in slope (0 -100%), altitudes (300-3000mt). The soil of entire district is acidic in nature (ph 4.5-6.5, rich in in-humus, organic matter, low in available P, and low to high in available K), the rainfall varies from 200mm to 350mm. The above mention agro- climatic factors by and large affects the management and productivity of the crops either in multiple cropping or under mono-cropping system. More over, the choice of crop is mostly local consumption oriented and system of cultivation is established in low input, capital, yield and technology because still primitive form of agriculture is most dominant in the district. The chemical environment of acidic soil is also not congenial for maximization of yield of crops sensitive to acidic conditions (Mandal 1979).

Out of the total cropped area of the district 43% are under the maize, The remaining area is occupied by Rice, Wheat, Pulse, Oilseed, Ginger, cardamom, Vegetable (Olericulture) and Horticultural crops. Out of this maize crop has uniform distribution of cultivation and the production. Like maize Pulse, Oilseed, Ginger also has uniform cultivation and production. Where as Cardamom and vegetable has concentrated in the northern part of the district.

SOUTH DISTRICT  
GRAM PANCHAYAT UNTT  
2005-06



"IT\*"

Fig4.1

#### 4.1. Cropped Area :(1990-'92)

Table 4.1 Percentage of Cropped Area South District 1990-92

Area in (%)	Category	No of Gram Panchayat Units	Total GPUs %
<80	Very low	21	17.77
80-90	Low	6	6.66
90-100	Medium	7	15.56
100-110	High	3	13.34
> 110	Very high	8	46.67
Total		45	100.00

\* Source: Crop Area Statistics, Department of Agriculture, Govt, of Sikkim. 1990-92

Table 4.1 represents the percentage of cropped area in the South District in 1990-92. Out of the total 45 Gram Panchayats, 18% of the GPUs are in the category of very low (<80%). The low category (80-90%) shares around 7% of the total Gram Panchayat units. Another 15% of the total GPUs are found in medium (90-100%) category. In this category Sripatam-Gagyong has the highest percentage having 98.87% cropped area. The high category (100-110%) has only 13.34% of the total GPUs of the district. In this category Ravong-Sangmo GPU has highest value of 107.38%. Around 47% of the GPUs or 21 numbers falls under the category of very high (>110%) cropped area. Tangi-Bikmat GPU has recorded the highest value having 162.80%. Other GPUs which falls in this category are Assangthang, Tinik-Chisopani, Sadam-Suntaley, Rong-Bul etc. The very low and low category is located in the central, western and north eastern parts of the district and medium and high percentages are concentrated in the south and south -western parts of the district. The very high category is found in the north eastern, eastern and southern parts of the district. The over all characteristics of the crop area in 1990-92 is that, more than half of the GPUs falls in the high and very high category which also indicates maximum utilization of available land resources. The percentage of crop area within the district is varied from Gram Panchayat Unit to Gram Panchayat Unit due to the variation of physiographic and the available of water for the purpose of cultivation. The high percentage of crop area is found in the southern part of the district. Where is the western part have medium utilization

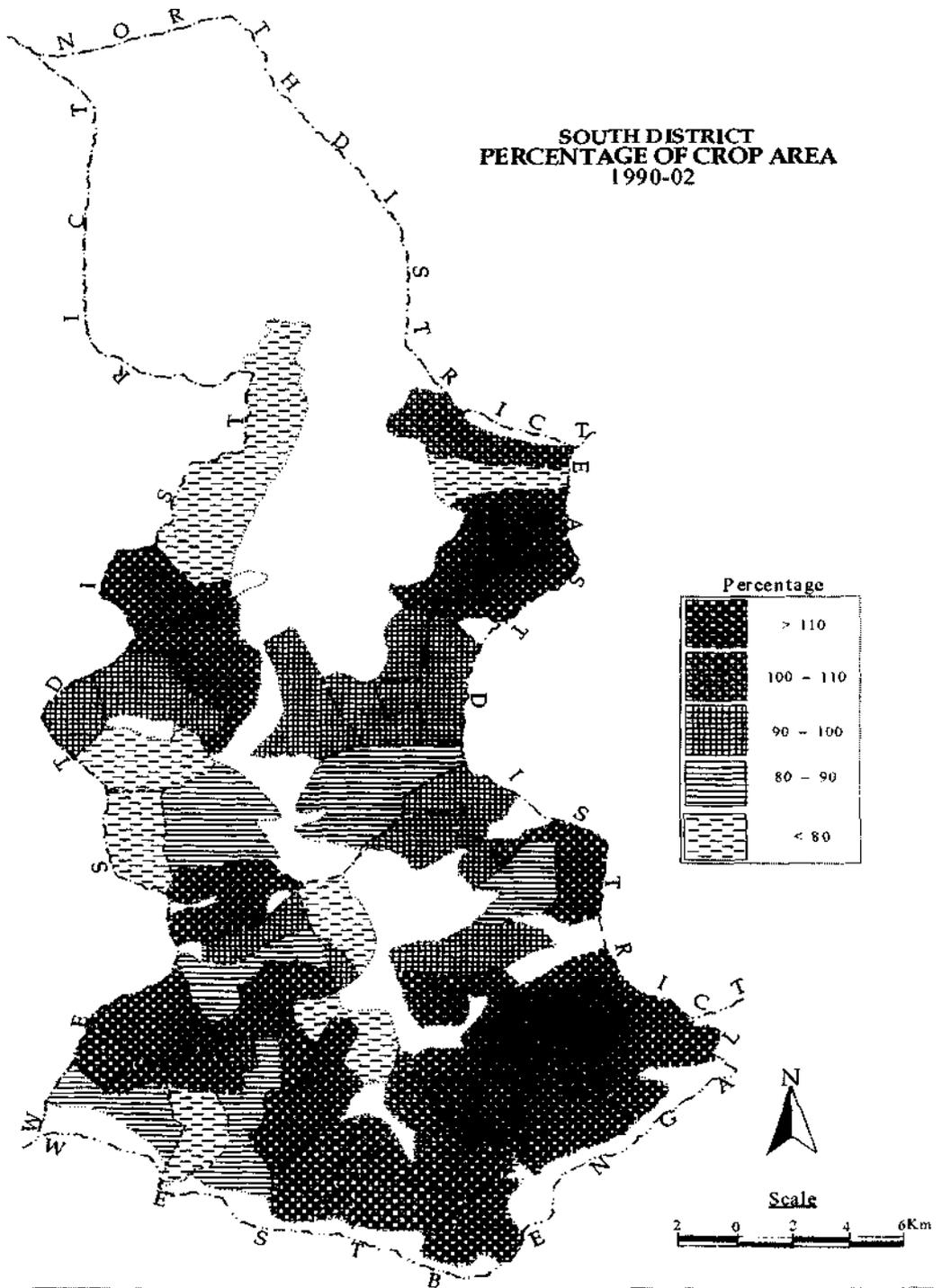


Fig4.2

### 4.1.1 Cropped Area: 2004-'05

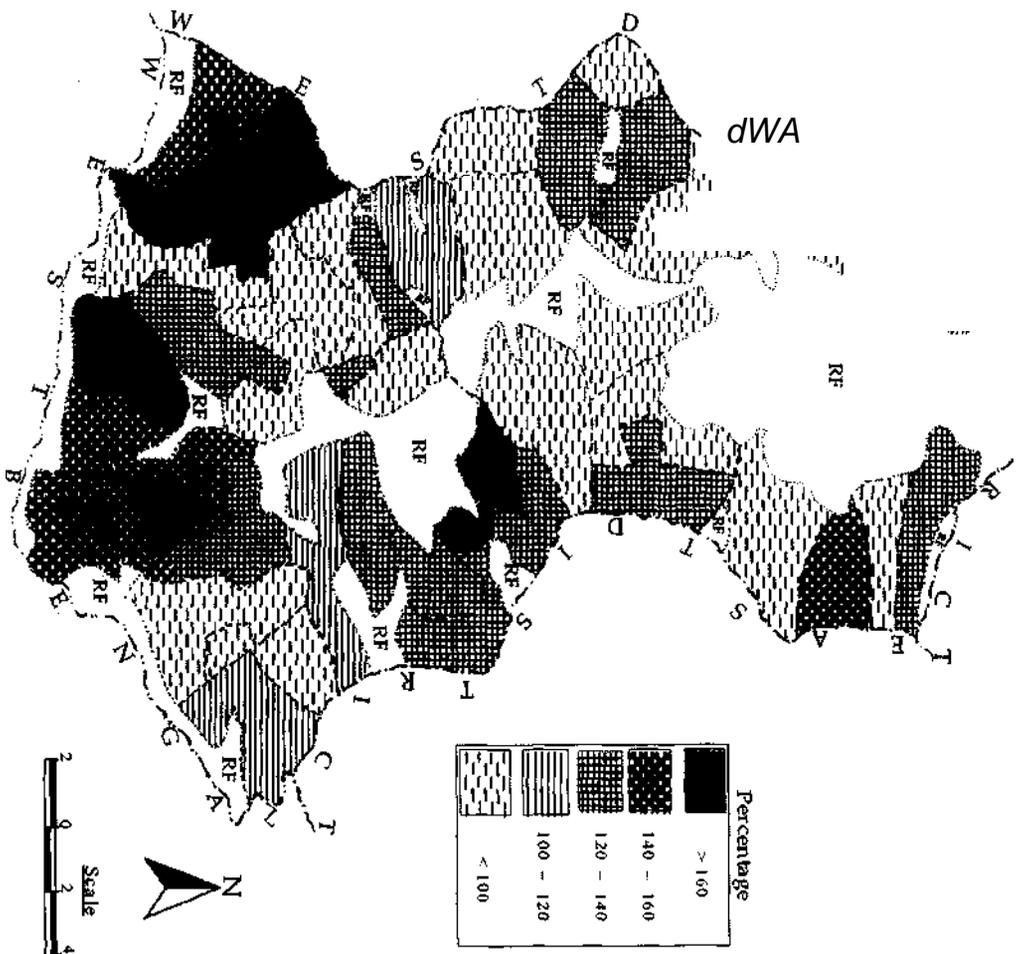
Percentage of cropped area in 2004-05 in South District is represented by the table 4.1b. It has shown another picture from 1990-92. Around 56% of the total GPUS are under the very high (>110%) category of the crop area. Amongst this category Longchuk-Kamrey has the highest value having 199.98% and the lowest is recorded in the Tuning -Mamring GPU. The high category (100-110%) has constituted only 4.44% of the total GPUs, and there are only two GPUs namely Wak-Omchu and Tringrithang. There are eight GPUs which occupied 18% of the total GPU in the medium (90-100%) crop area.

Table 4.2 Percentage of Cropped Area, South District 2004-05

Crop Area in (%)	Category	No of Gram Panchayat units	Total Gram Panchayat units %
<80	Very low	25	55.56
80-90	Low	2	4.44
90-100	Medium	8	17.77
100-110	High	6	13.33
> 110	Very high	4	89.89
Total		45	100.00

\* Source: Crop Area Statistics, Department of Agriculture, Govt, of Sikkim.2004-05

Most of these Gram Panchayat units are located in the western parts of the district, another six Gram Panchayat units or 13.333% of the total Gram Panchayat units have the percentage of crop area under the category of low (80-90%) and 9% in the very low category (<80%). The (fig4.2) represents the crop area in 2004-'05, and reveals that very high category are mostly concentrated in the north-eastern and south-western parts of the district and high category are found in the western parts of the district and the medium category are also found near the peripheral areas of the high category. The general picture of crop area in 2004 - 05 is that north-western and central part of the district has low intensity of utilization due to the unsuitable physiographic condition with high slope. And eastern and southern part as high intensity of utilization due to the favourable condition prevails. Here the productivity of rice, ginger and vegetables are the main product. As the local market demands of these three crops are increasing. Traditionally important crop i.e. maize importance is decreasing gradually. Another important factor is the suitability of oilseed cultivation and pulse in the district which leads farmers to changes from the traditional practice of cultivation leads to the crop area changes



#### 4.1.1a Changes of Crop Area: (1990-'92 to 2004-'05)

The comparison of crop area in the South District in 1990-92 and 2004'05 shows different picture (fig 4.3) Some of the GPUs which have recorded high in 1990-'92 becomes low in 2004-'05, and vice versa. This change from one category in one year to another category in another year indicates the reasons and real factors of land utilization in the South district. One of the important factors for these changes is the encroachment of the forest land, diversion of good cultivated land to settlement area and infrastructural development like construction of roads, buildings, office, and hospital etc. Besides, with an increase in population, expansions of settlement to the cultivated land leads to the decrease in cultivated land areas

Table 4.3 Changes of Cropped Area, South District 1990-92 to 2004-05.

Changes in %	Positive Changes	Total GPUs (%)	Negative Change s	Total GPUs (%)
<15	12	26.67	7	15.55
15-30	3	6.67	3	6.67
30-45	7	15.56	2	4.44
45-60	3	6.67	2	4.44
>60	5	11.11	1	2.22
Total	30	66.68	15	33.32

•Source: Crop Area Statistics, Department of Agriculture, Govt, of Sikkim, 1990-92 & 2004-05.

The changes in crop area in the district can be considered as positive having 67% is more than the negative changes, which has only 33.32%) of the total GPUs. In the very low (<15%) positive changes category, there are 12 GPUs constituting 26.67% of the total GPUs. Most of these GPUs are concentrated in the southern parts of the district. This large scale positive growth is due to the encroachment of the forest land which is cause by the fragmentation of land holding. With an increase of population, fragmentation of land holding amongst the issues leads to the clearing of forest land which was earlier kept for the fuel and fodder for every household. This is ine of the reason which leads to the maximum positive changes in this category. There are another three GPUs which accounts only 6.67% of the total GPUs in the low category (15- 30%). These three GPUs are located in the eastern parts of the district. In the medium (30 - 40%) positive changes category, there are seven GPUs which occupy around 16% of the total GPUs. These GPUs are found in the north-eastern and south -western parts of the district. The high (45-60%) positive changes are recorded in the three GPUs having 7% of the total Gram Panchayat units. Salghari, Bikmatr-Tangji, and Sripatam-Gagyong are GPUs which fall in this category. Another 11 %

Of GPUs are found in the very high (>60%) positive changes and all the GPUs which fall under this category are found in Namchi sub -division. ^

In comparison to positive changes, the negative changes have less of GPUs. This indicates that the area of certain crops is increasing. The very low (<15%) negative changes has only 15.55% of the total GPUs which have the highest percentage amongst the category of negative changes and these GPUs are scattered 6through out the district. But the low negative (15-30%) changes have 7% of the total GPUs. The medium (30-45%) and high (45-60%) negative change have 4.44% of the total Gram Panchayats unit. The medium negative changes are recorded in Borong-Pamthang and Singithang GPUs and the high negative is found in Saganath and Barfung-Zarung Gram Panchayat. In the very negative changes (>60%), there is only single Gram Pnachayat unit i.e. Maneydara.

The facts and figure show that, in the South District crop area are changing in the last 15 years. But the changes are more in the positive changes than in the negative changes. Most of the negative changes in the South District is due to the expansion of build up area especially for the construction of buildings for dwelling. This is initiated by the changes in socio-economic perspective. The expansion of towns is speedy and on going processes, which adversely affects to the cultivation areas. The GPUs like Singithang, Ravong-Sangmo, Barong-Pamthang, Lingzo-Likship, Temi and Tarku are the some good examples of the negative changes of crop area by the development of towns, industrial complex and construction of hydro electric project. On the other hand, the high positive changes are due to the encroachment of forest area. This is also not a good sign as it leads to the decreasing of forest cover which has an adverse impact on the environment. It is very much important to find out the area of crop under which crop is increasing and which crop are is decreasing for the proper planning as the land resource of the district is very limited and to find out suitable crops an cultivation methods which a locally suited as well as to protect the environmental condition of the district for the future also. Besides, encouragement for the local scientific community to develop locally suited methods and techniques for the local farmer keeping in mind the prevailing local problems is need of the hours

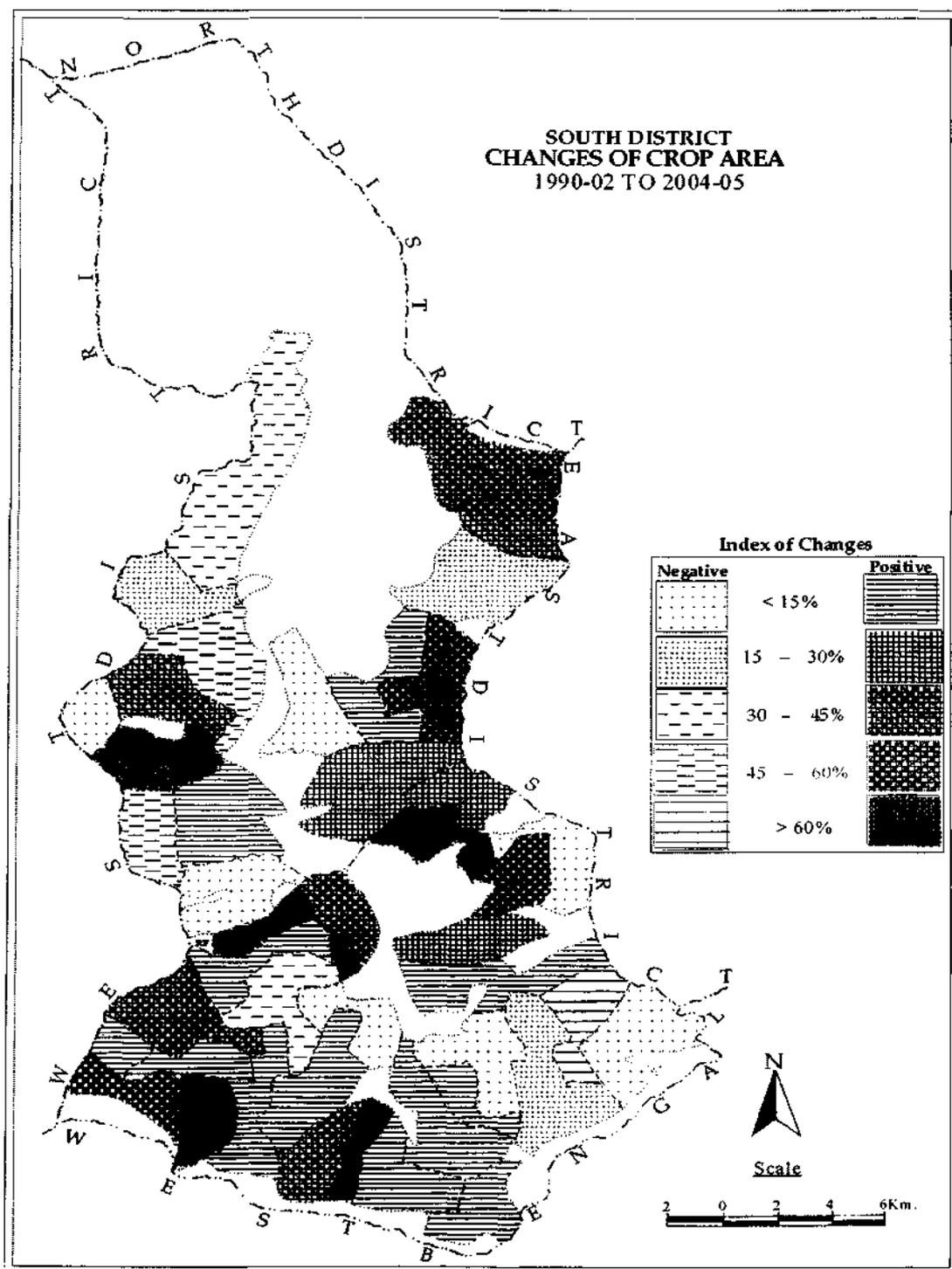


Fig4.4

## 4.2 AREA OF CROPS

As the variation in agro-climatic and socio-economic conditions in the South District the agricultural crop varieties are limited. Due to these, all the crops cannot be cultivated in the district. Out of the total cultivated crops only ten crops have been selected in terms of their economic importance to the farmers of the district. They are

maize, Rice, Wheat, Pulse, Ginger, Oilseed, Potato, Cardamom, Vegetable (Oreliculture) and Horticultural crops. The study of cultivated area of these selected crops for a period of 15 years will give the idea about variation of crops area and it will definitely be helpful for the future planning in the district. Out of these selected crops maize, rice, and wheat are under the cereal crops and ginger, cardamom are under the category of cash crop. Potato can be considered as semi-cash crop because potato is cultivated for the household consumption as well as for selling in the local market. The changes of vegetable area are also important because it has direct impact on the economy of the farmers of the district. Most of the vegetable are imported from outside the state. But one of the advantages of the vegetable production in the district is that it is base on the organic manure. The locally produce vegetable has high demand in the local market as they are free from chemical fertilizers. Horticulture is another important field where crop area can further increase, because of the suitable agro-climatic conditions. The changes of the crop are is considered for two time periods of 1990-'92 and 2004-'05 (fig4.4)

#### 4.2.1 Maize

Maize is one of the most important cereal crop cultivated in South District. It is believed that Sikkim and other North-Eastern to be the secondary centre of origin of Maize (Subba). The agro-climatic conditions are very suitable for its cultivation. Maize is used not only for the human consumption but also for feeding the domestic animals and fowls. The cultivation of maize required low capital inputs and low labour in puts is also an advantage to the small and marginal farmers of the district.

##### 4.2.1a Maize Cropped Area 1990-'92

All the GPUs have higher percentage of maize cultivated area in 1990-92. Table 4.2 represents the maize crop area in South District in 1990-92.

Table 4.4 Maize Cropped Area in South District 1990-92

Area in Hectare.	Category	No of Gram Panchayat units	Total Gram Panchayat Units %
<150	Very low	1	2.22
150-225	Low	12	26.67
225 - 300	Medium	12	26.67
300 - 375	High	9	20.00
>375	Very High	11	24.44
Total		45	100.00

\* Source: Crop Area Statistics, Department of Agriculture. Govt, of Sikkim. 1990-92

The distribution of Maize crop area is depicted in the figure (4.4). Out of the total 45 GPUs, only one GPU is i.e. Temi is under the very low category (<150 hect.) having 2.22 of the total GPUs. One of the important factors for very low maize cultivation in the GPU is due to the development of tea garden. The low category (150 -225 hect.) maize cultivated area has around 27% of the total GPUs. Most of these are located in the north-eastern and south-western parts of the district Another 12 GPUs are also found in the (225-300hect.) medium category having around 27% of the total GPUs. These GPUs are located in the western and southern parts of the district. In the high (300 -375 hect.) category, there are nine GPUs in this category constituting 20% of the total GPUs of the district and they are mostly found in the western parts of the district. The very high (>375 hect.) has 11 GPUs accounting more than 24% of the total GPUS. Out of these 11 GPUs, three were in the Namchi Sub-division and eight were in Ravongla sub-division. Table 4.2

#### **4.2.1b Maize Cropped Area 2004-'05**

Table.4.5 represents the maize crop area in 2004-05. The very low (<150hect.) category has three GPUs constituting 7% of the total GPUs. These GPUs are namely Singithang, Sanganath and Lingzo-Likship. These three GPUs were not in the category of low in 1990-'92. Their inclusion in the category is due to the expansion of town in Singithang, and development of hydro-electric projects in Likship leads to the decrease of maize cultivated area. In the case of low (150-225hect.) category the number of Gram Panchayat unit is decreasing form 1990-'92 to 2004-'05, becoming only nine GPUs having only 20% of the total GPUs. These GPUs are mostly found in north-eastern parts of the district. One of the interesting facts is that, the Lingi, Paiyong, Tarku, and Chisopani GPUs are still in the same category as it is in 1990-'92.

**Table.4.5 Maize Cropped Area, South Sikkim.2004-'05**

Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<150	Very low	3	6.67
150-225	Low	9	20.00
225 - 300	Medium	13	28.89
300-375	High	12	26.89
>375	Very high	8	17.77
Total		45	100.00

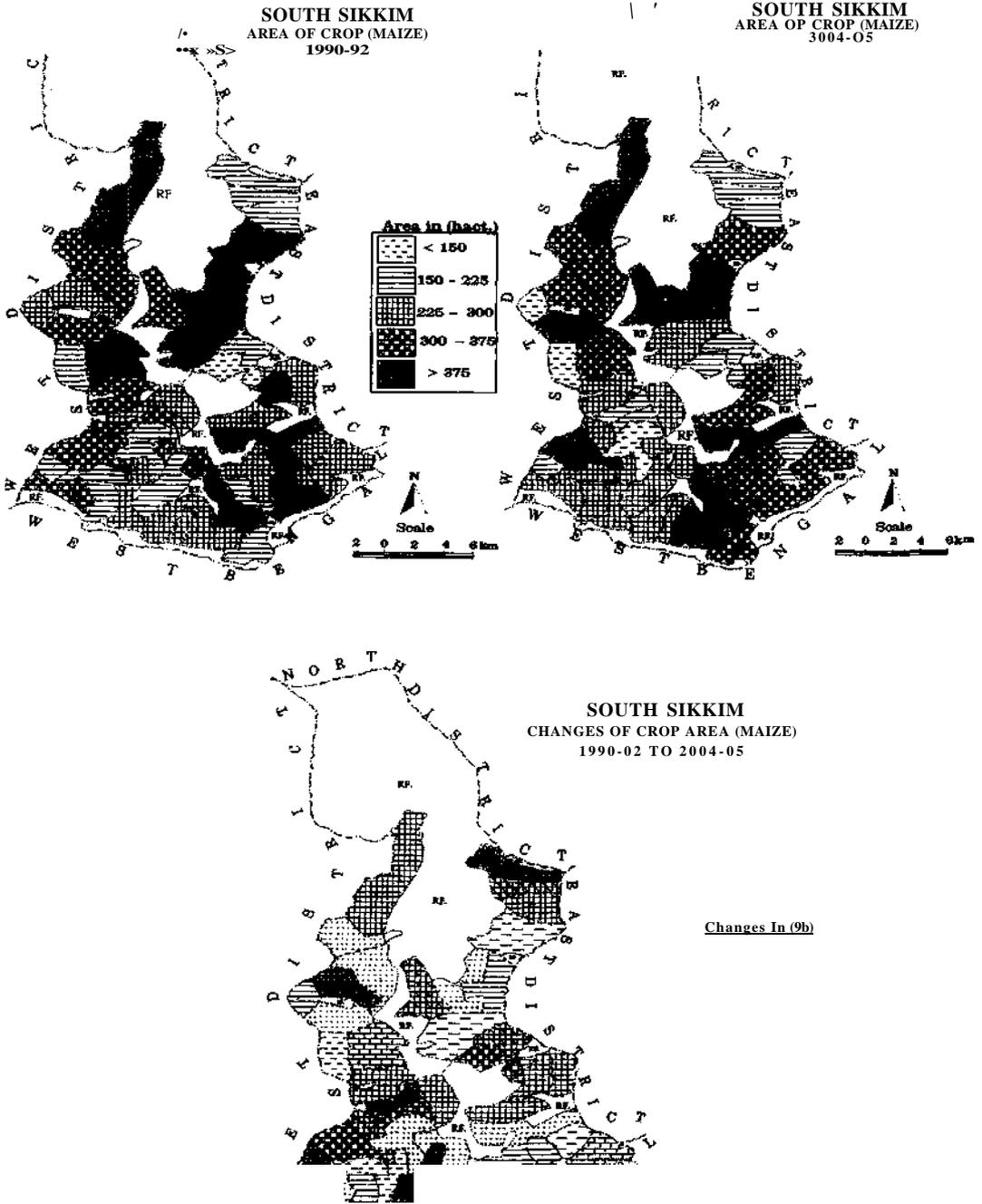
\*Source: Crop Area Production Statistics, Department of Agriculture, Govt of Sikkim. 2004-05

The medium category (225 - 300 hect.) has thirteen GPUs in creating one GPU from the base year 1990-92, and it constitutes almost 29% of the total Gram Panchayat units. Some of the GPUs are still in the medium category: they are namely Tokal, Damthang, Longchuck, and Sumbuk-Kartikey. But the high category (300 - 365 hect) category has recorded an increased from the base year. Around 27% of the total GPUs recorded an increased almost 7% from 1990-'92. The Zarung- Barfung and Ralong-Namlung are the two Gram Panchayat units which are still in the same category of high. In the very high (>375hect) category the percentage is decreasing from 24% in 1990-'92 to 17% in 2004-'05. But some of the GPUs are still in this category; they are namely Brong-Pamthang, Rayong-Yangang, Chuba -Perbinbg, Nagi-Pamphok and Sripatam-Gagyong.)



Photograph 4.1 Maize.Crop Collection

The discussion give some of the underlying facts that, some of the gram Panchayat units are still in their earlier category as it is in 1990-'92. The changing pattern also very interesting as the some of the GPUs units which are in the very low category in the base year 1990-'92 are in the high category in 2004-'05. Out of the total 45 Gram Panchayat units 11 GPUs have recorded no changes at all. (fig4.4b). Most of the negative changes are recorded in those revenue blocks which are located in the western and central parts of the district. And the higher negative growth is found in the south-western parts of the district.



Ejac  
Fig 4.5

**4.2.1c Changes of Maize Cropped Area (1990-'92 to 2004-'05)**

The study of changes in crop area of maize cultivation is very important because maize is the most important cereal crop of the South District. The comparison of maize crop area in percentage for 1990-'92 and 2004-'05 reveals that, the number of GPUs which has recorded negative changes is more than the positive changes.

Table.4.6 Changes of Maize Cropped Area, South District, 1990-92 to 2004-05

Changes in %	Positive Changes	Total Gram Panchayats %	Negative Changes	Total Gram Panchayats %
<25	7	15.56	11	24.44
25-35	2	4.44	4	8.89
35-45	3	6.67	3	6.67
45-55	2	4.44	6	13.33
>55	5	11.12	2	4.44
Total	19	42.23	26	57.77

\* Source: Crop Area Statistics, Department of Agriculture, Govt, of Sikkim 1990-02 & 2004-05.

There are nineteen GPUs or 42% of the total Gram Panchayat units which has registered as positive changes. Table 4.2b The negative changes has recorded in twenty six Gram Panchayat Units accounting 58% of the total Gram Panchayat units (fig.4.4c).The very low (<25%) positive changes has more than 15% which is highest amongst the positive changes. Of which, three Gram Panchayat units are in the Ravongla sub-division and another four GPUs are in the Namchi sub-division.

But in the case of negative changes the overall picture is very different from the positive changes. In the very low (<25%) negative changes there are 11 GPUs accounting 25% of the total GPUs, which is 10% more from opposite category of positive changes. Most of these Gram Panchayat units are concentrated in the southern parts of the district. The low (25-35%) negative changes are found in 4 Gram Panchayat units constituting 8% of the total GPUs and all these GPUs are located in Namchi Sub-division. In the medium negative changes (35-45%), there are 3 GPUs having 7% each and these GPUs are found in the western part of the district. More than 13% of the total GPUs are in the high (45-55%) negative changes, which is three times more than the same category in positive changes. But the very high negative changes has less percentage than the very high positive changes as only 4.44% are found having only two GPUs and both these are located in Namchi Sub-division.

One of the unique characteristics in the changes of maize crop area in the South District is that, most of the negative changes are recorded in the southern part of the district or Namchi Sub-division. This is due to the fact that infrastructural development has certainly effect to the maize cultivation in the southern part of the district in the form of encroachment in the cultivated field. Besides, decreasing trend in the use of maize as foods and animal feeds, as the people's foods habits changes. Nowadays it is difficult to find any household where meal is cooked mixing rice with maize. In the olden days in hilly area peoples main staple diet is rice cooked mixing rice. The use of maize for making local spirit (alcohol) is also decreasing due to cheap

and large scale availability of Indian made foreign liquor in the district. Another important factor is that used of maize as animal feeds is also decreasing due to increased used of artificial feeds imported from outside the state. The notable feature in maize crop changes is that most of the positive changes are recorded in the Ravongla Sub-division, because some of the cardamom cultivated areas are converted into the maize cultivating areas as the price of the cardamom is decreasing due to stiff competition from neighboring of west Bengal and countries of Nepal and Bhutan

#### 4.2.2 Rice

Rice is the second most important cereal crops of the South District next to maize. It is cultivated in the lower altitude especially in the river valleys of Tista, Rangit and Great Rangit. Besides, it is also cultivated in the gentle slope with the help of terrace farming.

##### 4.2.2a Rice Cropped Area (1990-'92)

Table.4.7 Rice Cropped Area, South District 1990-'92

Area in (hectare)	Category	No of Gram Panchayat units	Total Gram Panchayat units (%)
<25	Very low	17	37.78
25 - 50	Low	12	26.66
50 - 75	Medium	4	8.89
75 - 100	High	3	6.67
>100	Very high	6	13.34
NA	Not Cultivated	3	6.67
Total		45	100.00

\*Source: Crop Area Statistics, Department of Agriculture, Govt of Sikkim 1990-92

The rice cropped area in South District in 1990-'92 are represented by Table 4.7. In the very low (<25hect) category rice cultivated has occupy around 38% of the total Gram Panchayat units. Most of these Gram Panchayat units are located in north western, western, and south-western parts of the district. The low (25 - 50 hect) rice cultivation has constituted around 27% of the total GPUs. Most of these in the South-western corner of the district. Around 9% of the total Gram Panchayat units are under the medium (50-75 hect) category. The high (75-100 hect) category has around 7% Of the total GPUs and is found in the north -western and southern parts of the district. The very high (>100hect) category has more than 13% of the total GPUs. These GPUs are mostly concentrated in the north -western parts of the district. There are 4

GPUs where rice is not cultivated. They are Ravong-Sangmo, Damthang, Maindara-Phalidara and Sanganth constituting around 9% of the total GPUs (fig4.6a).



Photograph 4.2 Rainfed Cultivation of Rice

The overall character of rice cultivation in South District in 1990-92 is medium as the three categories i.e. very low, low and non-cultivated together accounts more than half of the total GPUs. This medium cultivation may be due to the constraints of agro-climatic factors which lead to the low productivity may directly discourage the farmers to cultivate rice. Besides, the price of the rice imported from outside the state is cheaper as the locally produced rice costs more than Rs.40 per kg. And the changing food habits of the people also indirectly affect the rice cultivation. Besides, rice requires a high labour input in hilly areas; lack of labour is one of the significant problems.

The lack of market, lack of labour, rough topography and the lack of irrigation facilities are the main problems faced by the farmers of the district for the cultivation of the rice. These problems are more or less avoided if they improved in the traditional and locally practiced method of farming as they are old age experience.

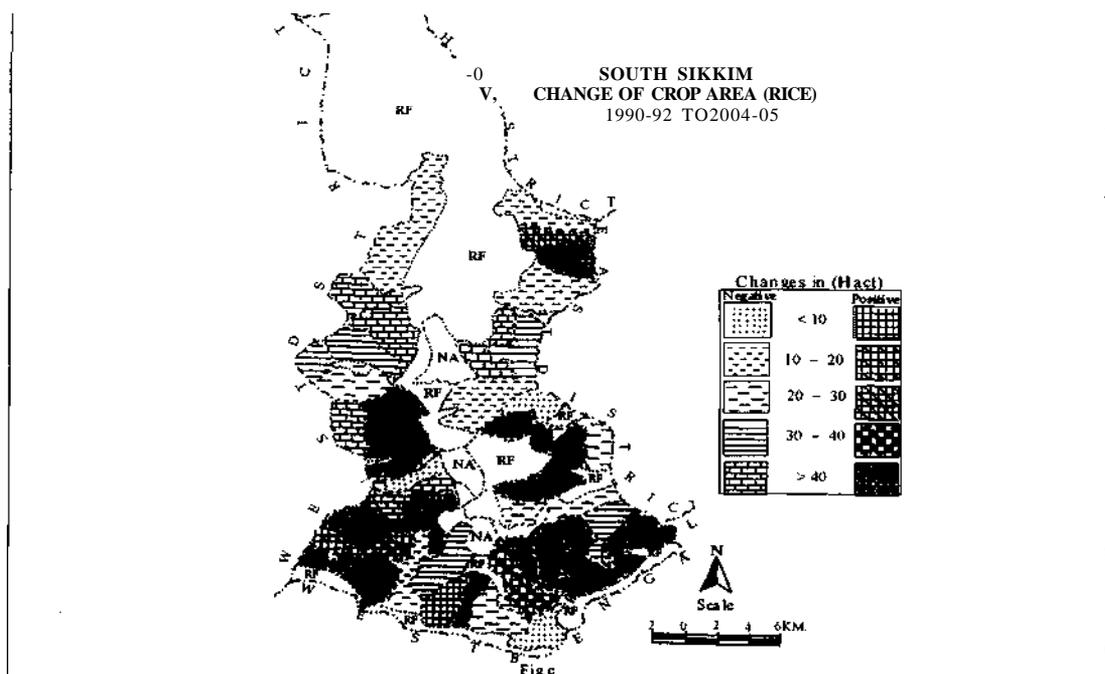
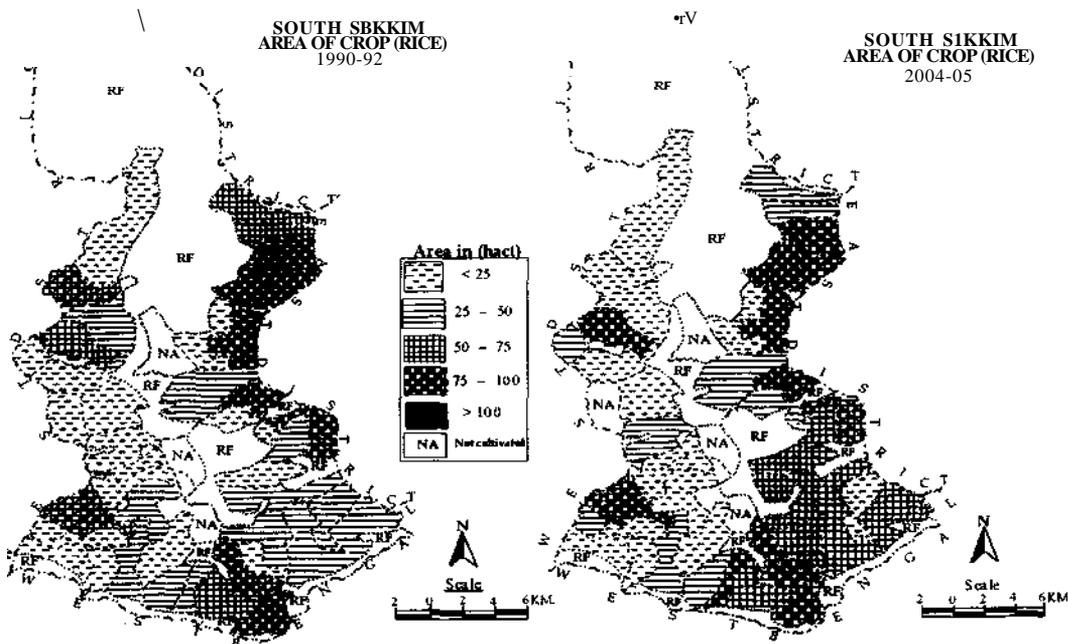


Fig 4.6

#### 4.2.2b Rice Cropped Area 2004-'05.

The scenario of Rice cultivation in the South District in 2004-'05 is different from that of 1990-'92 (fig.4.6b). The number of GPUUs in the very low category has

been decreased becoming 13 GPUs from 17 GPUs occupying around 29% of the total Gram Panchayat units.

Table 4.8 Rice Cropped Area, South District.2004-'05.

Area in hectare	Category	No of Gram Panchayat Unit	Total Gram Panchayat units (%)
<25	Very Low	13	18.88
25 - 50	Low	7	15.55
50 - 75	Medium	10	22.23
75 - 100	High	1	2.22
>100	Very high	9	20.00
NA		5	11.12
Total		45	100.00

\* Source: Crop Area Statistics. Department of Agriculture, Govt, of Sikkim.2004-05.

This decreasing trend has also been observed in the low category of rice cultivated area, where it becomes around 16% from 27% in 1990-'92. But in the case of medium category, it shows an increasing trend from 8.89% in 1990-'92 to 22% in 2004-'05 and is mostly concentrated in the western parts of the district. In the high category rice crop area is decreasing from 7% in 1990-'92 to 2.22% in 2004-'05. But in the case of very high category, rice crop area the trend is increasing from 13.33% in 1990-'92 to 20% in 2004-'05. The numbers of non rice cultivated area is also increasing (Table4.3a).

#### 4.2.2c Changes of Rice Cropped Area (1990-'92 to 2004-'05)

Rice cultivated area in South District has a very interesting feature< Unlike maize crop area, the rice crop area changes very significant as the quantum of changes in rice crop area is high, due to various factors. The positive changes altogether ahs around 49% of the total GPUs, where as the negative changes has been observed in twenty two GPUs accounting around 44% of the total GPUs and no changes occupy more than 6% of the total Gram Panchayat units.(Table.4.9)

Out of the total positive changes, the very low positive changes (<10%) has 2.22% having only a GPU i.e. Sumbuk. Another Gram Panchayat unit is alos in the low positive (10-20%) changes category, namely Chisopani GPU. But in the medium positive changes there are two GPUs occupying more than 4% of the total GPUs. They are Paiyong and Assangthang GPUs. Again the high positive change has only one gram Ppanchayat unit having only 2.22% of the total GPUs i.e. Nagi-Pamphok. The very high positive (>40%) changes has high percentage having 38% of the total

GPUs. Most of these GPUs are located in the southern and central parts of the district. (fig4.6c)

**Table 4.9 Changes of Rice Cropped Area, South District 1990-'92 to 2004-'05.**

Changes in (%)	Positive Changes	Total GPUs(%)	Negative Changes	Total GPUs (%)
<10	1	2.22	3	6.67
10-20	1	2.22	5	11.11
20-30	2	4.44	4	8.89
30-40	1	2.22	5	11.11
>40	17	37.78	3	6.67
Total	22	48.89	20	44.45
No Changes	3GPUs	6.67		

\* Source: Crop Area Statistics, Department of Agriculture,,Govt of Sikki, 1990-92 &2004-05

The negative changes in the rice crop area shows not much difference within the categories. The very low negative change (<10%) category has around 7% of the total GPUs. In the low (10-20%) negative change there are 11% of the total GPUs. They are namely, Brong-Pamthang, Lingi-, Niya-Mangzing, Ben and Kitam -Mikhola. Where as, in the case of medium negative change, the percentage is 9% of the total Gram Panchayat units. These GPUs are Lamting-Tingmo,Turuk-Panchagharey, Chuba-Perbing and Namphing. The high negative change has the same percentage with low category having more than 11%.. The rice cultivation area in the district can be concluded increasing.

### **4.2.3 Wheat.**

Wheat is the third important cereal crop and the most important rabi crop in the south district. Wheat is cultivated as part of mix cropping with mustard in the low altitude with dry area and maize in higher altitude with cool weather conditions. It is shown in October-November and harvested in March-April. The important wheat varieties cultivated in the district are Sonalika, Kalyan Sona, Sonali, VL-738, VL-616, K-88. But wheat crop area is lesser than other cereal crops in the South District.

### 4.2.3a Wheat Cropped Area: 1990-'92.

Table 4.10 Wheat Cropped Area, South District 1990-92

Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<10	Very Low	14	31.12
10-20	Low	8	17.78
20-30	Medium	6	13.33
30-40	High	2	4.44
>40	Very high	15	33.33
Total		45	100.00

\*Source: Crop Area Statistics, Department of Agriculture. Govt of Sikkim. 1990-92.

Table 4.10 represents the wheat crop area in South District. In the very low (<10hect) has constituted more than 31% of the total GPUs. Most of these GPUs are located in the central and western parts of the district. The low (10-20 hect) category has occuy around 18% having eight GPUs of which two are in Ravongla Sub-division and six are in the Namchi Sub-division. But medium (20 - 30) category crop area has lesser percentage having only 13% of the total GPUs. The high (30 - 40 hect) category wheat crop area has lowest percentage amongst the categories, registering only around 5%. The Gram Panchayat units which are under this category are Tarku and Linzo-Tingmo. Whereas the very high (>40 hect) category has the highest percentage amongst the categories having more than 33%. The GPUs which is under the category of very high wheat crop area is located in the Southern and north - western parts of the district (fig4.7a). It is interesting to note that very low and very high categories have occupied more than 60% of the wheat crop area of the South District.

The importance of wheat crop is decreasing due to the low productivity and lesser local demands and another important factor is most of the wheat crop areas are gradually converted into the cardamom cultivation and ginger cultivation as the demand of these two crop are ever increasing in the local and outside the district and state. Wheat one of the important crops which value is decreasing to the local farmers. Besides, the green house technology which help the farmers to cultivated floriculture and oreliculture also indirectly influence the decreasing of wheat crop area in the district

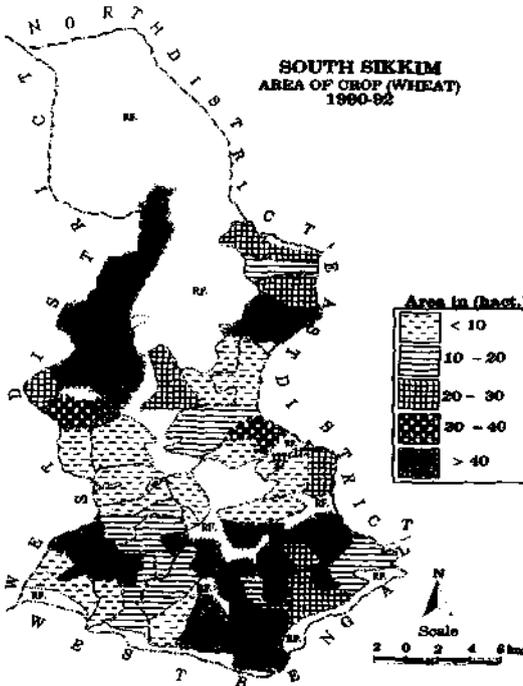


Fig. a

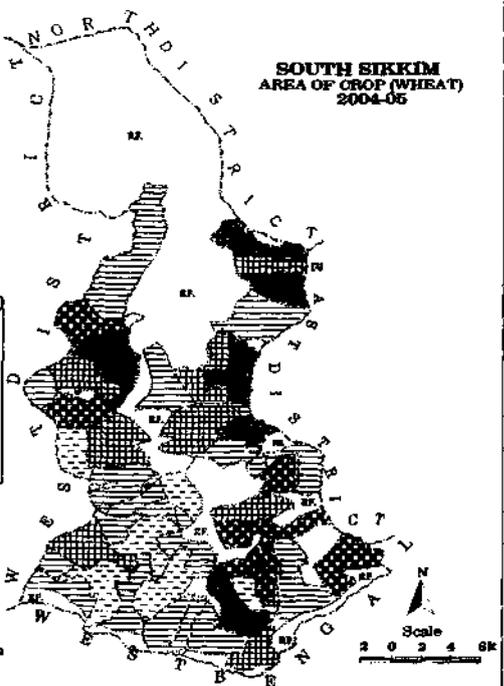


Fig. b

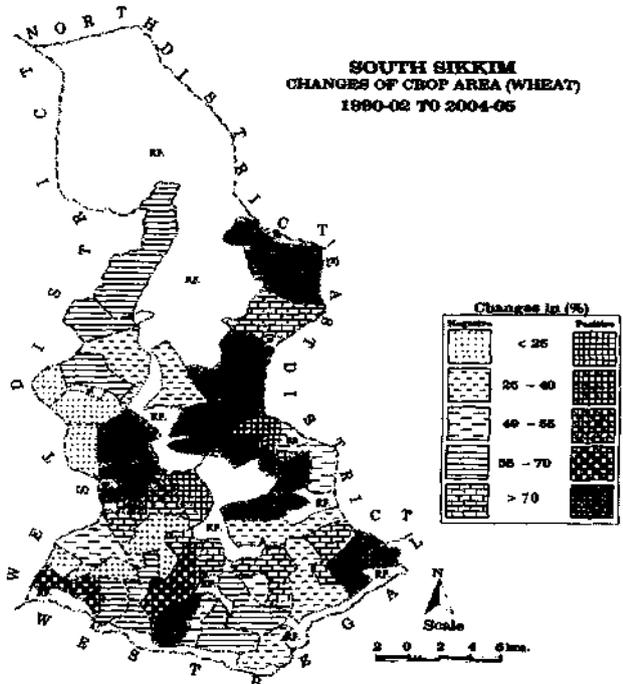


Fig. c

Fig 4.7

#### 4.2.3b Wheat Cropped Area 2004-'05.

The picture of wheat crop area for 2004-'05 in the South District has another picture (Table 4.11). The total area under the wheat crop area is decreasing. Even a single Gram Panchayat unit does not cultivate wheat in 2004-05, i.e. Maneydara GPU which was under the very high wheat crop area during 1990-'92. In the very low (<10 hect), the number of GPUs is decreasing from 1990-'92 becoming only 7 GPUs or around 16% of the total GPUs in 2004-05. All of these GPUs are in the very low category in 1990-'92. But the increasing trend in the low category becomes almost 38% from 18% in 1990-'92. Most of these Gram Panchayat units which fall in this category were in the very high category in 1990-'92. The medium category also shows an increasing trend as the number of GPUs fall in this category becomes eight from six GPUs in 1990-92, becoming almost 18% of the total GPUs and they are found in the western corner of the district. (fig4.7b)

Table 4.11 Wheat Cropped Area, South District 2004-'05.

Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<10	Very low	7	15.56
10-20	Low	17	37.78
20-30	Medium	8	17.78
30-40	High	6	13.33
>40	Very High	6	13.33
NA	Not Cultivated	1	2.22
Total		45	100.00

\* Source: Crop Area Statistics, Department of Agriculture.2004-05.

The increasing trend is still continuing in the high category of wheat crop area in 2004- 05. Only 2.22% were recorded in this category in 1990-92, but it becomes more than 3% of the total GPUs in 2004-05. Where as in the case of very high category of wheat crop area in 2004-05, it is found that highest decreased is recorded in this category only recording to 13% in 2004-05 form 33% in 1990-92. One of the important facts which is observed while discussing the wheat crop area in 2004-05 in the South District is that, most of the GPUs which are under the very high category during 1990-92 were become in low and medium category of wheat crop area in 2004-05.

#### 4.2.3c Changes of Wheat Cropped Area: (1990-'92 to 2004-'05).

The wheat crop area in South District has been changes due to various factors. (Table 4.12) The change is in the negative or decreasing trend. The percentage of the negative changes is 60%, which is more than the percentage of positive changes which has only 40%. This is due to the conversion of wheat cultivated in to maize crop area due to the low productivity. Out of the positive changes, low positive (<25%) has only two GPUs having only 4.44% of the total GPUs. They are namely Damthang and Tarku. Another three GPUs are in high (55 -70%) positive changes, which accounts around 5 of the total GPUs. All these three GPUs are found in the Namchi Sub-Division. But the very high (>70%) positive changes has sizable portion having around 29% of the total GPUs. Most of these GPUs are located in the north-western and eastern parts of the district.

Table 4.12 Changes of Wheat Cropped Area, South District. 1990-92 to 2004-05.

Changes in (%)	Positive Changes	Total GPUs (%)	Negative Changes	Total GPUs (%)
<25	2	4.44	6	13.33
25 - 40	Nil	0.00	5	11.11
40 - 55	Nil	0.00	4	8.89
55 - 70	3	6.67	7	15.56
>70	13	28.89	5	11.11
Total	18	40.00	27	60.00

\* Source: Crop Area Statistics, Department of Agriculture. 1990-92&2004-05

All the categories of negative changes are more than the positive changes, except the very high category. In the very low (<25%) negative changes there are six GPUs, constituting more than 13% of the total GPUs, and they are located in the western parts of the district. Another 11% are in the low category (25 - 40%) negative changes. The GPUs which fall under low negative are Ravong-Sangmo, Barfung-Zarung, Chuba-Perbing, Melli-Mellidara etc. The medium (45 - 55%) negative changes have almost 9% of the total Gram Panchayat units. It is found in the GPUs of Chisopani, Namphing, Rateypani and Longchok-Kamrey. The high (55-70%) negative changes have more percentage than it's counterpart in positive changes having around 16%. But the very high (>70%) negative change has lesser percentage than the positive changes occupying only 11% of the total GPUs (fig 4.12)

The discussion shows that for the last 15 years, the wheat cultivated area in the South District is decreasing because of various factors. Some of the important factors are due to the changes of wheat cultivated areas in to the ginger, cardamom,

pulses and vegetable cultivated areas. This is may be due to the low productivity and low market price lead the farmers have to changes the wheat cultivated areas into the cultivation of other profitable crops. So it can be rightly concluded that the wheat is one of the crop which lost importance to the framers of South District.

#### 4.2.4 Pulses

Pulse is one of the important food crops which supplement income as well as dietary protein. It contains 24% protein and considerable amount of phosphoric acid. South District is one of the important areas of the state for the production of pulse. It requires a warm humid seasons, heavier and water retentive soil is preferred where rainfall is scanty for better utilization of the residual soil moisture. Pulse is luxuriously grown in the lower and middle- hill up to an elevation of 1400mt. The important varieties of pulses cultivated in the South District are urad, rice bean, field pea, cowpea, arhar, french bean etc. Most of the pulses are cultivated as inter-crop and mix cropping. Broad casting is the method applied for the cultivation of pulses. It is shown during the month of June-July and harvested during November-December.

#### 4.2.4a Pulse Cropped Area: 1990-'92.

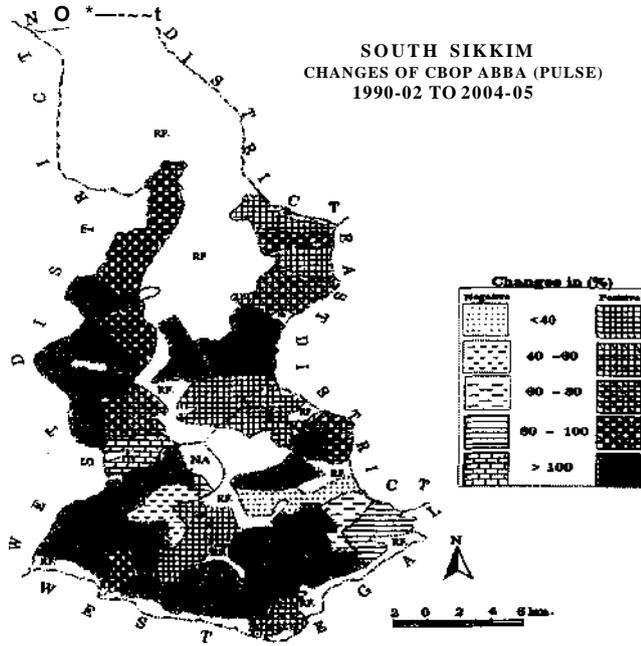
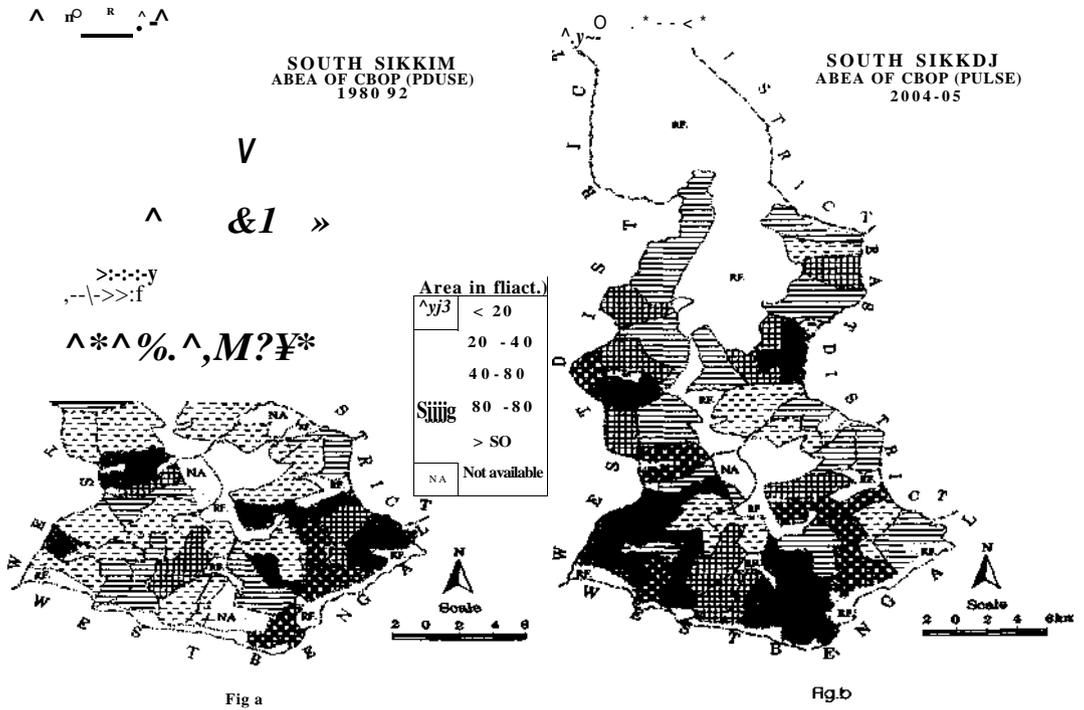
Table 4.13 Pulse Cropped Area, South District. 1990-'92

Area in hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<20	Very low	24	53.34
20 - 40	Low	7	15.56
40 - 60	Medium	3	6.67
60 - 80	High	2	4.44
>80	Very High	5	11.11
NA	Non Cultivated	4	8.89
Total		45	100.00

\* Source: Crop Area Statistics. Department of Agriculture, Sikkim. 1990-92.

During 1990-'92 the pulse cultivated area in South District was very negligible as the maximum of the GPUs have low percentage of pulse crop area. More than 50% of the total GPUs are under the very low category (<20hect). Table 4.5 These GPUs are mostly located in the northern parts of the district. The low category (20 - 40 hect) has around 16% of the total GPUs and is found in the western parts of the district. And another 7% are under the category of medium (40-60 hect). They are Tingrithang, Bul-Singtam, Maneydara. More than 4% GPUs are also under the high

(60-80hect) category. The very high (>80 hect) category has more than 11% of the total GPUs. Around 8% of the total GPUs do not cultivated pulse at all (fig 4.8a)



~Fig4.8

#### 4.2.4b Pulse Cropped Area 2004-'05

Table 4.14 Pulse Cropped Area South District. 2004-'05

Area in Hectare	Category	No of Gram Panchayat Units	Total Gram Panchayat units %
<20	Very Low	6	13.33
20-40	Low	13	28.89
40-60	Medium	9	20.00
60-80	High	5	11.11
>80	Very high	11	24.45
NA	Non Cultivated	1	2.22
Total		45	100.00

\* Source: Crop Area Statistics, Department of Agriculture. Govt of Sikkim. 2004-05.

The pulse crop area in 2004-'05 has another picture in the South District. Table 4.5a. In the very low category (<20 hect), the number of GPUs is decreasing becoming only six or 13% from 1990-'92. Most of these GPUs are located in the central parts especially the central ridge in the district. But in low (20 - 40 hect) category the percentage is increasing having around 29% and the cultivated areas are located in the north and north-western parts of the district. Another 20% of GPUs are under the category of medium (40 - 60hect). The high (60 - 80 hect) category occupies around 11% of the total GPUs. Where as the very high category (>80hect) constitutes around 25% Of the total GPUs. The very high pulse crop area are found in the southern and south western parts of the district (fig.4.8b)

#### 4.2AcChanges of Pulse Cropped Area (1990-'92 to 2004-'05)

Pulse cultivation in South District is tremendously increasing. The percentage of positive changes has more than the negative changes. The positive changes have around 87% of the total Gram Panchayat units, where as the negative change have only 11% of the total Gram Panchayat units.

Table.4.15 Changes of Pulse Cropped Area South District 1990-'92 to 2004-'05

Change in %	Positive Changes	Total GPUs %	Negative Changes	Total GPUs %
<40	7	15.56		2.22
40-60	1	2.22		2.22
60-80	2	4.45		2.22
80-100	5	11.11		2.22
>100	24	53.34		2.22
Total	39	86.68	5	11.13
No Changes	1	2.22		

\*Source: Crop Area Statistics, Department of Agriculture, Govt, of Sikkim, 1990-92&2004-05.

Table 4.15 shows the changes of pulse crop area in the South District. In the very low category (<40%), there are 16% of the total GPUs. They are mostly found in the north-western and western parts of the district. But in the low category (40 - 60%) positive change has only a single GPU constituting 2% of the total Gram Panchayat units' i.e Melli-Mellidara. The medium category (60 -80%) positive changes the percentage is very low having only 4% of the total GPUs. Where as the percentage in the high category (80-100%) positive change is little more than the medium category positive changes having 11% GPUs. These GPUs are namely Pamphok-Brong, Zarung-Shayampani, Namphing and Paiyong. But the very high category positive changes (>100%) has very high percentage having more than 53% GPUs which is mostly concentrated in the south and south-western parts of district. In the negative changes the total percentage is very low, altogether constituting only 11 % of the total changes. Each category of negative changes has a single GPU each. Maneydara is in the medium, Turung-Mamring is in high and Wak-Omchu is in very high negative changes (fig4.8c)

The discussion shows that the pulse crop area in South District is increasing. Some of the important factors of these high increased are may be due to the fact that, the physio-climatic condition is very suited for the cultivation; they are cultivated as a nitrogen fixing plants during the lean seasons. The low input but high return. And high local market demand is the important factors which lead to very high changes in pulse crop area.

#### **4.2.5 Oilseed**

Oilseed is another important crop which has registered increased in the crop area in South District. Traditionally it is successfully cultivated during the inter-cropping periods and well as in lean seasons along Maize, Tropicana and Vegetables. The oilseed cultivation is mostly concentrated in the southern parts of the district. Some of the important varieties of oilseed cultivated in South District are Soybean, Mustard Sunflower, Rapeseed and Linseed etc.

##### **4.2.5a Oilseed Cropped Area: 1990-'92**

Like pulse, the oilseed crop area during 1990-'92 in South District does not covers large area. This is due to the fact that importance is given to the cultivation of

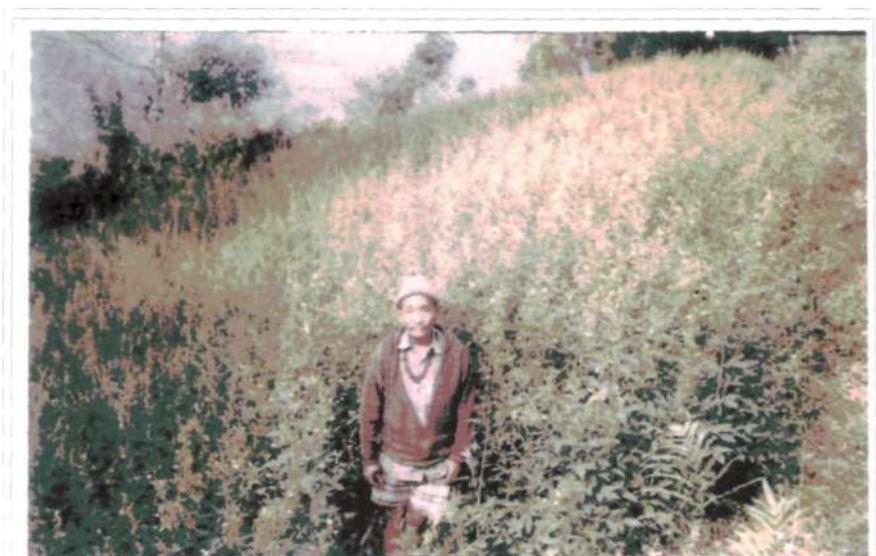
cereal crops. Table 4.16 represents the picture of oilseed cultivation during 1990-'92 in South District.

Table 4.16 Oilseed Cropped Area, South District. 1990-'92

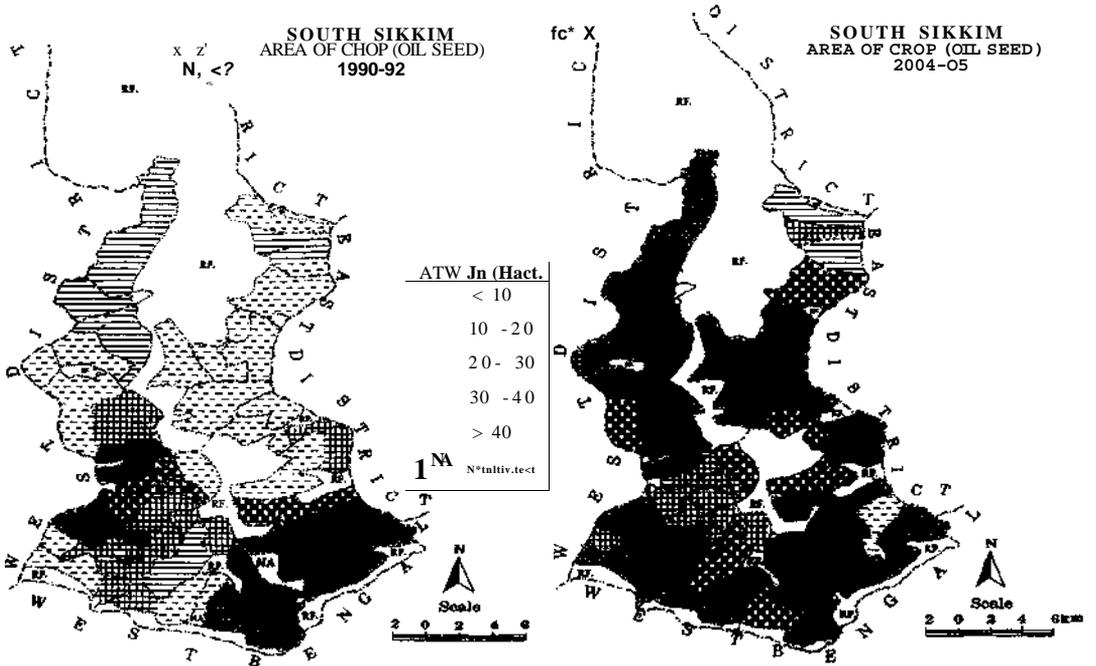
Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<10	Very low	20	44.44
10-20	Low	5	11.11
20-30	Medium	7	15.56
30-40	High	3	6.67
>40	Very High	9	20.00
NA		1	2.22
Total		45	100.00

\*Source; Crop Area Statistics. Department of Agriculture. Govt, of Sikkim. 1990-92.

The very low (<1 Ohect) oilseed crop area has highest percentage amongst all the categories having more than 44% of the total GPUs. These GPUs are mostly found in the north and north-eastern parts of the district in coincidence with high concentration of cardamom cultivation. But the low (10-20hect) oilseed cultivated area has around 11% of the total GPUs and are found in the north western parts of the district. The medium oilseed area (20-30hect) has around 16% of the total GPUs. They are mostly found in the south-western parts of the district, (fig 4.9a). But the high (30-40 hect) oilseed crop area has only 7% of the total GPUs having only two Gram Panchayat units i.e. Tringrithang and Chuba-Perbing. The very high (>40hect) has 20% of the total GPUs and they are mostly found in the south-western parts of the district. Another single GPU does not cultivated oilseed at all. The overall picture of oil seed cultivation in the South District during 1990-'92 is very low as the very low and low category constitutes more than 50% of the total districts percentage.

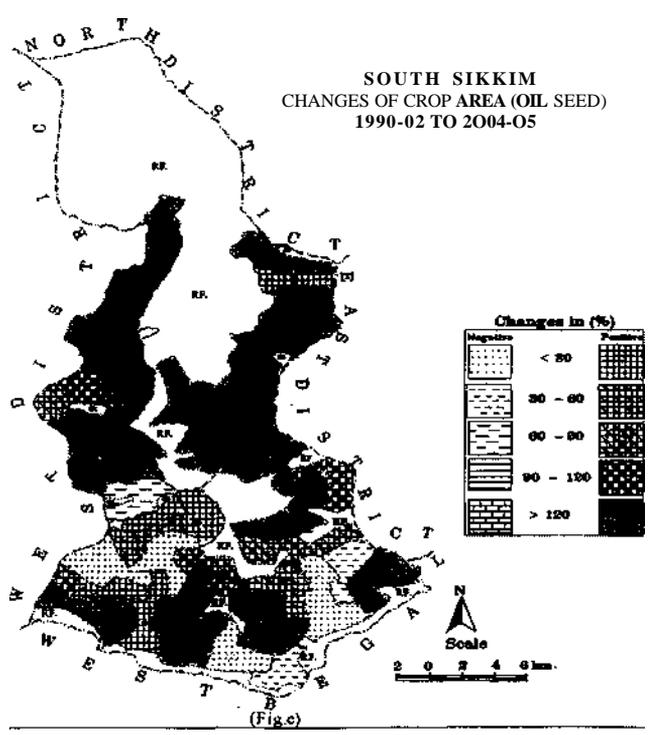


Photograph 4.3 Mustard cultivated field.



(Fig.a)

(Fig.b)



(Fig.c)

Fig4.9

**4.2.5b Oilseed Cropped Area 2004-'05**

The picture of oilseed crop area in South District in 2004-05 has another picture. Most of the very low and low oil seed cultivated area during 1990-92

becomes high and very high oilseed cultivated area in 2004-05. The high and very high category has constituted around 80% of the total cultivated area in 2004-05

**Table 4.17 Oilseed Crop Area. South District .2004-05**

Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<10	Very low	1	2.22
10-20	Low	2	4.44
20-30	Medium	6	13.33
30-40	High	7	15.56
>40	Very High	29	64.45
Total		45	100.00

\*Source: Crop Area Statistic. Department of Agriculture, Govt, of Sikkim. 2004-05

Table 4.17 shows the oilseed cultivated area in the South District. In the very low category (<10hect), there is a single Gram Panchayat unit, i.e. Maneydara GPU. Again the percentage in the low category (10-20 hect) is only 4.44% of GPUs. The Gram Panchayat units which are under this category are Lingi and Lingo-Kolthang. There are six GPUs in the medium category (20 - 30 hect) constituting 13.33% of the total GPUs. Most of these GPUs are located in the western parts of the district. But the high category has around 16% of the total GPUs. The very high category (>40hect) oilseed cultivated area has the highest percentage amongst the categories having more than 64% of the total Gram Panchayat units. This shows that the percentage of oilseed cultivated area in the South District has a high quantum jump from 1990-'92 to 2004-'05 (fig4.9b)

#### **4.2.5c Changes of Oilseed Cropped Area (1990-'92 to 2004-'05)**

**Table 4.18 Changes of Oilseed Cropped Area (South District 1990-'92 to 2004-'05)**

Changes in %	Positive Changes	Total GPUs %	Negative Changes	Total GPUs %
<30	5	11.11	4	8.89
30-60	2	4.44	2	4.44
60-90	3	6.67	1	2.22
90-120	3	6.67	Nil	0.00
>120	25	55.56	Nil	0.00
Total	38	84.45	7	15.55

\* Source: Crop Area Statistics. Department of Agriculture. 1990-92&2004-05.

The oilseed cultivated area in the South District has tremendous positive changes. The positive change is more than 84% of the GPUs. The very low (<30%) positive area has registered in five GPUs consisting more than 11% of the total GPUs. The Gram Panchayat units which found in this positive changes category are namely,

Paiyong, Damthang, Tingrithang, Assangthang and Mikhola-Kitam. But in the low positive changes (30 - 60%) has only 4% of GPUs. The medium (60 - 90%) and high (90 -120%>) positive changes has around 7% GPUs each. The GPU of Lingzo-Likship, Maniram -Phalidara and Chuba-Perbing are in the medium category and Kewzing-Bhakhim, Chisopani and Namphing are in high category. The highest positive changes (>120%) is recorded around 84%> of GPUs and most of these GPUs units are found in the northern parts of the district, one of the unique character of positive changes of oilseed area is that of high category positive changes in this category the percentage changes is more than hundred percent.(fig4.9c)

The negative changes of oilseed area in South District is very negligible as the total negative changes percentage is very around 15% or 7 GPUs of the total GPUs. Out of these seven, four GPUs are in the very low negative changes category (<30%) and occupying around 9% of the total GPUs. Another two Gram Panchayat unit are in the low category negative changes (30 -60%) which constitutes only 4% of GPUs. And only a Gram Panchayat unit is in the medium (60 - 90%) category of negative changes.

The discussion can be rightly concluded that oilseed is another crop which cultivated area is increasing in the South District for the last 15 years. This is due to the fact that scarcity of irrigation facility can not cultivate the other crop. The farmers has to choose oilseed which can be cultivated in low moisture condition and is cultivated during inter cropping season along with vegetable crop. Another important factor is that, the cultivation of oilseed does not require labour intensive. The local market demand is also very high. Besides, the cultivation of mustard crop as a variety of oilseed is very high in the South District because the leaves of this oilseed are also eaten as vegetable which is locally called "duko" of the tender butts of the mustard plant. Another variety of oilseed i.e. soybean is also eaten as a favorite by making fermented locally called "kinema" kinema is an indigenous fermented soybean food which serves as a sustainable supply of low cost source of high protein food in the local diet (Tamang1998). This leads to the growth of oilseed cultivated area in the South District.

#### **4.2.6 Potato**

Potato is one of the important semi-cash crops which are successfully cultivated in the hilly regions like South District. The dry condition which prevails in

the in the South District is very suitable for potato cultivation, Potato cultivation does not require intensive labour. Large scale irrigation is also not required. In the district potato is cultivated during spring season and autumn. The spring crop is grown in mid and lower elevation especially in paddy field of lower elevation where the irrigation facility is available (Subbal1984). The spring crop is planted during December-January and harvested in June. The autumn crop is cultivated during October-November and harvested in December-January. Autumn crop is mainly in dry fields of mid elevation (900-1400mt). Potato is also cultivated during January-March and harvested in August-September this type is mostly grown higher elevation (above 1400mt). Potato is cultivated throughout the year in South District.

#### 4.2.6a Potato Cropped Area 1990-'92

Table 4.19 Potato Cropped Area South District. 1990-'92

Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<5	Very low	17	37.78
5 - 10	Low	5	11.11
10 - 15	Medium	2	4.44
15 - 20	High	3	6.67
>20	Very High	16	35.56
NA	Not Cultivated	2	4.44
Total		45	100.00

\*Source: crop Area Statistics, Department of Agriculture. Govt, of Sikkim. 1990-92

Potato crop area in 1990-'92 in South District is represented by Table 4.19. the very low (<5 hect.) potato cultivated Gram Panchayat units has constituted around 38% and most of these Gram Panchayat units are located in north-eastern and south - western parts of the district. But in the low category ( 5 - 10 hect) potato cultivated Gram Panchayat units have occupy only 11 % of the total Gram Panchayat units and are located in the central parts of the district. The medium (10 - 15 hect) and high (15 -20 hect) potato cultivated Gram Panchayat units has 4.44% and 6.67% respectively. The Gram Panchayat units which fall under the category of medium are Turung-Mamring and Banryak and Naya-Mangzing, Tarku, and Singithang are under the high category of potato cultivation. But the very high category (>20 hect) has located around 36% of the total Gram Panchayat units. These Gram Panchayat units are mostly concentrated in north-western and south-eastern parts of the district. Out Of the total Gram Panchayata units Turuk-Panchagharey GPU does not cultivated potato at all. (fig4.10a)

#### 4.2.6.b Potato Cropped Area 2004-'05

Table 4.20 represents the potato crop area of the south district for 2004-05. In the very low (<5hect) category, there are only two Gram Panchayat units occupying around 45 of the total GPUs which is less than 1990-92. But the percentage in the category of low (5 -10hect) is around 29% of the total Gram Panchayat units, which is more than the base year 1990-92.

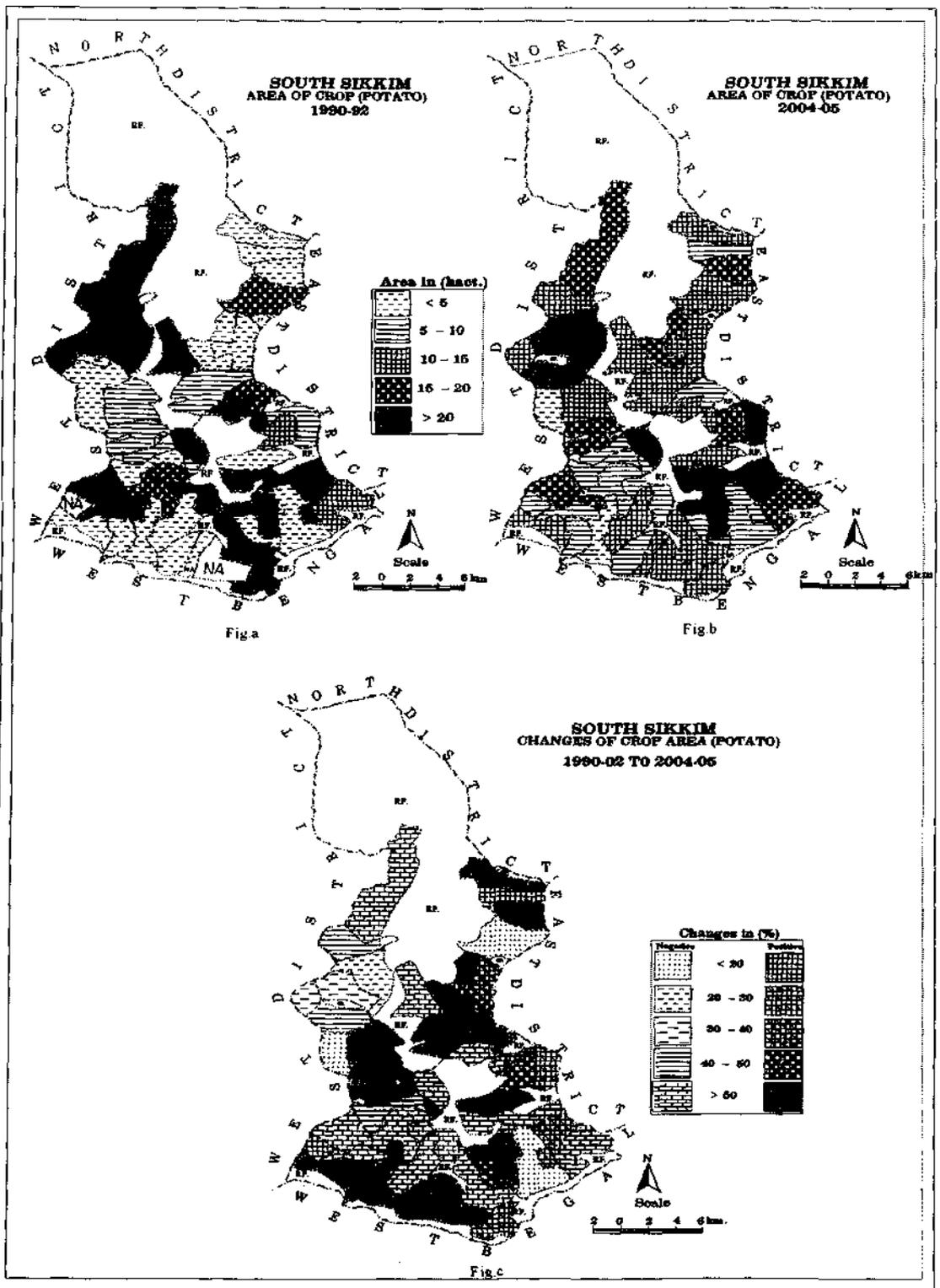
Most of these Gram Panchayat units are located in the southern and western parts of the district. The medium category (10-15hect) has the highest percentage amongst the categories having more than 35% of the total GPUs which is also more than the base year of 1990-92 and they are located in the western parts of the district. Another category which shows increasing trend is high category (15 -20hect) accounting around 16% of the total GPUs. But the very high category (>20hect) has registered decreasing becoming only 16% from 36% during 1990-92 to 2004-05. Another important feature of potato crop area in South district during 2004-'05 is that, there is not a single Gram Panchayat units which does not cultivate potato (fig4.10b)

Table 4.20 Potato Cropped Area South District 2004-'05

Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<5	Very low	2	4.44
5 - 10	Low	13	28.88
10 - 15	Medium	16	35.56
15 - 20	High	7	15.56
>20	Very High	7	15.56
Total		45	100.00

\*Source: Crop Area Statistics, Department of Agriculture. Govt, of Sikkim. 2004-05

The increased of the local demand for the potato crop is increasing and development of techniques and improved varieties as well as the long traditional knowledge of the potato crop cultivation also help the increased in the crop area. The traditional food variety of "aludom" which is one of the main food types which cooked only the potato also influence the increased crop area in the medium and high category cultivated field.



#### 4.2.6c Change of Potato Cropped Area (1990-'92 to 2004-'05)

The change of potato crop area in the South District for the last 15 years has been increasing represented by (Table 4.21). The positive changes has more than 53% of the total Gram Panchayat units, where as the negative change has around 47%. All the four categories of positive changes i.e. very low (<20%), low (20 -30), medium

(30-40%) and the high (40 -50%) has the same percentage of 4.44% each. And the very high (>50%) changes has more than 35% of the total GPUs, having the highest percentage. These Gram Panchayat units are located in southern and central parts of the district. One of the interesting facts is that most of these GPUs were in the very low category during 1990-92.

Changes in %	Positive Changes	Total GPUs %	Negative Changes	Total GPUs %
<20	2	4.44	3	6.67
20-30	2	AAA	1	2.22
30-40	2	AAA	2	4.44
40-50	2	AAA	3	6.67
>50	16	35.57	12	26.67
Total	24	53.33	21	46.67

\*Source: Crop Area Statistics, department of Agriculture, Govt, of Sikkim. 1990-92 &2004-05

The negative changes recorded GPUs are scattered in the district. The very low (<20%) negative changes has constitute around 7% of the total GPus. But the low (20-30%) negative changes are found in only a single Zarung-Barfung. The medium category (30 - 40%) has 4.44% of Gram Panchayat units. They are Lingzo-Likship and Kewzing-Bhakhim. And another 6.67% of the GPUs are in the category of high (40 -50%) negative changes. The very high (>50) negative changes has registered in twelve Gram Panchayat units constituting 27% of the total Gram Panchayat units. These Gram Panchayat units are mostly found in the southern and western parts of the district. (fig4.10c)

#### 4.2.7 Large Cardamom

Large Cardamom is the most important cash crop of the South District. Large cardamom is natural habitant of humid and sub-tropical, semi - evergreen forest of mountain sub Himalayan region (Karibasappal998), where the well distributed rain fall spread around 200days. The weather is remaining mostly cloudy and foggy during monsoon months. In the district the crop is grown between 600mt -2000mt above the mean sea level. The mean monthly requirement of temperature is ranging between 6°C in December and 30°C in June-July accompanied by constant high relative humidity .These conditions are prevails in the northern part of the district i.e. Ravongla Sub-division and cultivation is concentrated in this sub-division. The

cultivation of large cardamom is negligible in the Namchi Sub-division due to the drier climatic conditions.

#### **4.2.7a Large Cardamom Cropped Area: 1990-'92.**

**Table 4.22 Large Cardamom Cropped Area South District. 1990-'92**

Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<50	Very low	21	46.67
50-100	Low	3	6.67
100-200	Medium	2	4.44
200 - 300	High	4	8.89
>300	Very high	6	13.33
Not Cultivated		9	20.00
Total		45	100.00

\*Source: Crop Area Statistics. Department of Agriculture Govt, of Sikkim. 1990-92

Table 4.22 shows the picture of large cardamom cultivation in the South District. The very low (<50hect) category has constituted around 47% of the total Gram Panchayat units. The entire sub-division of Namchi is under this category except the two Gra Panchayat units of Damthang and Chuba-Perbing. But the low (50 - 100 hect) category has recorded in 7% of Gram Panchayat units. The medium (100-200hect) category has only two Gram Panchayat units having more than 4% GPUs. The Gram Panchayat units which fall in the category are Chuba-Perbing and Linzo-Likship. The high category (200-300hect) has occupies around 9% of the total GPU. The very high category (>300hect) cardamom cultivated area has constituted more than 13% of the total GPUs; these GPUs are mostly concentrated in the Ravongla-Sub-division. Another 20% of the total Gram Panchayat units does not cultivated large cardamom at all and most of these GPUs are located in the Namchi Sub-division (fig 4.1 1a)

#### **4.2.7b Large Cardamom Cropped Area: 2004-'05.**

The picture of Large cardamom cultivated area of South District shows another picture in 2004-05 the number of non cardamom cultivated area is increasing. It is also found that the very low and the medium category cultivated area are also decreasing.

Table 4.23 Large Cardamom Cropped Area, South District.2004-05

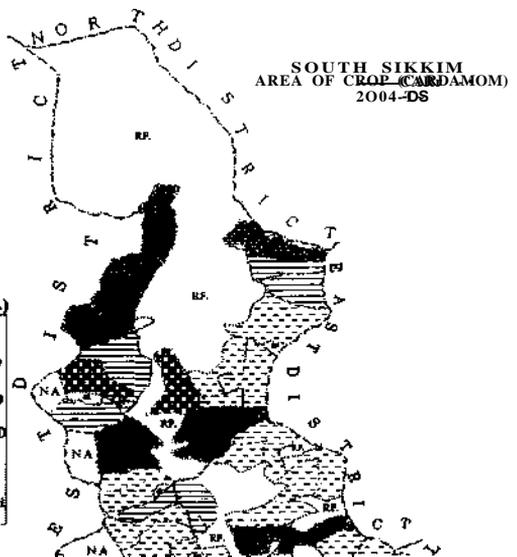
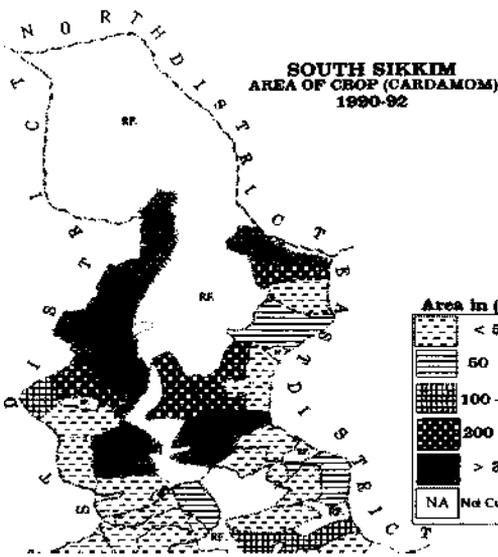
Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<50	Very low	17	37.78
50-100	Low	6	13.33
100-200	Medium	Nil	0.00
200 - 300	High	2	4.44
>300	Very high	6	13.33
Not Cultivated		14	31.12
Total		45	100.00

Source: Crop Area Statistics, Department of Agriculture, Govt, of Sikkim. 2004-05.

In the very low category (<50hect), the percentage is decreasing having recorded 37% in 2004-05 from 46.67% in 1990-92. Most of these Gram Panchayat units are concentrated in Namchi Sub-division. But in the low (50 -100hect) category the percentage is doubling from 1990-92 becoming 13.33% of the total Gram Panchayat units. It is interesting to note that there are not single GPUs which fall under the category of medium (100 - 200hect). Again, the high category also registered decreasing having only 4.44% in 2004-05 from 89% in 1990-92. Where as the case of very high, there is no change from the base year having the same percentage as it was (Table 4.23) (fig 4.1 1b)



Photograph 4.4 Large Cardamom Cultivation

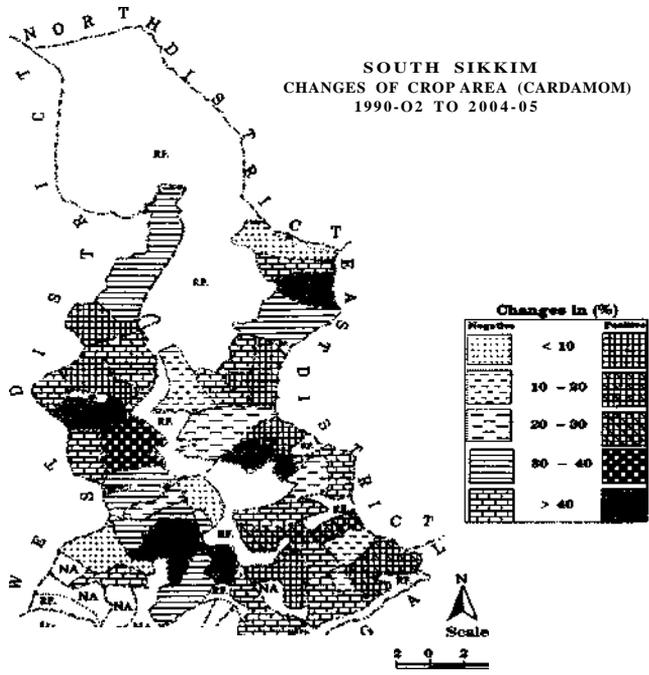


W -%<-t<sup>8</sup>T<sup>N</sup>j I ^z-ci?/NA  
T 3 --  
Fig.a

Scale

W V < NAHJ > < Y j -- T - 'Ar  
£ - \ ' - t A MA - f ! mē

Fig.b



Flgc  
Fig4.11

**4.2.7c Changes of Large Cardamom Cropped Area (1990-'92 to 2004-'05)**

Table 4.8b shows the changes of large cardamom crop area in South District. The change is more in high negative changes as the percentage of negative changes is more than the positive changes. Total negative changes has more than 55% of the total Gram Panchayat unit and positive changes has only around 29% of GPUs.

Another fact which support the decreasing in cardamom crop area is that, the percentage of non cardamom cultivated Gram Panchayat units is also increasing.

Table 4.24 Changes of Large Cardamom Cropped Area South District 1990-92 to 2004-05

Changes in %	Positive Changes	Total GPUs %	Negative Changes	Total GPUs %
<10	5	11.11	4	8.89
10-20	1	2.22	2	4.44
20-30	1	2.22	2	4.44
30-40	1	2.22	5	11.11
.40	5	11.11	11	24.25
Total	13	28.88	24	53.13

•Source: Crop Area Statistics, Department of Agriculture. Govt, of Sikkim, 1990-92 &2004-05

The maximum change of large cardamom cultivation is observed in Namchi Sub-division (fig 4.11c). In the positive changes both very low and very high category has same percentage having 11.11% each of total GPUs. The same pattern is also found in the case of low (10 - 20%), medium (20 - 30%) and high (30 - 40%) category positive changes have only 2.22% each of total GPUs. The negative changes are found in the traditional cardamom growing belt in Ravongla Sub-division. The very low negative growths has constituted around 9% of the total Gram Panchayat units and are recorded in the Gram Panchayat of Lingi, Damthang, Poklok, Denchung and Melli-Mellidara. But the low and medium category negative change has equal percentage having 4.44% each. The earlier one is recorded in the Ravongla and Maneydara and the letter one is recorded in Ben and Tingrithang. The high negative growth is found in five GPUs which altogether constitute more than 11% of the total Gram Panchayat units. Another 25% GPUs are in the category of very high negative changes. Of which four GPUS are in Namchi and seven are in Ravongla Sub-division.

The large cardamom crop area in the South District has the following underlying characters. High positive growth is registered in the traditionally low cultivated Gram Panchayat of Singithang, Temi and Maniram -Phalidara. The percentage of non cardamom cultivated area is very high in comparison to other crops as the physio-climatic conditions does not favored in most of the these Gram Panchayat , those are located in the river valley where the rice cultivation is dominated. This decreasing trend is due to the factors like frequent hailstorm and diseases which strike the crop area and the fluctuation of market price of the cardamom crop. These factors lead the farmers to changes cardamom cultivated area into the cultivation of Ginger, Potato, Maize, Broom and Horticultural Crops.

## 4.2.8 Ginger

Ginger is the second most important cash crop of the South District. Unlike cardamom, ginger can be cultivated in all the climatic conditions, especially up to 1500mt from mean sea level with partial shade. A uniformly distributed rainfall of about 2100 mm annually is very suited. A deep well drained loamy rich in humus soil is ideal. Maximum yield can be obtain in fertile black soil in hilly area, but rhizome grown in red soil preferred in local market due to its good keeping quality. In South District ginger is mainly grown as rain feed areas as an annul crop during kharif. It is grown as single or mixed crop especially with maize, soybean and pulse.

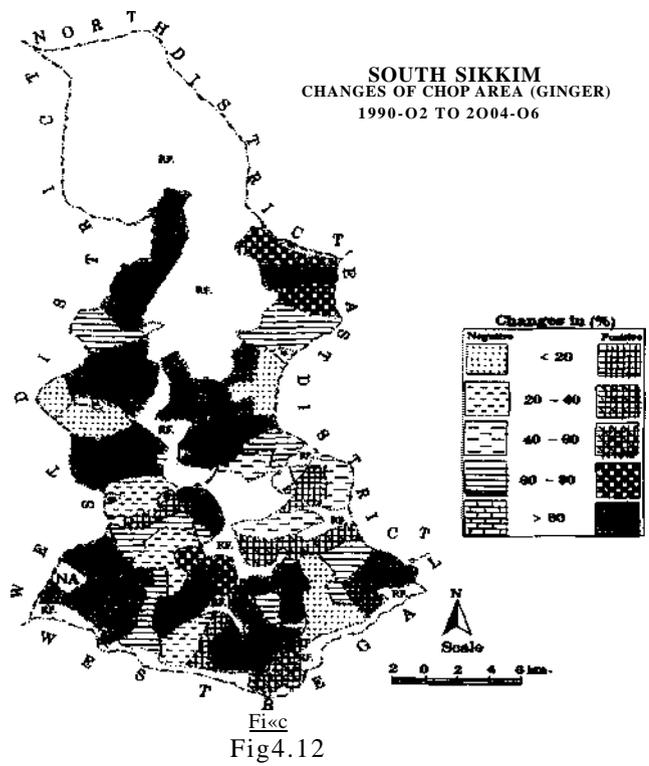
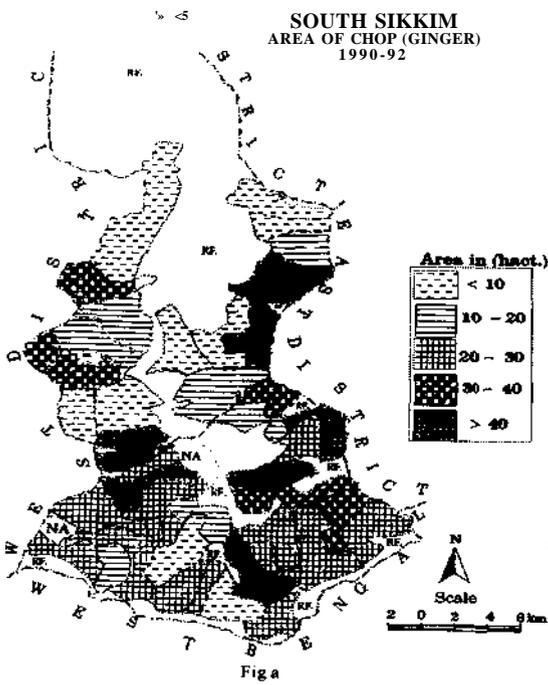
### 4.2.8a Ginger Cropped Area 1990-'92.

Table 4.25 Ginger Cropped Area South District 1990-9'2

Area in Hectare	Category	No of Gram Panchayat unit	Total GPUs %
<10	Very low	9	20.00
10-20	Low	7	15.56
20-30	Medium	14	31.11
30-40	High	6	13.33
>40	Very high	7	15.56
Non Cultivated		2	4.44
Total		45	100.00

\*Source: Crop Area Statistics, Department of Agriculture. Govt of Sikkim. 1990-92

The ginger cultivation in south District is represented by Table 4.25 The very low (<10 hect) category is recorded in nine GPUs having 20% of the total Gram Panchayat units. Most of these GPUs are located in northern, central and southern parts of the district. (fig4.12a). the low (10-20 hect) category has constituted around 16% of the total GPUs, which are found in western parts of the district. Another 14 Gram Pnachayat units are in medium category (20 - 30 hect) having around 31% of total GPUs and are mostly found in Namchi Sub-division, which's comparatively warmer and lesser altitudes than Ravongla Sub-division. There is another six Gram Panchayat units which fall in high (30 - 40 hect) category of ginger cultivation, occupying more than 13% of the total Gram Panchayat units. Out of these six, three GPUs are in Ravongla Sub-division and another three are in Namchi Sub-division. In the very high (>40 hect), there are seven GPUs which constitute almost 16% of the total GPUs. Another two GPUs does not cultivate ginger at all, which has occupied 4.44 % of the total Gram Panchayat units.



#### 4.2.8b Ginger Cropped Area: 2004-'05

Table 4.26 Ginger Cropped Area South District.2004-'05

Area in Hectare	Category	No of Gram Panchayat unit	Total GPUs %
<10	Very low	3	6.67
10-20	Low	11	24.45
20-30	Medium	11	24.45
30-40	High	4	8.88
>40	Very high	15	33.33
Non Cultivated		1	2.22
Total		45	100.00

\* Source: Crop Area Statistics Department of Agriculture. Govt, of Sikkim. 2004-05.

The ginger cultivated area in South District has been increased in 2004-'05 (Table 4.26). The percentage in the very low (< 10 hect) category is decreasing from 1990-92 having only 6.67% in 2004-05 from 20%. But in the low (10 - 20 hect) category it shows an increasing trend having recorded almost 25% in 2004-'05 from 15.56% in 1990-'92. Most of these GPUs are found in the southern parts of the district. Another 25% are in medium category (20 - 30 hect). The high (30 - 40 hect) category has occupied around 9% of the total GPUs; these are found in the western parts of the district. In the very high (> 40 hect) category the percentage is also increasing having more than 33.33% in 2004-05 from 15.56% in 1990-92. The GPUs which fall in the category are found in south and south-western parts of the district (fig 4.12b).

#### 4.2.8c Changes of Ginger Cropped Area (1990-'92 to 2004-'05)

Table 4.27 Changes of Ginger Cropped Area 1990-'92 to 2004-'05

Changes in %	Positive Changes	Total GPUs (%)	Negative Changes	Total GPUs (%)
<20	2	4.44	4	8.89
20-40	2	4.44	3	6.67
40-60	1	2.22	3	6.67
60-80	3	6.67	7	15.56
>80	19	42.22	Nil	0.00
Total	27	59.99	17	37.56
Non cultivated	1 GPU	2.22		

\* Source: Crop Area Statistics, Department of Agriculture, Govt of Sikkim. 1990-92 & 2004-05

The table 4.27 reveals the underlying nature in the changes of ginger cultivation area in South District. Out of the total GPUs around 60% has registered in positive changes, whereas the negative changes is around 33% of the total GPUs and non cultivated has only 2.22% of the total GPUs. This fact shows that ginger

cultivated area in the South District is increasing. The very low (<20%) and low (20 - 40%) positive changes have same percentage having 24.45% each of the total GPUs. The medium positive (40 - 60%) has recorded in Melli-Mellidara. Around 7% of the total GPUs has registered high (60 - 80 %) positive changes. But the highest positive changes is recorded in the category of very high (>80%) having around 43% of the total GPUs. These GPUs are well distributed in western, central and southern parts of the district.

The very low negative change (>20%) has recorded around 9% of the total GPUs. But low (20 - 40%) and medium (40 - 60%) negative changes has same percentage having around 7% each of GPUs. The former are found in the western parts of the district and the later area is located in eastern parts of the district.. There is not a single GPU in high (60 - 80%) negative change. But in very high (>80%) negative changes has more than 15% of the total GPUs (fig 4.12c)

The area of ginger cultivation like pulse, maize, and potato is increasing for the last 15 years. The increase is may be due to the various reasons > Some of the important factors are, for ginger cultivation no intensive labour is require, suitability of physio-climatic condition, fetching of higher price in local market and low capital inputs has encourage in the increased of ginger cultivation area.

#### **4.2.9 Vegetable**

Vegetable is high labour-cum-capital intensive in nature and high pay off crops, pays a unique role in the health and economy of the farmers (Duttal993). With the increasing use of organic farming in the State, the demand for locally cultivated vegetable in the local market is also increasing. Besides, out of the four district of the state, South District is the largest producer of vegetable crops. It may be due to suitability of its micro-climatic and physical conditions.. Various types of vegetable crop are cultivated in the district. They can be classified into three groups viz, kharif vegetables, rabi vegetables and off season vegetables. The important varieties of kharif vegetables are lady finger, gourd, brinjal, capsicum, chilly, cucumber, pumpkin, radish, tomato, tree tomato, turmeric, beans, nettle, edible fern etc. and important varieties of rabi vegetable are, cabbage, cauliflower, carrot, onion, peas, spinach, mustard etc. The important off season vegetables are spring onion, bamboo shoots, garlic, asparagus and mushroom etc.

#### 4.2.9a Vegetable Cropped Area 1990-92

Table 4.28 Vegetable Cropped Area South District. 1990-'92

Area in Hectare	Category	No of Gram Panchayat unit	Total GPUs %
<10	Very low	7	15.56
10-20	Low	6	13.33
20-30	Medium	9	20.00
30-40	High	6	13.33
>40	Very high	17	37.78
Total		45	100.00

\* Source: Crop Area Statistics, Department of Agriculture, Govt, of Sikkim. 1990-92.

Vegetable crop area in South District in 1990-'92 is represented by (Table.4.28) In the very low (<10hect) category of vegetable cultivation area has occupy around 16% of the total Gram Panchayat units. These GPUs are located in north-eastern and eastern parts of South District. Another 13% of the total GPUs are in the category of low (10-20 hect) and are found in western parts of the district. The medium (20 - 30 hect) category have 20% of the total Gram Panchayat unit and are mostly found in the central parts of the district. The high (30 - 40 hect) category also has the same percentage as low category having 13% of the total GPUs and these GPUs are located in north-western parts of the district.(fig 4.13a). The very high (>40%) category vegetable cultivated has highest percentage amongst all the category of vegetable crop area having around 38% of total GPUs. These GPUs are mostly concentrated in South and south -eastern parts of the district.

#### 4.2.9b Vegetable (dropped Area 2004-'05.

Table 4.29 Vegetable Cropped Area, South District. 2004-'05

Area in Hectare	Category	No of Gram Panchayat unit	Total GPUs %
<10	Very low	2	4.44
10-20	Low	16	35.56
20 - 30	Medium	12	26.67
30-40	High	8	17.78
>40	Very high	7	15.56
Total		45	100.00

\* Source; Crop Area Statistics. Department of Agriculture. Govt, of Sikkim.2004-05.

Table 4.29 represents the picture of vegetable crop area in South District during 2004-'05. The very low (<10 hect) category has more than 4% of total GPUs which is lesser than the base year 1990-'92. But the low (10 - 20 hect) category has

the highest percentage amongst all the categories in 2004-05 having around 36% of total GPUs. Most of these GPUs are located in western parts of the district. Around 27% of the GPUs are in the category of medium (20 - 30 hect) vegetable crop area. Almost 18% of the total GPUs are under the category of high (30 - 40 hect) vegetable

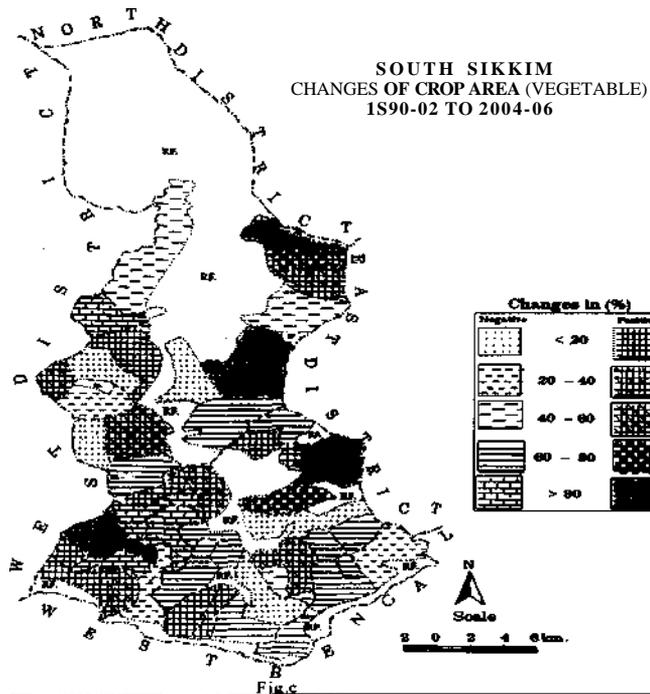
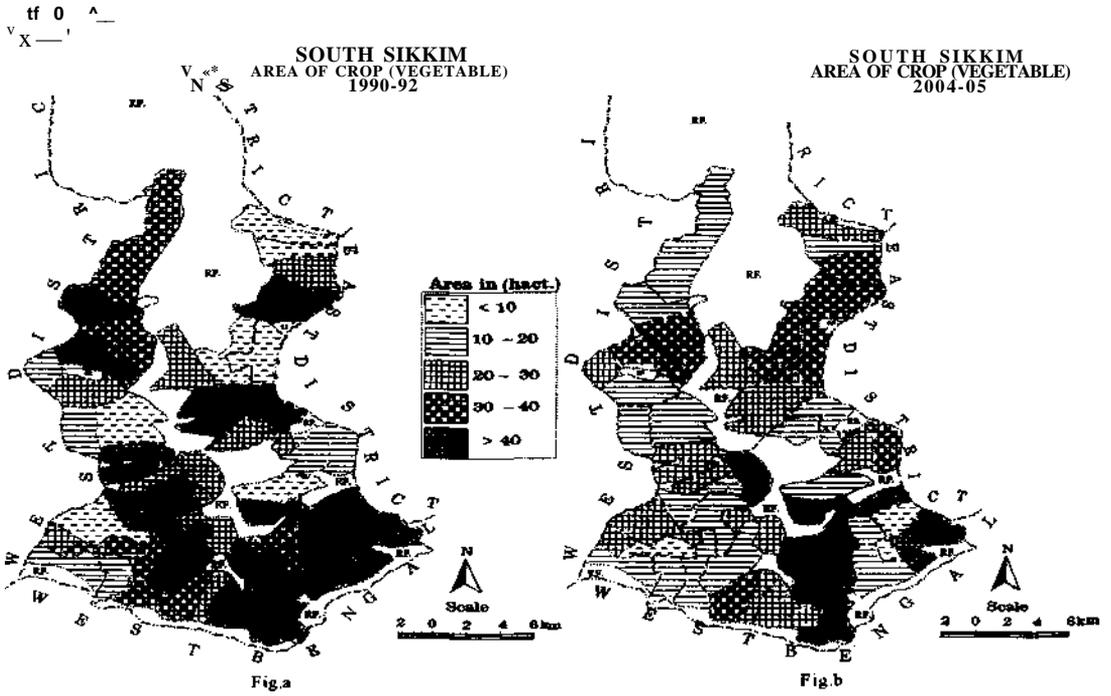


Fig4.13

cultivated area which is mostly found in western parts of the district. The very high (>40 hect) category has only 16%, which is lesser than the base. Most of the GPUs, which fall under this category, are situated in south-western parts of the district (fig 4.13b)

#### 4.2.9c Changes of Vegetable Cropped Area (1990-'92 to 2004-'05)

Table 4.30 Changes of Vegetable Cropped Area South District 1990-92 to 2004-05

Changes in (%)	Positive Change	Total GPUs (%)	Negative Changes	Total GPUs (%)
<20	7	15.56	5	11.11
20-40	5	11.11	3	6.67
40-60	2	4.44	3	6.67
60-80	1	2.22	9	20.00
>80	6	13.33	4	8.89
Total	21	46.66	24	53.34

\* Source: Crop Area Statistics, Department of Agriculture, Govt, of Sikkim. 1990-92 & 2004-05

Vegetable cultivated area in South District is changing but not in positive direction but in negative direction as the percentage of changes has more in negative changes than positive changes having 53% and 46.66% respectively. The very low (<20%) positive changes has been recorded in seven GPUs constituting around 16% of the total GPUs and these GPUs are Barfung, Tingrithang, Chisopani-Tinik, Salghari, Tarku, Longchuk-kamrey and Suntaley-Sadam. Another 11% are in the category of low (20 - 40%), which are mostly found in the GPUs of Paiyong, Lingzo-Likship, Gom, Rabitar-Bikmat and Damthang. There is only two GPUs which are under the medium (40 - 60%) positive changes and recorded in Pamthang and Naya - Mangzing. Another a single GPU is in the category of high (60 - 80%) positive changes i.e. Rameng-Nijameng. More than 13% are under the category of very high positive changes.

The very low (<20%) negative change has been recorded in five GPUs which occupied more than 11% of the total GPUs. But low (20 - 40%) and medium (40 - 60%) category negative changes has 7% each and mostly found in northern and south-western parts of the district. Where as, the high (60 - 80%) negative changes has the highest percentage amongst the negative changes having 20% of the total GPUs. They are mostly situated in the traditionally vegetable dominated areas of southern parts of the district. In the case of very high (>80%) negative changes, there are only 9% of the total GPUs and these are mostly found in the western parts of the district. (fig4.13c)

The decrease in vegetable crop area is due to various reasons, vegetable crops require intensive labour which is not available in hilly areas like South District and productivity is very low due to the lack of irrigation facility. The availability of large fertile plain is limited due to the sloppy nature of the terrain and this restricts the large scale cultivation of vegetable crops. If available they are engaged for the cultivation of main cereal crop i.e. rice. Another important factor which support the declining of vegetable crop area is the import of cheaper price vegetables from outside the state especially tomato, onion, and other varieties. Although local varieties have higher demand but the low productivity can not meet the local demand. More over the encroachment of kitchen for construction of buildings for dwelling purpose also leads the declining of vegetable crop area.

#### 4.2.10 Horticulture

Horticulture is another important type of land use in the South District. But the economy support by the horticultural production is very meager in the district. The climatic conditions found in the district have favored the cultivation of horticulture. The important fruit crops found in South District are mandarin orange, banana, guava, papaya, mango, peach, plum, pear, avocado, amala, passion fruits etc (Upadhayaya 1998). Among these mandarin orange, avocado and passion fruit are commercially important. If proper planning and technical help are provided horticulture production can be further developed in the district,

##### 4.2.10a Horticulture Cropped Area 1990-'92.

Table 4.31 Horticulture Cropped Area South District 1990-'92

Area in Hectare	Category	No of Gram Panchayat unit	Total GPUs %
<10	Very low	24	53.34
10-20	Low	13	28.89
20-30	Medium	5	11.11
30-40	High	1	2.22
>40	Very high	2	4.44
Total		45	100.00

\*Source: Crop Area Statistics. Department of Agriculture. Sikkim. 1990-92.

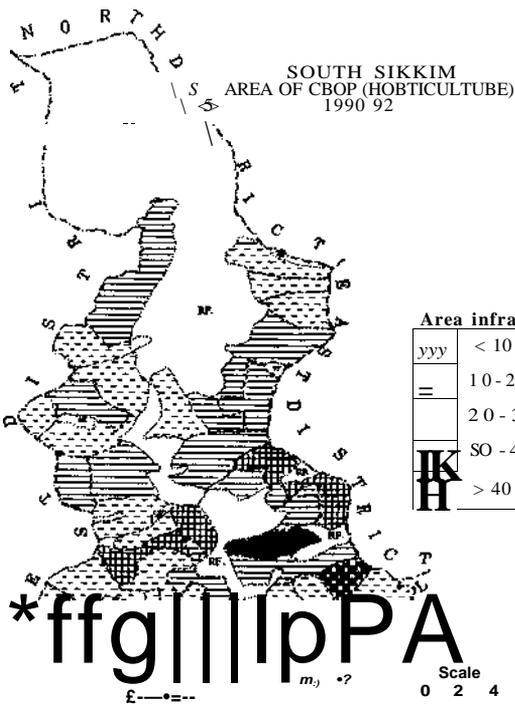


Fig.a

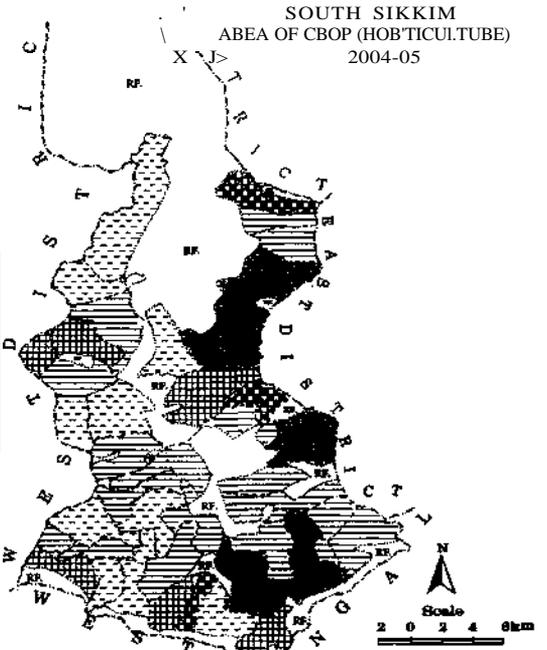


Fig.b

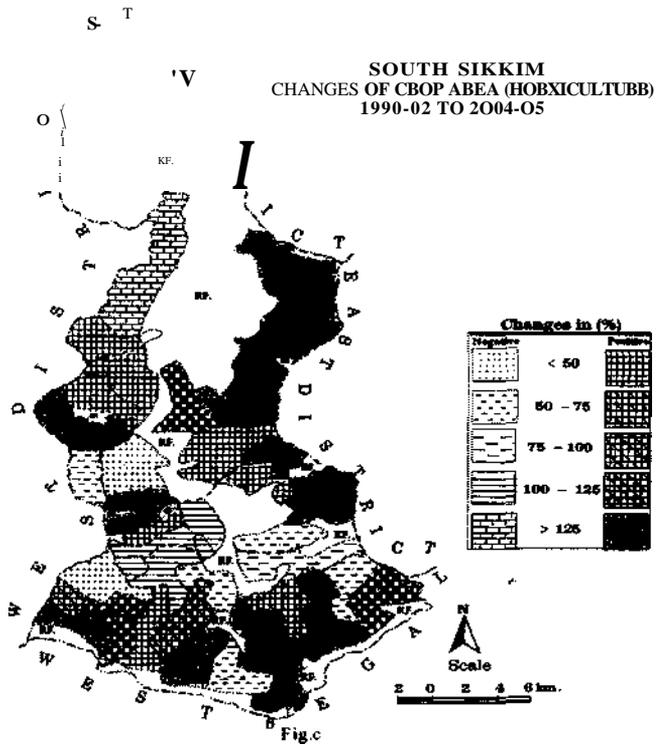


Fig4.14

Horticulture crop area in South District in 1990-92 is very low (Table 4.31). The very low (<10 hect) horticulture crop area has almost 54% of the total GPUs and these are mostly concentrated in western, south-eastern and south-eastern parts of the district. Whereas the low (10-20 hect) has lesser share having around 29% and these GPUs are found in eastern and north-western parts of the district. Another 11% is under the category of medium (20-30 hect) but the high (30-40 hect) and very high (>40 hect) categories have low percentage having only 2.22% and 4.44% respectively. Maneydara Gram Panchayat unit is in the category of high and Turuk-Ramabung and rameng-Nijameng is in very high category (fig 4.14a).

#### 4.2.10b Horticulture Cropped Area 2004-'05.

Table 4.32 Horticulture Cropped Area .South District. 2004-'05

Area in Hectare	Category	No of Gram Panchayat unit	Total GPUs %
<10	Very low	10	22.22
10-20	Low	18	40.00
20-30	Medium	6	13.3
30-40	High	3	6.67
>40	Very high	8	17.79
Total		45	100.00

\* Source: Crop Area Statistics. Department of Agriculture. Govt, of Sikkim.2004-05

The horticultural crop area in South District is changing in 2004-'05. (Table 4.32) The percentage in very low (<10 hect) category is decreasing as it was 54% in 1990-92, but becomes 22% in 2004-05. And the percentage in low (10-20 hect) category is increasing from 29% in 1990-92 to 40% in 2004-05. Most of these GPUs are located in the central parts of the district. An increasing trend is also observed in medium category (20-30 hect) having around 13% from 11% in 1990-92. Around 7% of the total GPUs are in the category of high (30-40 hect) horticulture crop area and they are mostly concentrated in the north-eastern parts of the district.(fig 4.14b). Another 18% are under the category of very high (>40 hect).

#### 4.2.10c Changes of Horticultural Cropped Area: (1990-'92 to 2004-'05)

The horticultural crop area in South district has high positive changes. Most of these changes are found in the south-western and north-western part of the district. (fig 4.14c)

Table 4.33 Changes of Horticultural Cropped Area, South District 1990-'92 to 2004-'05.

Changes in (%)	Positive Change	Total GPUs (%)	Negative Changes	Total GPUs(%)
<50	7	15.56	2	4.44
50-75	1	2.22	5	11.11
75-100	2	4.44	1	2.22
100-125	4	8.89	3	6.67
>125	19	42.23	1	2.22
Total	33	73.34	12	26.66

\* Source: Crop Area Statistics, Department of Agriculture Govt, of Sikkim.1990-92&2004-05

Table 4.33 reveals the silent feature of changes in horticultural crop area. The positive changes has more than 73% of the total GPUs, where as the negative changes has around 27% only. Out of the positive changes, very low (<50%) category has around 16% of the total GPUs which are registered in western and eastern parts of the district. But low (50 -75%) category changes has found in one GPU i.e. Tangji-Bikmat having only2.22% of the total GPUs. Another two GPUs are in the medium (75 - 100%) category, which occupy only 4.44 of the total GPUS. Around 9% of the total GPUs are under the category of high (100 -125%). But the highest positive changes is recorded in the very high (>125%) category accounting more than 42% of the total GPUs.

Out of the total negative changes, the very low changes (<50%) has only 4% of total GPUs and are found in the GPUs of Tinkitam-Rayong and Poklok-Chemchey. Another five GPUs or more than 11% are under the category of low (50 - 75%) negative change and these are located in the eastern parts of the district. The medium (75 - 100 %) negative changes has only 2.22% having aGPU i.e. Perbing-Chuba. But high (100 -125%) negative changes has found in three GPUs which together account almost 7% of the total GPUs and another one GPU is in the very high (>125%) negative changes i.e. Pamthang GPU.

The high positives changes of Horticultural crop area in South District, is due to the various reasons. Most important among them is the low intensive labour requirement, the favorable physio-climatic conditions, positive policy of government like incentives for horticultural growers and distribution of seeding plants on free of cost as well as proper training of farmers, Besides local market for the horticultural product is very high. The establishment of of squash factory in the state itself has also help the increased of horticultural crop area. This is another area of agricultural activities where further development prospect exists.

## CONCLUSION

The areas often selected crops are changing. Out of the ten selected crops viz. rice, pulse, oilseed, potato, ginger and horticultural has shown positive changes. The remaining crops like wheat, maize, cardamom, and vegetable shows decreased in crop area. The decreases are due to various factors, like low productivity and high intensive labour in the case of wheat, encroachment of maize cultivated field, low market price and changing of food habits e.g. ten years back most of the native use to take meal by mixing rice with maize and it is one of the favorite staple foods, but today there is harcty and family who took this type of food as main meal. Besides, the use of maize as feeds for domestic animal are also decreasing due to the readily availability of artificial feeds more over lack of proper planning and policy cause negative changes of these crops. Another important factor for decreased of these area is the encroachment of crop field in the name of infrastructural development and urbanization, urbanization leads to the encroachment of cultivated land as well as transfer of water and labour for non agricultural purpose. All of these crops require large field for cultivation, ultimately these crop area has to be diverted for infrastructural development like construction of roads, market place, housing, hospital, schools etc. The fragmentation of land holding also leads to the decreased of crop areas, as most of these crops are cultivated in gentle slopes. Besides, changes of socio-economic and cultural out look also help the decreased of crop area because of farmers have to cultivate only high market demand crops for profitable as the crop insurance system is not here, ultimately farmers has to shift to the profitable crops. Where as the positive changes are due to the less labour intensive require and lack of irrigational facility, in the crops like pulse, oilseed, potato and ginger which can be cultivated in low soil moisture conditions. The entire positive changes crops require less moisture in soil, which is prevails in South District. This means extra irrigation facility is not required as means of irrigation is very difficult in hilly slope terrains. These crops can be cultivated in rain feed areas without extra efforts. High local demand and higher market value and non perishable nature of the crops leads to increased in crop area. Crops like pulse, potato, and oilseed did not require specific preservation facilities, after harvesting they can be store by using simple traditional methods of storing.

The summary that derived from the discussion is that, the district is also facing the problems of hilly and mountainous farming characteristics of free and over grazing due to lack facility, small land holding, short growing seasons, predominance of traditional cropping system, poor quality of local live stocks, lack of good and nutritious fodder, over and under exploitation of soil condition, lack of scientific methods of cultivation, low degree of diversification and over dependence upon the rain feed cultivation.