

CHANGING AGRICULTURAL PATTERN AND ITS IMPACT ON LAND USE IN SOUTH DISTRICT OF SIKKIM

A Thesis Submitted for
Doctor of Philosophy in (Science)
Geography-

Submitted By
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TO WHOM IT MAY CONCEREN

I am pleased* to certify that Shri B. Anil Kumar Sharma a Private Research Scholar is known to me for the last five years and he has been working for his Pr D. Thesis entitled "*Changing Agricultural Pattern and Its Impact on Land Use in South District of Sikkim*" under my guidance for the degree of Ph.D. in Geography and Applied Geography, University of North Bengal. He prepared the Tresis on the basis of data and information collected from primary and secondary sources by intensive field visits in his area under study. The Thesis is ar original and it is ready for submission to the University for Evaluation. He is sincere, hardworking and methodological in his work. He bears a good moral character.

I v/ish his success in his future life.

D rte : 15.04.2008

(Prof. M.M.Jana)
Supervisor

PREFACE

The study of land use with special reference to the agriculture is one of the important areas in the field of land use study. Out of the various type of land use, agricultural use has occupied more prominent position in the hilly area like South District

The South District of Sikkim occupies a unique position in the land utilization especially in terms of agricultural practice. The district is smallest amongst the four districts of the state, but has the second highest density of population. But the pace of infrastructural development has encroaches the good agricultural land and converted for other uses. In reality in the state 7000 hectares of agricultural and culturable land has been converted for the infrastructural development and urbanization process. The consumption of better agricultural land for purpose of urbanization is, thus, a great danger to the farmers; because the land withdrawn from agricultural use is either never returned to the farmers or even returned, it is so done only after a long lapse of time (Stapledon, 1940). This situation leads to the decreasing of agricultural land.

The scope of the present study to find out the underlying problems of the land use in relation to the conversion of good agricultural land to other use, which determined by the social needs and cultural advancement of the people of the district. The districts economy is entirely base on the agriculture. In the district good agricultural land is losing due to the infrastructural development on one hand and the changing to organic farming on the other influence the land use pattern and productivity of the land, which adversely affect to the economy of the district. These arises the need of appropriate remedial measures which can solved the underlying problems, otherwise the importance of agriculture will end as a mainstay of the economy of the district.

The work commence with the first chapter, which deals with the physical back ground of the study area. As the agricultural practice is control by host of physical factors such as, geology, relief, drainage, drainage

density, climate, soil and vegetation. This chapter deals with all the physical aspects of the study area.

The second chapter deals with demographic characteristics of the study area i.e. the population number, their growth, density of population, composition, workers participation in agriculture, literacy, age-sex structure and dependency ratio as all these directly and indirectly affect to the development of agricultural utilization of land.

The third chapter deals with general land use pattern, net sown area, cultivated land, culturable waste land, fallow land, forest cover, pasture land, area not available for cultivation, build up area, irrigated area and trend of their changes for the last fifteen years.

The fourth chapter deals with the changes of total crop area and its changes. Out of the total crops cultivated in the district ten crops i.e. maize, rice, wheat, pulse, oilseed, potato, ginger, cardamom, horticulture and vegetables crop area and their changes are studied for and their impact on agricultural development

The fifth chapter deals with the cropping pattern, crop concentration, crop combination, diversification, efficiency, productivity level and feature prospects of suitable combination were discuss.

The sixth chapter deals with the availability of infrastructural facilities for the agricultural development in the district viz. educational facility, health care facility, transport and communication, market, rural development, co-operative societies, financial institutions, and agricultural inputs are discuss in the chapter.

The seventh chapter deals with the identification of major problem for agricultural development in the district. The problems can be divided into three types, firstly physical problems mainly deals with topography, soil fertility and erosion, deforestation, rainfall sun shine, secondly institutional problems deals with land right and ownership, size of holding, land tenure, labour, mechanization, irrigation and financial inputs etc. The third socio-cultural problems deal with the constraints arising from the changes of socio-cultural outlook of the farmers.

The eight chapter deals with the review of the earlier, present and future strategy introduce for the agricultural development and their pitfall etc.

And finally the ninth chapter comprise of the problem based development strategy, suggestion and conclusion.

B Anilkumar Srtarma

ACKNOWLEDGEMENT

The agricultural peasant life in the hilly and mountainous areas, their adaptation and co-existence with the harsh physical conditions, their traditional practice of agriculture without disturbing complex ecological balance, traditional values of food crops, and their economic conditions has always attracted and fascinated me. I had to travel a lot during the course of study. I also had to prepare interview transcripts and notes from field visits and personal records, official records, reports, journals, periodicals, monograph and have to interview officials of various departments as well as individual farmers. It was truly mammoth tasks to distil the essence from my researches to fit into the limited space available to me. Personally I can say, it has been a very enriching and memorable trip to mingle with luxurious farming community of the district.

I am indebted to my honorable teacher and thesis guide Dr. Prof M.M. Jana, UGC Emeritus Fellow, Department of Geography and Applied Geography, University of North Bengal, India under whose guidance and supervision I have able to complete the work. Without his constant inspiration, encouragement and suggestions in all level of work, it would have been a quite impossible to carry on the research work and bring the final shape of the thesis.

I am also extremely grateful to my friend and colleagues Sri.Uttam Kumar Upadhyaya, Lecturer in English, Namchi Government College, for correcting the manuscripts in spite of his busy scheduled.

I am grate full to the officials of Agriculture, Horticulture, and Land Revenue and Disaster Management Department specially; L.N. Pradhan (Retired) Joint Director Department of Agriculture and food security, for providing necessary data, reports, documents and literature for the completion of my works.

My special thanks to my father Mr.B. Brajabihari Sharama and mother Mrs. B. Jamuna Devi, who have been a constant source of strength and encouragement.

Finally, I owe a deep dept of gratitude to my wife Mrs Susma Tamang, Primary Teacher, Govt .of Sikkim who have^ been a paragon of patience, dedication and sparing me from house hold responsibilities and my two daughters Miss B. Archana Sharma and B. Karina Sharma for their understanding me. My family members are true the pillars of my success without their supports it is impossible to complete the thesis. All of my success is dedicated to them.

B Anil Kumar Sharma

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GLOSSARY

Bustywala	=	Villager
Kutiadar	=	Tenant (yearly lum-sum amount)
Adiadar	=	Tenat (Half the product)
Charey	=	Tenat (on leased)
Chu	=	River or Stream
Duko	=	Tender butts of Mustard Plant
Kinema	=	fermented soybean
Hat	=	Weekly market
Kazi	=	Landlord
CCTI	=	Central Computer Training Institutes
NIC	=	National Informatics Centre.
CIC	=	Community Information Centre
SISCO	=	Sikkim Co-operative Bank Limited
AIBP	=	Accelerated Irrigation Benefit Programme.
ITD	=	Innovation in Technology Dissemination
NATP	=	National Agricultural Technology Project
ATMA	=	Agricultural Technology Management Agency
SREP	=	Strategic Research Extension Project
AES	=	Agri-Ecological System.

INTRODUCTION

Land use may be defined as the land where the human activity are involved on a specific point at a given time and space. Land is primarily used for crops, forest, pasture, mining, gardening, and residential, industrial and commercial purposes.

Land use is also related to conversion of land to one major use to another general use. Land use changes to fulfil man's need. Stamp (1948) classified the needs of man into six major categories viz. the need of wood, house, food, transport, communication, defence and recreation. To fulfil his needs man utilized the land, the need of food means conservation of good agricultural land for production of food and cash crops. The land has to be satisfied the basic need of man i.e. shelter in various forms as build up area. Again, the land has to be satisfied the need of transportation and communication. Besides, land is used for recreational use in the shape of parks, playground, garden, pasture, forest and clubs etc. Above all, use of land in the modern context of human survival, and conservation of land as natural resource are the prime needs. It has to protect and conserved as apart of environment as well as for future generation also.

To meet the increasing demand of food for an increase of population, land was to be use very carefully and judiciously, here arise the concept of land use capacity, its refers to the ability of any given piece of land resource to produce a net returned above the production cost associated with its use. Spatial distribution of land cover information and its changes are desirable for any planning, management and monitoring programmes at local, regional and national level, especially in grass root level. The information not only provide a better understanding of land utilization aspects but also play a vital role in formulation of policies and programmes required for developmental planning. Planning means the assessment for future use and making provision for it, for increasing sustainable development. It is necessary to monitor on going changes in land use pattern and land cover area over a period of time.

So, the study of changing land use pattern and its impact on agriculture in South District is the prime concerned to the present study. The increasing population pressure leads to judicious and cautious use of land. More over changing socio-economic conditions leads to changes in the land use pattern.

LOCATION MAP OF SOUTH DISTRICT

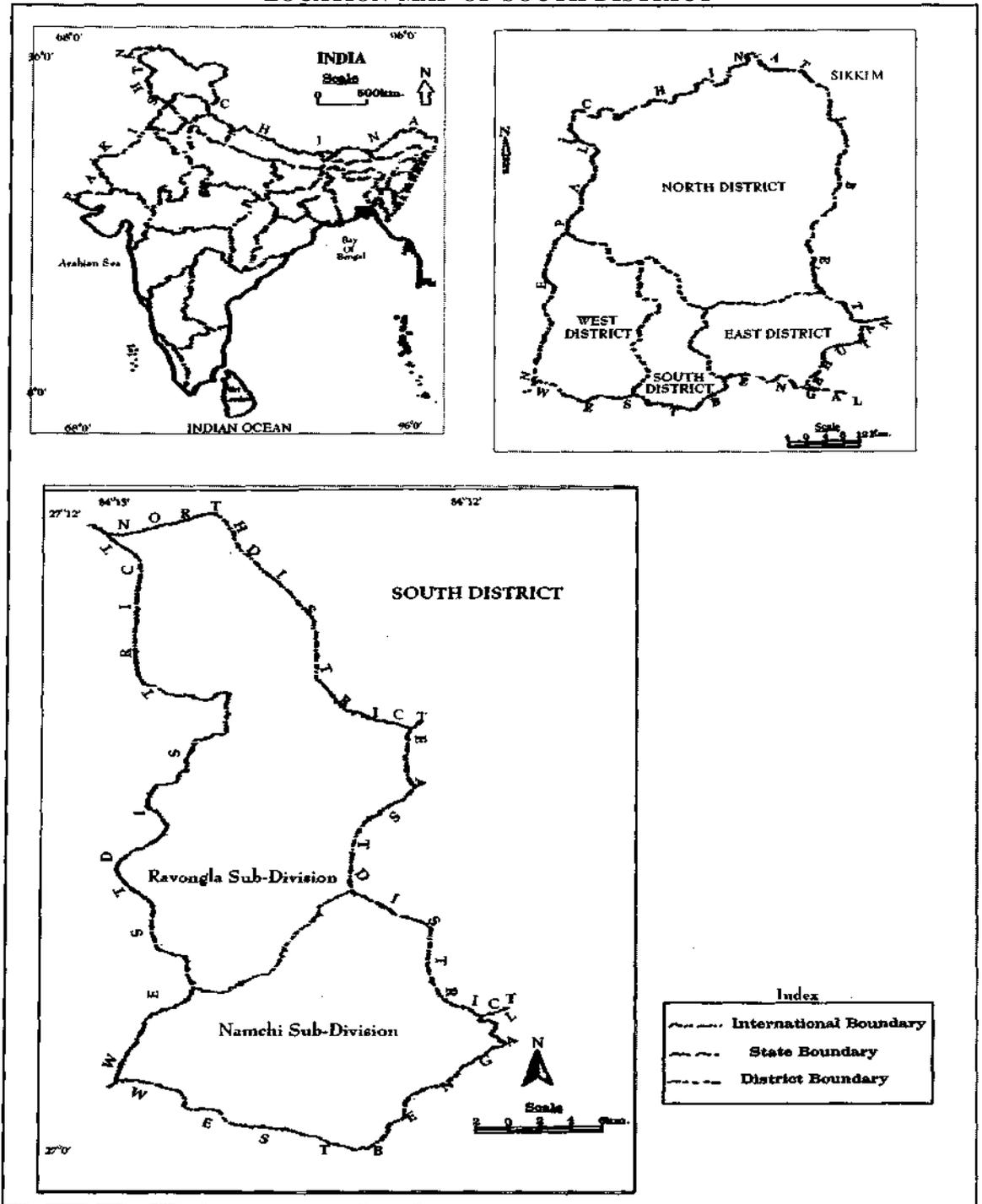


Fig 1

The study area i.e. South District of Sikkim is located in the inner parts of Great Himalayan Mountain system. Extending from $84^{\circ}.15'E$ to $84^{\circ}.22'E$ longitude and $27^{\circ}.00' N$ to $27^{\circ}.12' N$ latitude bounded by three district of Sikkim i.e. East, North and West District in the east, north and west. In the south, it is also bounded by northern parts of West Bengal. The district is distinctly skirt by two mighty river

systems of Sikkim i.e. Tista in the East and Rangit in Western and Southern part of the district. The district is comprises of two sub-division, viz. Namchi and Ravongla. (fig.1a)

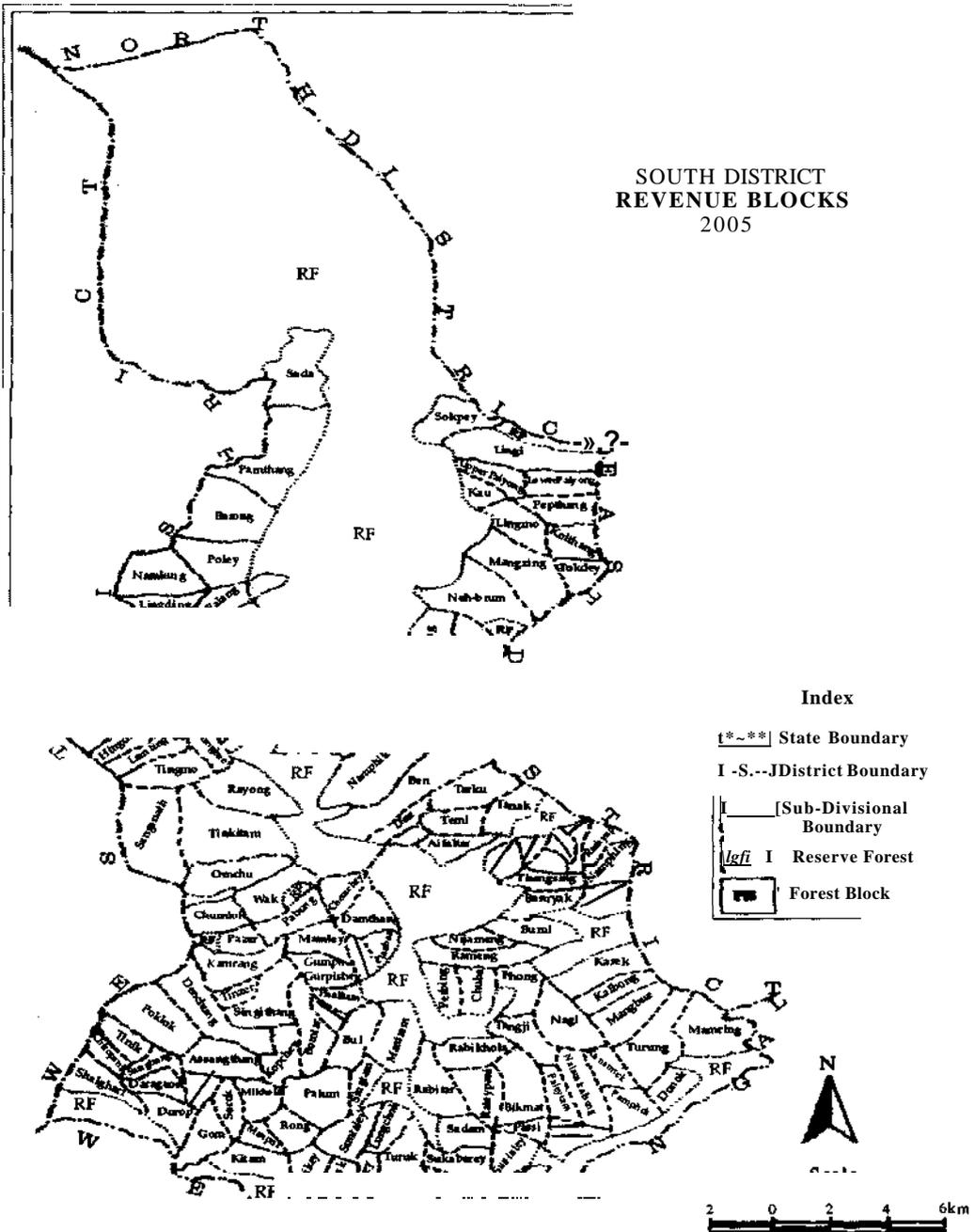


Fig 1a

PURPOSE OF THE STUDY

The South District is the smallest one out of the four district of the Sikkim, but is the second highest populated district of the state having 1,31,506 population (2001

census). It means the district accommodates 25% of the total population of the Sikkim. The density of population in this district is 175 persons per km². Out of the total area of the district nearly 40% is occupied by the forest and the remaining is use for different purpose. So it is very interesting to study the changing land use pattern and its impact on agriculture of the district.

The district selected for the study draws its importance for the following reasons:

1. Large scale changes took place in the land use pattern of the district due to large scale migration of the people from other three district of the state and as well as from the other neighboring states and country.
2. Large scale unplanned sprawling of urban areas in vertically and horizontally leads to an encroachment of rural and forest fringe which adversely creating problems for future planning.
3. Owing to its location in hilly area, landslides create havoc to the people and ultimately disturbing the socio-economic and environmental conditions and affecting land use pattern.
4. High dependency rates on the forest resource for fuel, woods, foddors, and other purposes leads to exhaustion of forest, land resources which ultimately causing soil erosion and environmental degradation.
5. The forest protection and soil conservation practice are inadequate.
6. The increase of population and expansion of settlement leads encroachment of the forest land and cultivated fields. These affect the catchments areas which supplied water for domestic consumption and agricultural purpose. Most of the important towns of the district namely Namchi, Ravongla, Melli, and Jorethang are severely affected as the deforestation; overgrazing, forest fire and compaction of impede the infiltrations of water into the soil. Most of the revenue blocks are facing chronic water shortage during the dry season not only to the population but also causes draught condition for cultivation.
7. Agriculture and horticulture which is the main back bone of the district are poorly developed due to lack of scientific methods of cultivation. All these problems are necessary to investigate properly and their analysis is required for future suggestion and planning.

OBJECTIVE OF THE STUDY

The present study is an attempt to provide an intergraded study of changing land use pattern and its impact on agriculture in the South District of Sikkim.

The main objectives are:

- (i) To study the physical background of the study.
- (ii) To study the population characteristics and its dependency on the natural resources.
- (iii) To find out the general land use pattern in the District.
- (iv) To study the changing land use pattern from 1981 onwards.
- (v) To find out the changes in agricultural practice due to the diversification of land uses and modernization.
- (vi). To identify the various problems arising from the changing land use pattern in the case of socio-economic, environmental condition of the district.
- (vii) To assess the land resources and their potentialities for the development and their proper use.
- (viii) To formulate a strategy for the development of land resources and their management.
- (ix) To formulate a integrated development plan for agriculture and allied activities in the study area.

METHODOLOGY

- (i) The present study is only from 1981 on ward only as the reliable data and information is available only after the 1981.
- (ii) Physical aspects of the district are to be studied from Survey of India topographical sheet 78 'A' series with scale of 1:25000. A base map is prepared showing various types of land uses in the district.
- (iii) Various types of secondary data related to agriculture, forest, soil type, build up area, transport, and communication, irrigation and settlement are to be colleted from con concerned department of Govt, of Sikkim. Besides, land holding records and data are also to be collected from District Administrative Office, Namchi
- (iv). Data and literature have also been collected from different libraries, journals and personal experience.

- (v) Available data were computed by scientific calculator and computer and the result have been analyzed for obtaining the explanation and conclusion
- (vi) Comparison will be done with the collected data and the base map with primary data map prepared form top sheet.
- (vii) Field survey will be done for selected revenue blocks/villages.
- (viii) Maps and models have been drawn using different cartographic techniques and computer to illustrate the data and information in maps and diagrams.
- (ix) Lastly photographs were taken to pin points the different types of agricultural practice and to identify the problems like physical, demographic, socio-economic condition associated with agriculture.

HYPOTHESIS

The South District is divided into two Sub-divisions namely Namchi and Ravongla. Land use changes with increase of population and adversely related to man land ratio. To understand the existing problem face by the changing land use and its impact on agriculture, it is necessary to study block wise which is the smallest administrative unit. Besides, problems of environment, socio-economic, transport and communication, trade and commerce and pace of urbanization are also necessary to study about changes because these are related with land use. Land use like forestry, agriculture, expansion of build up area etc, may lead to the degradation of land resources. It is also necessary to find out land use pattern due to increase of population and livestock may exert pressure on land and lead to environmental degradation. Inadequate and irresponsible use of irrigation might turn agricultural land into wasteland. The study of basic amenities i.e. education, medical facility, safe drinking water, communication, facility, market place, entertainment facility, trade and commerce facility are important because these facilities are depended on utilization of land resources and also needed to expand for the future welfare of the society.

LIMITATION

The physical condition and time constraints do not allow conduct such large household survey of the district. So, random samples survey is conducted in every part of the district as far as possible is to be undertaken. The data will be collected as many as possible for the study.

DESIGN OF THE THESIS

The whole work commence with, the identification of location of the district, land use pattern and agricultural practice giving, purpose, objectives and methodology adopted for the study. Then the work commence with the:

1st Chapter: Physical Background of the District.

2nd Chapter: Population Characteristics

3rd Chapter: General Land Use

4th Chapter: Changing Agriculture Pattern and Its Impacts on Land Use

5 Chapter: Crop Production. Concentration, Combination and Diversification

6th Chapter: General Infrastructural Facilities

7th Chapter: Major Problems of Agricultural Development.

8th Chapter: Policies and Strategies of Agricultural Development.

9th Chapter: Suggestions and Conclusion.

CHAPTER-I

PHYSICAL BACKGROUND

INTRODUCTION

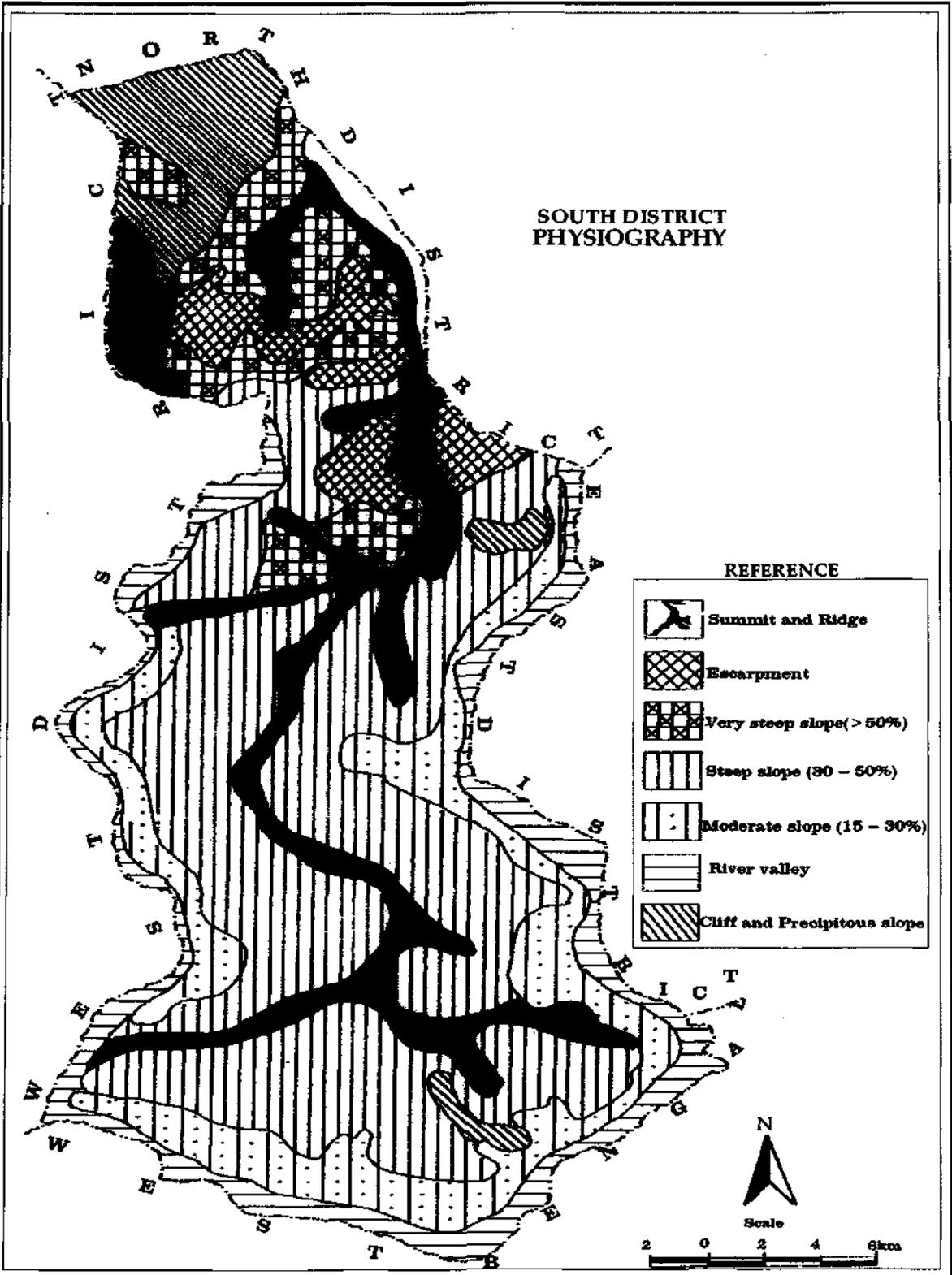
The study of physical back ground is prime importance before further study of any field in a particular area or region, without understanding basic physical back ground, further study of any problem is incomplete. Besides, development and developmental panning of any region is depends up on the understanding the Physical back ground of the region. Like studying of problems in land use, agriculture, settlement, transport and communication etc are entirely depends upon the understanding of the physical set up of the area. It also helps to differentiate the study region from another area.

1.1 PHYSICAL BACKGROUND

The general relief of the district is sloping towards the south from the north. The part is highly elevated with an average of 4600m above the sea level and southern part, mainly the river valley has an average altitude of less than 330m from sea level.(fig1.1) The altitude of the district is consisting of five zones:-

- 1 River valleys (<600m)
2. Lower hills (600m -1800m)
3. Middle hills (1800m-3000m)
4. Alpine (3000m-4000m)
5. Snow bound (>4000m)

The elevation of the district ranges from 300m in extreme south of Rangit valley and Tista valley in east to 5000m in the north. The extreme northern part of the district is snow bound having more than 5000m from sea level covering an area of 55 km². Some part of Alpine zone is also cover by snow, occupying about 70 km² of the total area of the district, having forest and mixed jungles. The middle hills have an area of 160km and lower hills have cover 300km out of the total area of District. The river valley has occupied around 140km². Most of the inhabitant blocks of the district fall in the lower hills which have the altitudinal range of 600m to 1800m, because these areas are favourable for settlement due to low degree of slope which is comparatively easier for agricultural practice.



Source: NATMO.DPS(S)

Fig 1.1

1.1.1 Relative Relief

Relief is one of the important features of the study of physical lay out of an area. While studying the relief of an area relative relief method is usually employed. Relative relief is also termed as amplitude of available relief. It is also an important morphometric variable which is used for overall assessment of morphological characteristics of terrain and degree of dissection. The relative relief of the district has been inversely influenced by the two rivers, and ranges from 330m to 1350m throughout the district. The fig 1.2 shows that the very low relative relief is concentrated in the river valleys. Most of these very low relative relief is occupied by paddy fields. The important settle blocks in this zone are namely Ralong, Likship, Lingmo, Sanganath, Salghari, Majitar and Donok etc. Besides, important forest blocks are also existed in this zone of relative relief viz. Katikey RF. Sumbuk RF. Melli RF. Manning RF. etc.

The medium relative relief (660-990m) are mostly located in Ravongla Sub-division and some pockets in southern part of Namchi Sub-division. The high (990-1330m) relative relief is also mostly concentrated in the Ravongla Sub-division. Here the settlement is very scanty and wide apart; the drainage density is also very high. Again the very high (> 1320m) relative relief is also found in Ravongla Sub-division only. The distribution of relative relief in the district has the following characteristic. The category of very low and low relative relief occupies most of the area of Namchi Sub-division except few pockets of medium and high. In the case of medium, high and very high are concentrated in the Ravongla Sub-division, except some patches of low relative relief.

This character of high and low relief shows the true nature of mountain topography, where the agricultural practice can not be successfully taken up. But the traditional practice of agriculture by the local farmers in accordance with the existing physio-climatic condition is very interesting to study for the further development of agriculture in the district

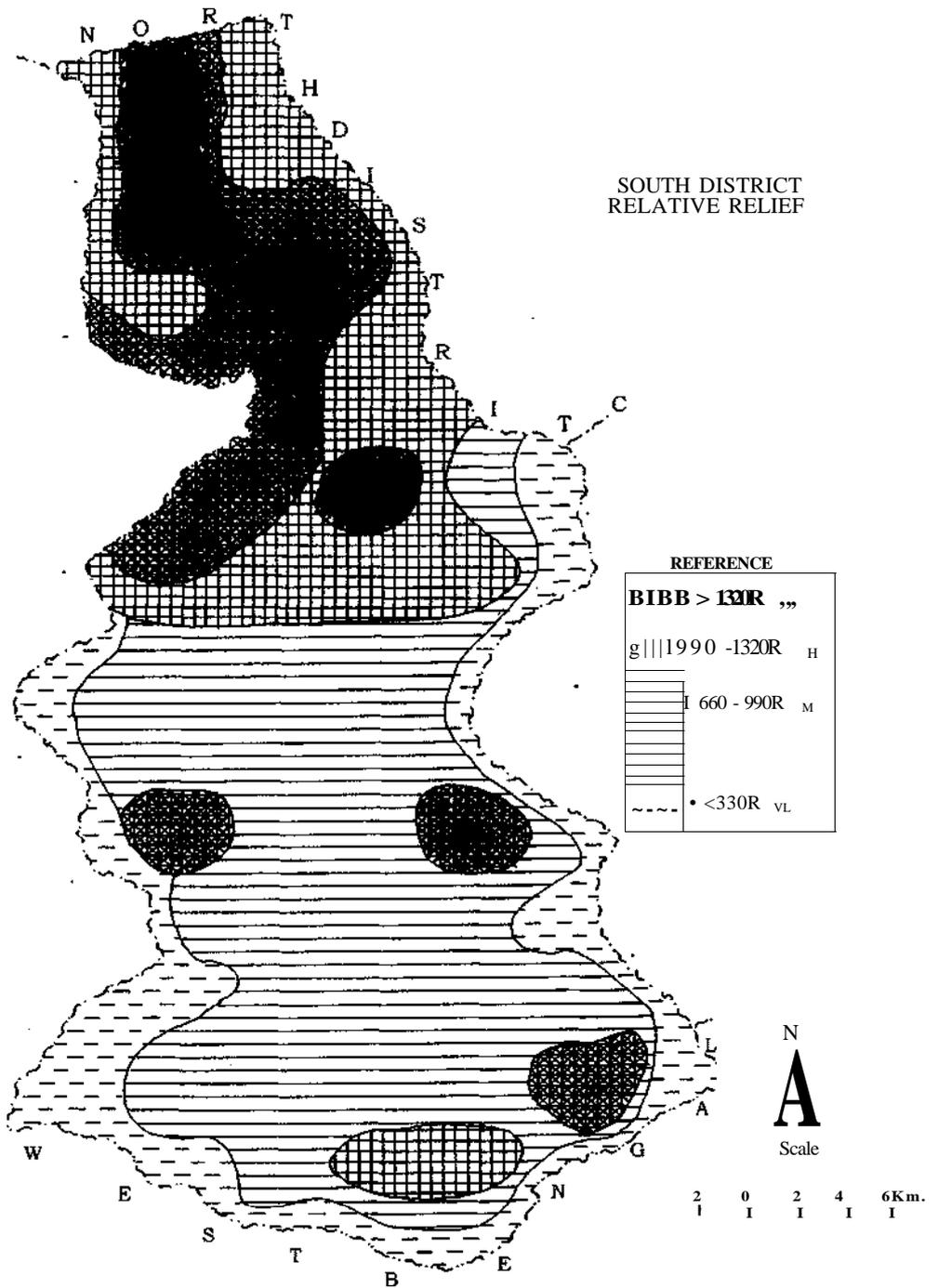


Fig 1.2

1.1.2 Slope of the Terrain

The analysis of slope for any particular area specially, hilly and mountainous region is very important because it plays an important role in the distribution and location of settlement and different socio-economic activities of human being and development of infrastructure, as the gentle slope area favourable for agriculture and settlement, which inversely lead to well development of transport net work and

communication. Again in gentle slope the formation of soil is higher than steep slope and erosion is very high and very difficult to agriculture and allied activity. So, the slope and their nature of formation and extent play a dominant role for determining the livelihood pattern of a particular area.

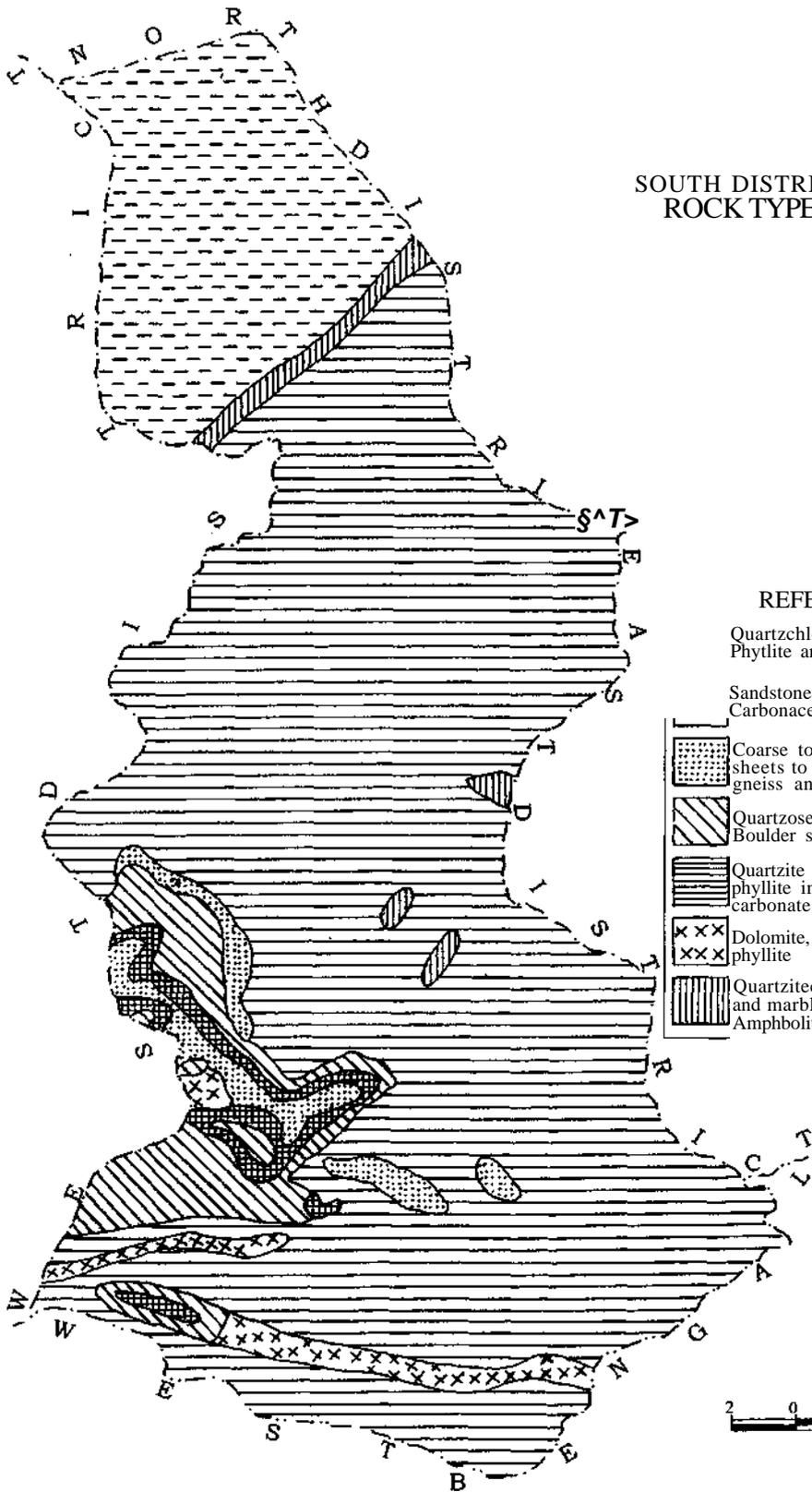
South District of Sikkim has symmetrical valleys, spurs, escarpment, ridge, summit cliff, precipitous slope, and free face with talus slope below like and mountainous region of the world. In the district the slope varies from 80m per km to 600m per km. Fig 1.1 reveal that slope category more than 600m per km as summit and ridge is concentrated in central part extending from north eastern parts of the district to south like a parallel range dissecting the district in to two parts, further this ridge is separated into two limbs, one going towards the south west and another one towards the south east covering an area of 170 km². Another area where the slope is more than 600m per km² is found in north western part over looking the Rangit River, beyond this area cliff precipitous slope are exist up to the extreme northern part of the district . The slope category between 300 and 600m per km² is mostly found in northern and central part of Ravongla Sub-division as escarpment; here the slopes are more than 50% covering about 100 km². Both the area is not suitable for human settlement reserve forest is mostly found in this area. In the slope category of 150-300m per km are exist surrounding the ridge which exists in the central part of the district occupying about an area of 340 km² where the slope is 30-50%. In the slope category of 80- 150m per km both the river valley of Rangit on west and south and Tista in the east fall, where the slope is 15-30% having an area of 140km² but supporting the maximum population of the district. The less than 80m per km is concentrated in the southern part of the district in coincidence with great Rangit valley having supported only 10 inhabitant blocks and 5 forest blocks.

1.2 GEOLOGY

The geological formation of South District is comparatively soft, thin, and half schistose and coarse loamy rocks, which denuded easily and in this area which is least elevated and best populated in Sikkim (Rishley1894). The district is mainly made up of un-fossiliferous metamorphic and crystalline rock groups under the river and axial tectonic belt. This axial belt exposes the crystalline nature of the rock lead to the formation of intrusive granite. The weak structural feature and mobile geological belt of the district lead to the formation of thermal springs in different parts of the district.

The parent underlying rock formation of the district has mainly seven types of rocks namely Quartz, Chlorite, Sericite schist, Phyllite and Quartzite, Quartzite Caleogenesis and Marble, all these seven rock types covered 80% area of the district. Besides, these Amphibolite and Opatite, Sandstone, Shale, Slate and Granite are also found in small patches. In the northern part of Ravongla Sub-division, Amphibolite and Opatite occupy half of the area and in the central part of this sub-division, the coarse to medium grain foliated sheets with strong lineated gneiss and granite mylonite exist as a narrow belt extending from north east to south west covering an area of four km² (fig. 1.3). The combination of sandstone often pebbly, shale, carbonaceous shale, coal, quartzite, gritty boulder slate, dolomite, limestone imbedded with phyllite occupies in the western part of the Namchi Sub-division covering an area of 12.5 km². In the southern part of the sub-division, the combination of quartzite, calcareous phyllite inter bedded with carbonate narrow belt exists extending from east to west covering an area of 3.5 km².

The district is not rich in mineral deposit, because large area of the district still remain unexploited because of the paucity of demand and supply of locally available mineral base industries and lack of infrastructural facilities are also in initial and formative stage. According to Geological Survey of India, occurrence of coal, dolomite, limestone, quartzite, base metal, talc, copper, phyllite, rock phosphorous are found in the district, (fig.1.4). the occurrence of coal is widespread in the Ragit tectonic window. But unfortunately there is no large scale deposits which can exploit in commercial basis. Another important mineral which is abundantly found in the district is limestone, it is found in seven limestone field. This field are located near Sanganath, Pabong, Mamley, and Namchi. Dolomite field exists in the eastern part of Phalidara, Parbing and Namchi forest blocks. The occurrence of copper is found in four revenue blocks namely, Tanak, Suntalry, Chuba and Rong. Besides, there are two important mineral springs which are found at Borong block.



**SOUTH DISTRICT
ROCK TYPE**

REFERENCE

Quartzchlorite,sericiteschist
Phyllite and quartzite

Sandstone often pebbly,Shale,
Carbonaceous Shale and Coal

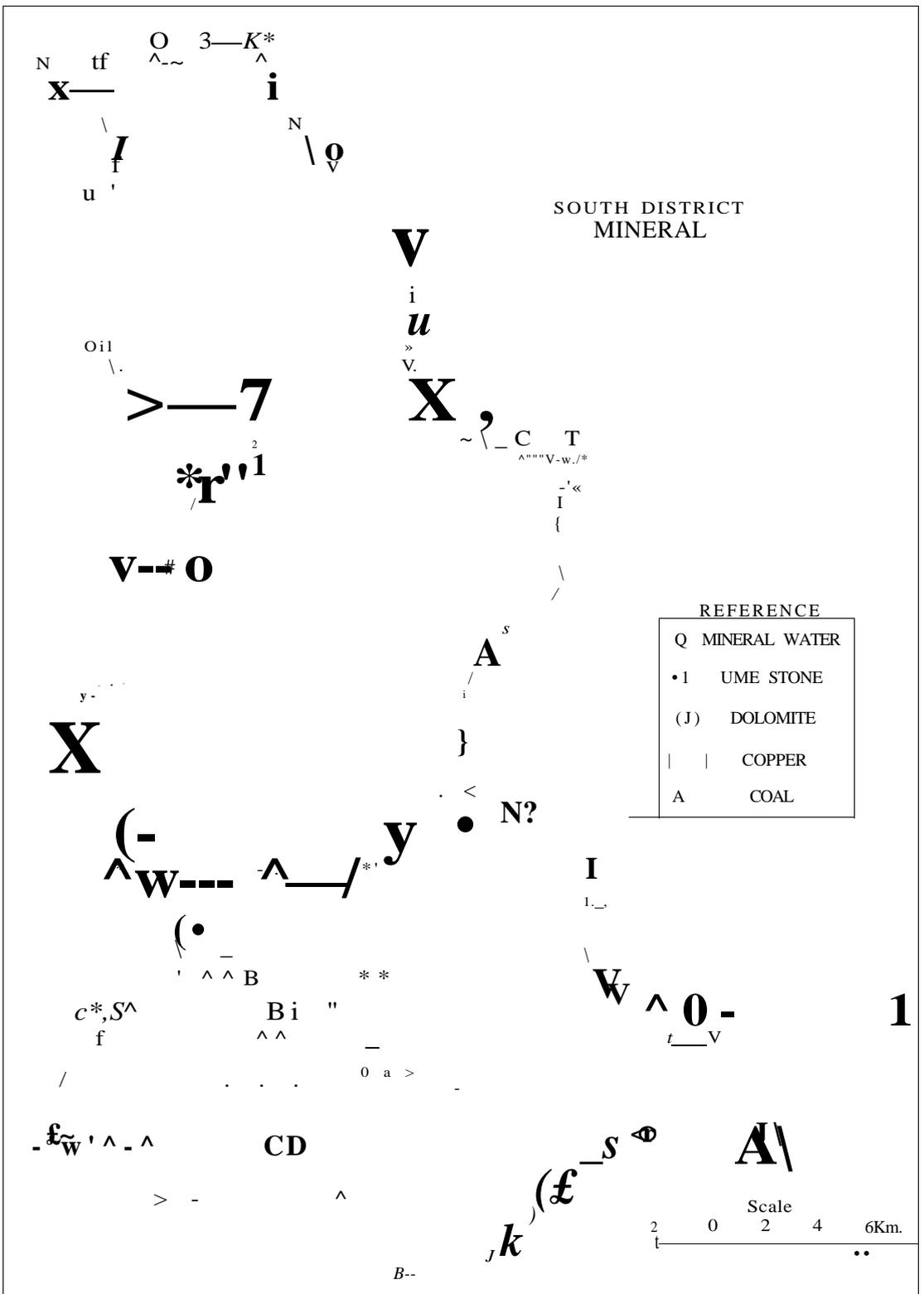
- Coarse to medium grain foliated sheets to stongly lineated granite gneiss andmylonite
- Quartzose pebbly and gritty slate
Boulder slate
- Quartzite occasionally calcareous phyllite interbanded with carbonate
- Dolomite, Limestone interbanded phyllite
- Quartzitecalcgneiss,Calcgraulite and marbles band of bottle schist
Amphbolite and Opatile



Scale
2 0 2 4 6Km.

Source: NATMO,DPS(S)

Figl.3



Source: NATMO

Fig 1.4

The discussion suggested that, the district is not rich in mineral resources in spite of some important minerals of coal, dolomite, limestone, and copper. Their commercial basis exploitation is out of question due to requirement of huge capital investment and estimated reserve is not known except coal. The only mineral

resources which are use and benefited to local people is the mineral springs where lots of tourist are visited for taking bath for medicinal purpose.

1.3 DRAINAGE SYSTEM

The South District of Sikkim is drained by two important river systems of Rangit and Tista River, and their swift flowing tributaries. The two river systems bounded the district from east, west and southern boundary and play a dominant role in sculpturing the land surface feature of the district and both following north to south. The Rangit river originated from Kanchi reserve forest area with an altitude of about (4600m) in the northern part of Ravongla Sub-division and follows westward as head stream and joined by Rangdung Chu and Lungdung Chu near Phamthang block beyond this it flows as Rangit river, further down the stream near Jorethang, it is joined by Ramman Khola and then known as Great Rangit and ultimately fall into Tista at Melli.

The Rangit River which flanks the western and southern boundary of the district has total length of about 98 km from head water source to Melli, where it joined to Tista. The Rangit has a wide network of channels with its tributaries. Table 1.1 represents the tributaries of Rangit, their length, basin and altitude from where they are originated.

Table 1.1 Important Tributaries of Rangit River

Name of the Tributary	Length in (km)	Basin Area in (km ²)	Altitude in (metre)
1.Rangdung Chu	12.0	5.7	4620
2.Lingdung Chu	12.0	5.7	3900
3. Kayam Chu.	12.0	6.0	3600
4.Rangit Chu	14.0	6.0	4200
5.Barme Chu	6.0	4.6	3300
6.Sangang Chu	7.5	4.2	3300
7.Bania Khola	5.0	4.2	2100
8.Rayong Khola	5.0	4.2	1980
9.Rinchu Khola	8.5	4.8	1900
10.Manpur Khola	10	5.0	1690

Source: Field Survey..

Out of the various tributaries of Rangit which originate from the South District, Rangit head water stream has the longest course having 14km, draining an area of 6 km², and originated from an elevation of 4200m from the northern part of Ravongla Sub-division, having characteristic of barbed drainage pattern. The next important tributaries are Rangdung Chu and Kayam Chu, both has 12km each length

and draining 5.7 km² by the first one and 6.0 km² by second one and originated from an elevation of (4820m) and (3900m) respectively. Rangdung Chu has trellis pattern and Kayam Chu has dendritic pattern. The tributary which join near Phamtham is Lungdung Chu which is also has 12 km in length, originated from Lingi forest area(3990m) draining an area of 5.7 km². Down ward the tributaries which join the Ragit River are Barme Chu (3300m), Sangang Chu (3300m), Bania Khola(2100), Rayong Khola(1980m), and Rinchu Khola (1900m) having 7.5,5,5, and 8.5 km of length respectively and draining an area of 4.6, 4.2, 4.2, 4.2, 4.2, and 4.8 km² respectively. The most important tributary which join the Rangit river in the southern part is Manpur Khola, which has the length of 10km originating from the southern slope of Nacmhi ridge from and altitude of about 1,690m and drains an area of 5 km². Besides, KaliLora, Khani Khola, and Rolu Khola are also important tributaries of Great Rangit River. All these tributaries are originated from an elevation of less than 2,000m above the sea level and are in radial pattern, (fig.5)

The eastern bounded Tista has a length of 45 km from Lingi where it touches the South district to Melli where it left the South District and the Sikkim and enters The West Bengal. Some of the landform associated with it includes mainly the four tier, terrace, canyons or gorges and different asymmetric valleys, U- shape valleys, steep slope, alluvial cones, truncated ridge, spurs etc. The associated drainage pattern of the Tista River is rectangular, barbed, parallel, radial and sub-dendritic etc.

Table 1.2 Important Tributaries of Tista Originated from South District.

1 .Name of the Tributary	Length in (km)	Basin Area (km ²)	Altitude in (metre)
2.Rangap Chu	12	4.8	3600
3.Rangpo Khola	12	4.3	3600
4.Kau Khola	6	4.2	3200
5.Brum Khola	5	3.8	3120
6.Ben Khola	6	4.1	2000
7.Puppung Khola	6	4.2	2000
8.Katlej Khola	9	4.8	2000
9.SetiKohla	5	3.1	1800
10.Rabi Khola	6.5	4.8	1800

*Source: Field Study

Out of the tributaries of Tista river originated from South district Rangpham Chu and Rangpo Khola has the longest length both having 12 km each and draining an area of 4.3 and 4.8 km². Both the tributaries are originated from an elevation of (3600m). The second longest tributary is Katlej Khola (2000m) which have 91

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SOUTH DISTRICT
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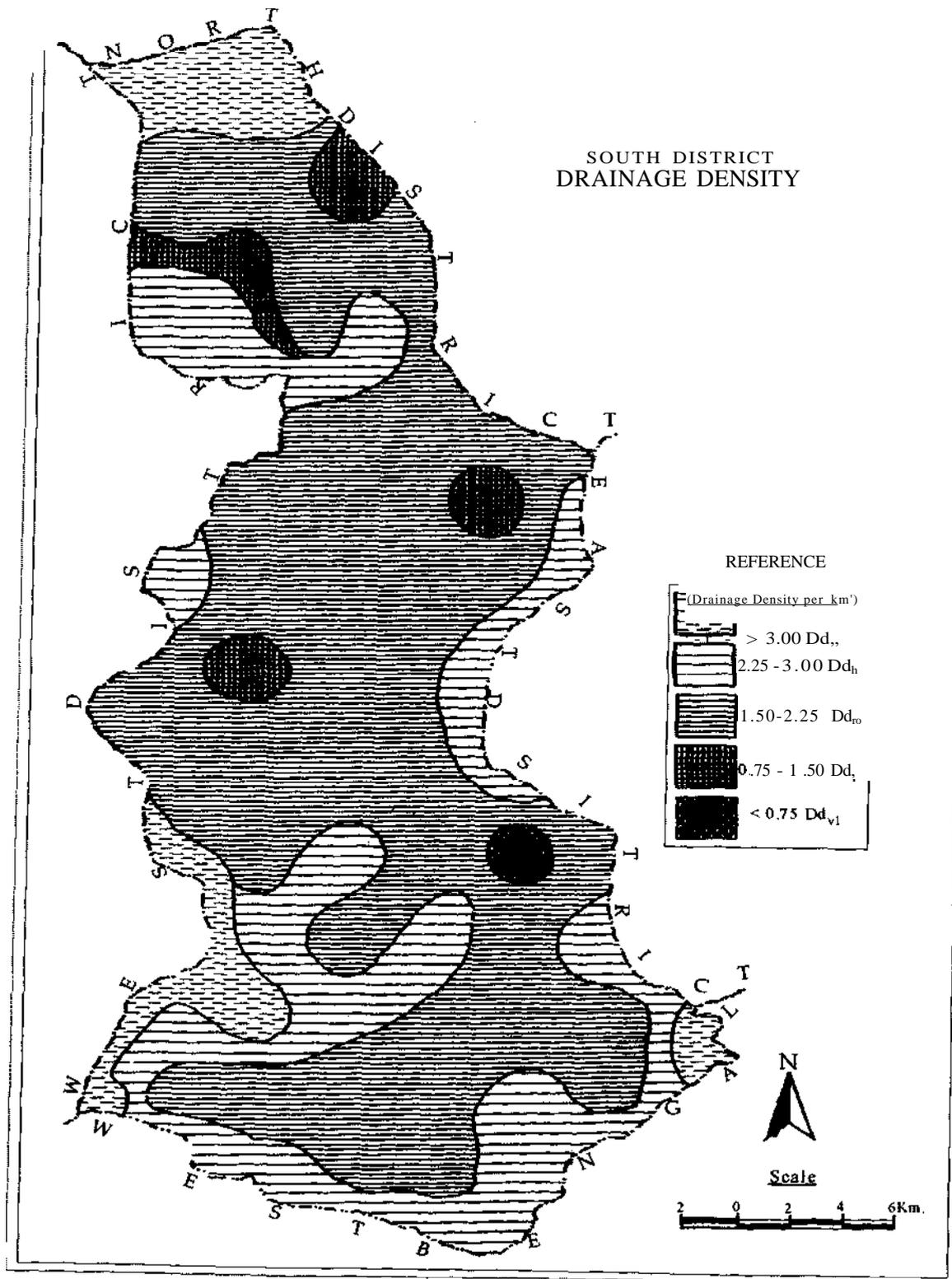
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Scale

2 0 2 4 6 km

Fig 1.5

SOUTH DISTRICT
DRAINAGE DENSITY



Figl.6

length and having 4.8 km² basin areas. The other remaining tributaries i.e. khola(3200m). Brum Khola(3120m), Ben Khola (2000m), Pungpung Khola(2000m), Seti Khola(1800m) and Rabi khola (1800m) have than 6.5 km and drains an area of less than 4.5 km² each.

1.3.1 Drainage Density

The study of drainage density is one of the important tools for morphometric analysis; with the help of this method the erosion activity of the area can be summarised. The drainage density of the district has been depicted by (fig 1.6). The very high drainage density (>3km per km² Dd_{vh}) is found in pockets of north eastern corner of the Namchi Sub-division on Pungpung and Katlej Khola. The high (2.25 - 3km per km² Dd_h) are found in Karsangala Chu the head water of Rangphap Chu, Kau Chu, Rangit Chu, Lungdung Chu Bania and Rayong Khola. The medium drainage density (1.5 - 2.25km per km² Dd_m), is found most of the drainage covering more than 60 percent of the district. The low drainage density (0.75 - 1.5km per km² Dd_l) are exist near the river valley of both the rivers and the very low (<0.74km Dd_{vl}) are concentrated in south eastern part of Namchi Sub-division especially in Mamring block.



Photograph 1.1 Confluences of Rangit and Tista River

1.3.2 Drainage Frequency

Drainage frequency is also an important tool which has the ability to study the underlying parent rock structure, usually the drainage frequency is very high in soft rock areas and low where the rock structure is hard. The highest drainage frequency in

Rangit River and its tributaries is found in Rangang Chu basin having the value (3-4 per km²) and medium drainage frequency is measured in Chil khola basin (2-3 per km). The lowest drainage basin in Rangit river is found in Dao Khola having the value (<1 per km). The highest drainage frequency among the Tista basin has recorded in Naya Khola and Ranka Khola having (2-3 per km²) and lowest is found in Kau Khola basin which have (<1 per km²). The drainage frequency distribution pattern of the district shows that the underlying rock of the northern portion of the district and most of the streams are swift and down cutting or lateral erosion is very active. Toward the south of the district frequency is low but down cutting of the rivers is still going on and is shown by the presence of numerous canyons and water falls.

1.4 CLIMATE

Climate is one of the important components of physical environment. There is no denying fact that weather and climate are the important determining factor of our day to day life and long term activities. It also took a leading role in fashioning the various activities, mode of life in South District of Sikkim. More over the knowledge of weather and climate is very much essential in different planning purposes, without further damaging the environment. In the opinion of Dayer "there is no more fundamental environmental component than the air we breathe, and the sunshine and rainfall that nourished our crop".

The South District as a whole comes under the influence of south west monsoon climatic conditions due to the location and direct expose or over looking to the Bengal plain. But the district has its own regional variation cause by its geographical location, elevation, topography and other physical aspects, which is inversely produce local rain fall pattern, variation in temperature etc.

The (fig 1.7) represents the rain fall and temperature condition of the district. There are three different types of rainfall pattern in the district viz, high, moderate and low. The high (>2800 m) per annum rainfall zone is mostly fall in the Ravongla Sub-division covering 16 revenue blocks and moderate (2400 -2800m) annual rainfall also found in the Ravongla sub-division. In the Namchi Sub-division moderate rainfalls is observed in the north eastern part, covering 14 revenue blocks. Low (>2400m) annual rainfall is recorded in the extreme north western part of the Ravongla Sub-division, covering an area of 32 km² Around 90 percent of the Namchi Sub-division is under the category of low rainfall. The distribution pattern of the district that most of the

Southern part of the districts comes under the drier belt were as the northern portion has comparatively higher rain fall.

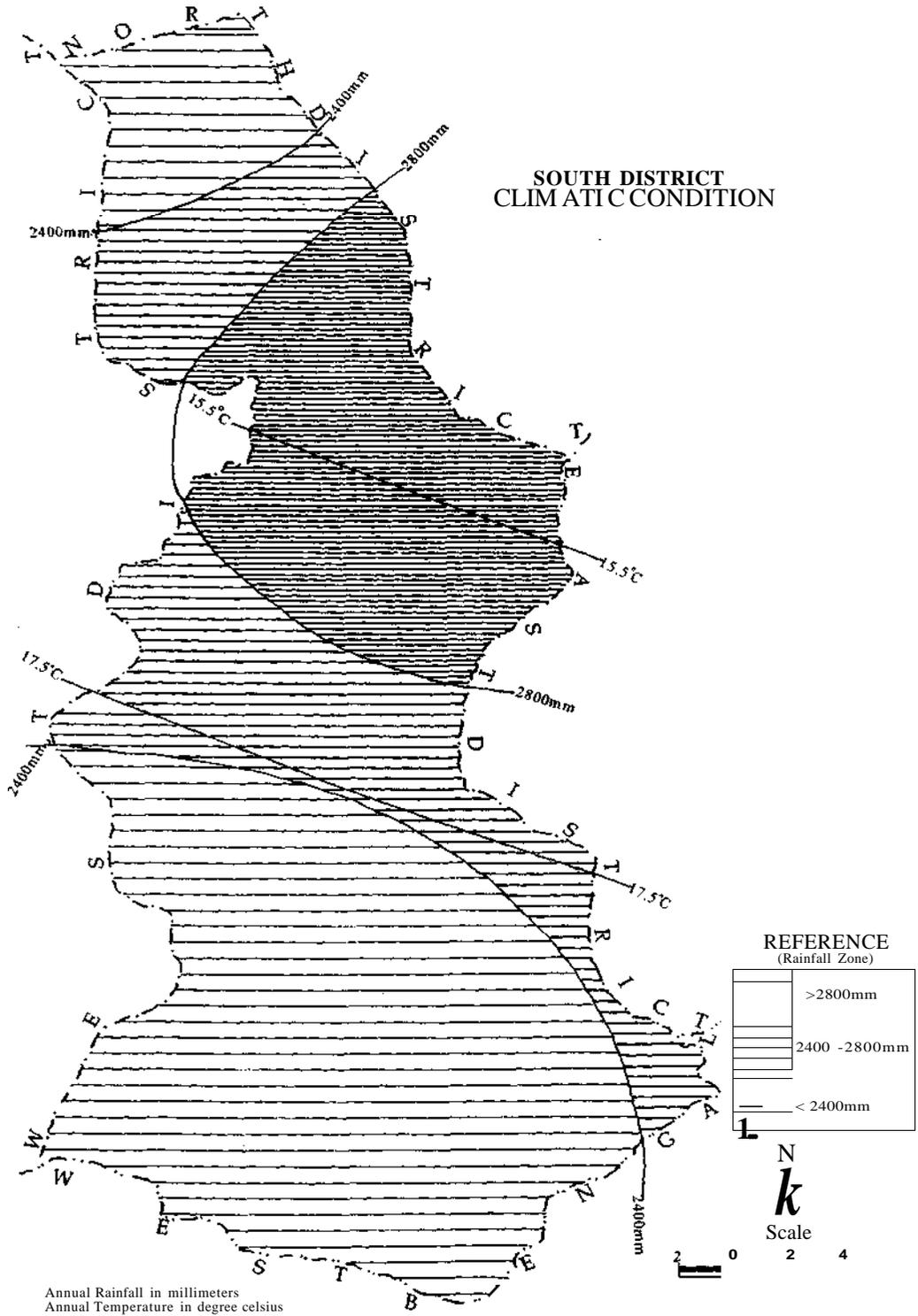


Fig 1.7

In the district there are three distinct temperature belt viz. high (>17.5 °C), medium (15.5°C- 17.5°C) and low belt (<15.5°C). Around 80 percent of the Namchi Sub-division comes under the high temperature belt which is concentrated in the southern part. The medium temperature covers half the area of Ravongla Sub-division especially southern parts and extreme part of Namchi Sub-division While the low temperature is mostly concentrated in the northern half of the Ravongla Sub-division .Beyond this range in the extreme northern part of Ravongla Sub-division permanent snow cover areas exists.

Table 13 Monthly Maximum and Minimum Temperatures and Rainfall, South District. 2005.

Months	Temperature in °C		Relative Humidity in (%)		Rainfall in (mm)		Wind velocity in (km/hr)
	Max	Min	Max	Min	Mean Monthly	No of day	
January	15.20	11.12	70.15	56.5	3.60	4	22.9
February	16.17	9.11	83.4	80.5	1.80	2	20.90
March	24.2	16.5	85.15	82.20	16.6	7	25.2
April	25.6	14.15	78.2	72.60	27.3	4	23.2
May	22.7	21.8	80.20	55.60	130.5	16	17.95
June	25.5	20.6	80.40	75.5	110.8	15	20.90
July	27.5	19.8	93.2	87.5	325.0	22	14.70
August	26.8	16.4	91.4	85.2	292.40	20	80.7
September	24.4	15.8	87.6	73.5	180.6	16	27.45
October	22.6	19.5	83.2	76.5	60.20	10	21.2
November	25.4	18.7	80.6	72.5	11.19	3	31.22
December	20.6	10.8	70.4	65.3	4.0	2	25.17

* Source: Meteorological Station Damthang.2005.

Table 13 represent the monthly maximum and minimum temperature, humidity, and rain fall and wind velocity of the district for 2005. The table shows a close relationship between the main climatic elements i.e. temperature, rainfall, humidity and wind velocity. But the relation is disturbed by the altitude and wind direction of the district. The maximum temperature varies 15.2°C to 27.5°C and range of temperature is 12.3°C. The maximum temperature is recorded during the month of August (27.5°C) and Minimum in January (9.1°C) the average mean monthly temperature is 19.6°C. But minimum temperature is recorded in month of January and February. During the winter months usually snow fall is occur in Ravongla Sub-division. The high humidity is also found in the month of July and August. And the rainfall also high rainfall is found in the month of July and August. Rain fall is moderate during the month of September, October, March and April, but

low rainfalls are occurred in months of November to February. The prevailing climatic conditions show that South District of Sikkim has essentially monsoon in nature and this directly influences upon the type and pattern of Agricultural practice.

1.5 SOIL

The nature, property and characteristics of soil of an area is directly or indirectly influence by the existing conditions of relief, altitude, slope, parent materials, and biological factors etc. The existence thick and luxurious soil deposition encourages successful practice of soil husbandry and direct bearing towards the development of the region.

The National Bureau of Soil Survey and Land Use Planning, Kolkata Regional Centre, have established eight sub-groups and some independent soil series in the South District, through their low intensity survey in the district in 1981. (Table 1.4)

Table 1.4 Soil sub-groups and its relation with relief in (South District).

SL. No.	Soil Sub-Group	Related Physiography.
1	Pachic Haplumbrepts	Ridge and Submmit.
2	Typic Hapludolls	Very high steep side slope (>50%) highly dissected.
3	Umbric Dystrochrepts	Very steep side slope (30-50%) mostly dissected with 20-40% forest cover
4	Typic Argudolls	Very steep side slope (30-50%) with cultivated land.
5	Entic Haplumbrepts	Very slide slope (30-50%). Highly dissected with 30-50% forest cover.
6	Cumulic Hapludolls	Very Steep (15-30%). Slope moderately dissected with Cultivated Land.
7	Typic Cryothents	Periglacial land
8	Lithic Udorthents	Rocky Cliff

* Source: Sikkim Statistical Profile.2002.

Out these eight dominant sub-soil types four types are very prominent, they are Entic haplumdrepts (25.3%) Cumulic Hapludools (17.3%), Umberic Dytrochrepts (16%), Typic Argudolls (15%), Pachic Haplumbrepts and (8%),Lithic Cyrothents (1.4%).

The largest constituent Entric Haplumbrepts are not continuously found. It is found in eastern part i.e. Rameng, nijameng, Phong, Karek, and Manry Dara in Namchi Sub-division, and northern part of the district. In the western and central parts Namchi Sub-division, and Ravongla Sub-division it is found in north eastern corner.

moderate slope with cultivated fields. The important revenue blocks located in this region are Mamring, Donok, Phamphok, Melli, Jorethang, Shalghari. Pajer and Tinik, etc. (figl.8)

The third dominant soil is Umbric Dystrochrepts which are mostly found in the Ravongla Sud-ivision covering around 134 km . These areas are very steep side slope with (30-50%) and are mostly dissected with 60-70% forest cover. The next important soil group in terms of area is Typic Argudolls , which constitutes 15% of the total area of the district and are found in the eastern and south eastern parts of the Namchi-Sub-division and south western parts of the Ravongla Sub-division covering an area of 99 km². The fifth sub -type of soil is Pachic Haplumdolls which occupy only 87 km² of the total area of the district. This soil is exists as a star shape in the middle of Namchi Sub-division. And in Ravongla it is found in the extreme north eastern part. Most of these areas have ridge and cliff with large forest cover. Typic Haplumdolls which is the sixth important type of soil occupy 8% Or 80 km². And found only in northern part of Ravongla Sub-division., where the periglacial land forms are exists. The seventh and eight type of soil is Typic Cryorthent and Lithic Udorthents but their presence is not much significant in terms of area coverage, both constitute 1.4% and 2.1% of the total land area of the district covering 23 km and 20 km respectively. They are found only in the extreme north western parts of the Ravongla Sub-division and most of the areas are occupied by expose cliff and precipitous slope.

The soil profile of the district is very unique, in the upper parts of the slope, there is formation of washed off soil and towards the base of the slope there is formation of washed in soil. In terms of soil property and chemical composition, the soil of the south district is dominated by acidic soil type and ph value varies from less than 4.5 to 6.8 of even more. The organic composition also varies from less than 0.86% to 5.00% in various parts of the district. Besides, the nitrogen, phosphorous and potassium content also varies from block to block. Table 1.5 represents soil fertility status of the district.

Table 1.5 Fertility Status of Soil, South District. Sikkim.

Name of the VLW Centre.	Soil Status in (N+P ₂ O ₅ +K ₂ O)
Mellidara, tarku, Maniram, Damthang, Tokal, Nandugaon, Sumbuk, Sadam, Ralong, Bermoik.	Medium + Medium+ Medium
Turung, Lingmo	Medium + High +Medium
Lingi, Kewzing	Medium + High + Low
Turuk	Medium +Low +Medium
Namchi	Medium +Medium+ High
Wok	Medium + Medium+ Low
Rateypani, Namthang.	High + Medium + medium
Bikmat	High+ High+ Medium
Kitam	Medium+ High +High
Payong	High+ Medium+ High

*Source: Agricultural Reports, Govt of Sikkim, 1987.

In the district Village Level Worker (VLW) centre is the most important for collection of soil study. There are 21 VLW centres in the district. Of which 10 VLW centres has medium fertility status in all three component of soil, nitrogen, and potassium and phosphorous. And remaining 11 VLW centres have recorded deficiency in any one of the three types of soil nutrients. The over all characteristics of soil in the district is compose of non-calcareous, sandstone, and siltstone. The parent materials of this soil are derived from granite, phyllite, mica schist and gneisses composed of feldspar.

1.6 VEGETATION

The study of vegetation is usually included both flora and fauna. The biodiversity of the district is very rich. By virtue of location in the one of the genetically hot spots region of the world and having varied climatic conditions of high rain fall, scanty snowfall, high humidity and low temperature and other factors contribute to the immense wealth of biological resource. Species wise the district has, 6000 species of flowering plants, 515 species of orchids, 36 rhododendrons, 16 confers, 23 bamboo, 362 ferns, 8 tree ferns, 60 primulas, 11 oaks, over 424 medicinal plants, 150 mammals, 552 birds, 48 fishes, and 690 butterfly. It can truly conclude the district is very rich in vegetation.

1.6.1 Flora In terms of flora the district is very rich both luxuriance and diversity. The important gerera and species of gymnosperms in South Sikkim are *Abies*, *Junipers*, *Pinus*, *Yeas*, *Psunga* and *Larix* etc. the dominant flowering plants are

Orchdieceae, Composite Graminae, Leguminosae, Rosaceae, Rubiaceae, Labiatae etc. The floral community of the district can be classified according to altitudinal variation zone the following table 1.6 represents the floral classification.

Table 1.6 Floral Classification, (South District)

Type	Altitude in (metre)
Tropical	<800
Sub-Tropical	800-1500
Temperate	1500-3500
Alpine	3500 - 5000

* Source: Annual Administrative Report, Dept of Forest. Govt, of Sikkim. 1998-99.

The tropical zone is found in the altitude of less than 800m. In this floral zone *Shorea Robusta* or locally called 'Sal' forest patches of riverine mixed deciduous forest specially savannah vegetation and swampy. This zone is mainly concentrated in the river valley of the two river system of Tista and Rangit. The sub-tropical zone is concentrated in 800 - 1500 m ranges of altitude, pine, birch and bamboo are the main species of this zone. The temperate zone is located in between the altitude of 1500 - 3500m; this zone is divided into upper and lower temperate zone. The upper zone is rich in coniferous species and bamboo, besides these main species oak, cherry, chestnut, maple is also found. The alpine zone is exists in 3500 - 5000 m altitude. This zone is mostly occupied by *rhododendron* and *juniperus* species. South District is also rich in orchid; some of the important varieties are *Crybidium, Vanda, Cattaleya, Hookericma, Farmeri, Dendrobium amoenum, and Dendrobium noble orchid*. The district is also rich in medicinal plants, there are as many as 425 plants having medicinal values especially for herbal medicine. Important species are *Actinodaphne hokkeri, Basella Aiba, canarium Benganense, Dalbergiesissoo, Eicssorria-crassiees, Ficusunia* etc. Besides the district is also has host of germplasm of several rare and endanger taxa viz, *Aconitum novaluridum, (Munz), Calmus intermis (T.Andres), Soulia vaginata (French)* etc, which are being depleted at a alarming rate from the country due to biotic interference.

1.7 FAUNA

Like floral distribution, South district is also rich in fauna by virtue of varied physiographic and climatic condition from tropical to alpine. The district has some of the endanger species of wild life, According to the forest and wild life department, there are 150 mammals, of which Bharal, Clouded Leopard, Fishing Cat, Golden Cat,

Musk deer, etc are the important endangered species of the district. Besides the district has also 550 species of birds. The important species of the birds found in the district are Black neck Crane (migratory), Blood Pheasant, Peafowl, Tibetan Snow Cock, Tragopan Pheasant, Snow Partridge, Siberian Crane, (migratory) etc. but most of these birds are lost irretrievably due to deforestation, increasing use of pesticide and insecticide. Around 650 species of butterflies and moth, 33 species of reptile and 16 species of frog are also found in the district.

CONCLUSION

The general relief of the district is sloping towards the south, where the river valley of Tista and Rangit River exist, with less than 330mt from the sea level to the snow capped mountains of Kanchunzanga in the north with an average altitude of 4600mt. The physical condition of the district can be classified into five different zones viz. river valley, lower hills, middle hills, alpine and snow bound. The relative relief of the district is varied from 330mt to 1350mt from south to north. This varied relative relief of the district has been inversely influenced by the two river system of Tista and Rangit. The district has symmetrical valleys, spurs, escarpment, ridge, summit, cliff, precipitous slope. The slopes are varied from 80mt per km to 600mt per km. The parent underlying rock formation of the district has mainly consists of seven types of rocks namely, quartz, chlorite, sericite schist, phyllite, quartzite, quartzite calcaneiss and marble. All these seven rocks types have covered 80% area of the district. The district is not rich in mineral deposits but occurrences of coal, dolomite, lime stone, quartzite base metal, talc, copper, rock phosphorous are found. The two river system i.e. Tista and Rangit with their swift flowing tributaries has play dominant role in sculpturing the land surface feature of the district. The varied drainage density from 0.74 km per km² to 3 km per km² and drainage frequency of less than 1km per km² to more than 3km per km² shows the real dissected mountainous topography of the district. The climatic condition of the district is influenced by south west monsoon; having three different types of rainfall i.e. high (>2800mm) per annum, moderate (2400-2800mm) per annum and low (<2400mm) per annum and three different temperature belts of high (>17.5°C), medium (15.5°C - 17.5°C) and low (<15.5°C). The soil of the district is made up by eight semi groups which support rich vegetable covers extending from tropical to alpine with important endangered species of flora and fauna rightly reveals the true mountainous

characteristics of South District as hilly and mountainous part of the county. This unique characteristic of physical conditions has evolved to form its own unique features of socio-economic and cultural trails which are very interesting to study especially the limited available land resource and its husbandry and utilization and its impact on one of the important occupation and economic sector of the district.

CHAPTER-II

POPULATION CHARACTERISTICS

INTRODUCTION

The roles of improving notwithstanding the pattern of population distribution in the world continue to reflect the influence of a variety of physical determinants, although the degree of control being exercised by physical factors may be on the decline. The factors like altitude, slope drainage and sub-soil water table have been affecting population distribution clearly at local level. The South District has hilly terrain and sever climate which adversely affect the distribution of population. The distribution of population in the district is uneven. In the district, most striking evidence of the influence of landform upon population in the distribution at the micro level has been observed between mountain and river valleys.

The 2001 census reveals that the distribution of population is very uneven in the South District of Sikkim. It is also observed that there is a relationship between population and area of the blocks. Most of the revenue blocks in Namchi Sub-division have smaller area in comparison to the Ravongla Sub-division. But Namchi has accommodated 66.42 percent of the total population of the district. On the other hand, Ravongla Sub-division has accommodated only 33.58 percent of the population of the district. Ravongla Sub-division is situated in the northern part of the district which experiences moist weather, which is very harmful for health. Out of the 44 inhabited revenue blocks of the sub-division, some are located near the river valleys of Tista and Rangit Rivers and lower hills. These blocks are favourable for settlements to flourish as they have fertile agricultural land, irrigation facility, warm climate and easy transportation facility.

On the other hand, Namchi Sub-division is more densely populated than Ravongla. The sub-division has 91 inhabited blocks. Comparing to other parts of the sub-division, central portion is highly elevated and has low concentration of settlements. Thus, most of the settlements are located in the river valleys and on gentle slopes near Rangit, Great Rangit and Tista River. One distinct trend of distribution of settlements is observed that the settlements are dense if one moves southward and along the main drainage channel. As these river valleys provide good cultivation field readily availability of irrigational facilities, low degree of slopes and elevation as well as equitable climate, attract the people to settle here. The discussion

reveals that different physiographic and climatic factors are responsible for uneven distribution of population in the South District.

2.1 DISTRIBUTION OF POPULATION

In the South District, a revenue block is the lowest administrative unit. The revenue block comprises of several hamlets, which is owes to the hilly character of physiographic condition. The size and area of the individual block in the district varies from one place to another place due to nature of accessibility. In the northern part of the district, revenue blocks are generally medium in sizes but concentration of population is low. Whereas in the southern part of the district, the revenue blocks are small and agglomerated but distribution of population is comparatively higher.

Table 2.1 Classification of Revenue Blocks in terms of Area. South District 2001

Area of Revenue Blocks (km ²)	Category	No. of Revenue Blocks	Revenue Blocks (%)	Share of Population (%)
<1	Very Small	11	7.10	6.6
1-2	Small	37	26.80	24.92
2-3	Medium	36	25.70	26.80
3-4	Large	28	20.20	19.79
>4	Very Large	28	20.20	21.89
Total			100.00	100.00

*Source: Census of Sikkim Provisional.2001

According to 2001 Census, it is observed that only 7.10 percent of the revenue blocks (Table 2.1) are very small (<1km²). These blocks are namely, Melli, Paleytam, Donok, Gangchung, Rashayap. Jorethang etc are in Namchi Sub-division and Mangbrue, New Sada, Ravangla etc are in Ravongla Sub-division. Out of these blocks Melli which is one of the smallest blocks accommodate largest population (2476 persons per km) and Ralong Monastery has population of (12 persons). The second category of size (1- 2km²) occupies 26.80 percent of the total revenue blocks. Some of the important blocks which fall in the category are, Chumlok, Pajer, Chemchey, Gumpa Gurpishey, Tanak, Aifaltar etc in Namchi Sub-division. There are only two blocks which fall in this category in Ravongla Sub-division. This category altogether accommodates 24.92 percent of the total population of the South District, Salghari has the largest population (6,399 persons) concentration, and Chemchey has the smallest. In the third category of medium size i.e. (2 -3km²), there are 36 revenue blocks

occupying 25 percent of the total revenue blocks. Altogether these blocks accommodate 34,850 persons or 26.80 percent of the total revenue blocks of the district. The large category (3-4 km²) size of the revenue blocks constitutes only 20.20 percent of the total revenue blocks of the district. These revenue blocks accommodate 26,041 persons or 19.79 percent of the total population of the district and are located in the central and northern parts of the district. The very large size (> 4km²) has 25 percent of the total revenue blocks. These categories of blocks have 21.89 percent of the total population of the district. The facts reveal that, most of the very small and small size blocks are located in the southern part of Namchi Sub-division. The medium size has equal distribution in the two sub-divisions, whereas most of the larger size blocks are found in Ravongla Sub-division. In Namchi sub-division, it is found that the relation between the size of total population and revenue blocks is proportionate, neither the population distribution is disproportionately larger nor the individual revenue blocks occupy large area. It is sheer, bigger number of revenue blocks that account for the higher proportion of the population residing in Namchi. Out of the total revenue blocks, those which have the population of more than two thousand persons according to 2001 census are namely, Salghari, Bomtar, Singithang, Melli and Namphing in Namchi Sub-division and Barfung and Ravongla Sub-division. All these blocks occupy only 4.28 percent of the total area of the district but occupy around 17 percent of the total population of the district. The blocks which have population (1000 - 2000) persons have more than 18 percent of the total area of the district accommodating 36 percent of the total population of the district. The blocks which have the population between (1000-2000) persons has more than 18 percent of the total area of the district and these areas accommodate around 36 percent of the total population of the district. The blocks which have the population between (1000-2000) persons are as, Mamley, Kamrang, Jorethang, Namphok, etc. The remaining 60 percent of the blocks have the population (< 1000 persons) occupying 31.68 percent of the total area of the district.

The general characteristic of the distribution pattern of the population in the South district is that most of the populated blocks are situated where the suitable conditions exist. Good transport network attracts the population to concentrate at a particular place, which leads to the concentration of dwelling near the road side. The emergence of rural marketing centres also acts as a pull factor for the population to concentrate near the market place. The district and sub-divisional head quarters have

higher concentration of population due to the availability of urban amenities. Besides, establishment of educational institution also attracts the population to settle nearby. In the district low populated blocks are situated near the forested tracts which are devoid of road net work, higher altitude and steep slope. The drier belt in the southern parts of the district has the characteristic of low concentration of population.

2.2. RURAL -URBAN POPULATION

Rural-urban population composition is also a very important demographic study in an area because it has a direct bearing to socio-economic and cultural advancement. According to 2001 Census, the South District has only 3 percent of the urban population, while it was 2.61 percent in 1991. In comparison to district percentage Namchi Sub-division has little higher rate having 4.5 percent and Ravongla Sub-division has no urban population at all as it is entirely rural population. The district has two notified towns as Namchi and Jorethang, both of which are located within the Namchi sub-division. Both the towns are developed by virtue being the district headquarters in the case of Namchi, where as Jorethang is for being a trade centre and located as nodal transport centre for both south and west districts. Due to lack of potentialities these towns are not developing fast and their influence in their periphery is very limited. These constraints consistently reduce the pull factor of these towns.

2.2.1 Changes of Rural - Urban Population: (1971-2001)

Total 2.2 Changes of Rural - Urban Composition, South District. (1971-2001)

Year	Rural in (%)	Changes in (%)	Urban in (%)	Changes in (%)
1971	97.70		2.29	
1981	92.93	-5.53	7.59	+ 69.82
1991	97.39	-0.32	2.67	+ 16.59
2001	96.98	-0.73	3.39	+ 48.03

* Sources: Census of Sikkim, 1971, 1991 & 2001.

The change of rural and urban population in the district has different degree. The urban population have an increasing trend in the South District of Sikkim, (Table 2.2.). The urban population is increasing from the year 1971 to 1981, the increased was almost 70 percent and again in the period of 1981 to 1991 it had increasing trend having 17% even though the increased is lesser in comparison to the previous decade. Again in the period 1991 to 2001 the increased was more than 48 percent.

The trend in the rural population is decreasing. Almost all the census years the rural population is more than 90 percent. But the decreasing trend of the rural population is less in comparison to the urban population. It was 5.53% decreased in the period of (1971-81), 0.32% in (1981-91) and 0.73% in (1991-2001). Nevertheless the percentage of changes is less in the rural population. This trend reveals the entire rural character of population in South District.

The slow pace of urbanization in the South District is due to the lack of facilities, like industry, trade and commerce, transport and communication and over all hilly topography.

2.3 COMPOSITION OF POPULATION

Composition of population is a vast field comprising ethnic characteristics, races, tribes, language, literacy, religions, education, age sex, economically active population etc and many more trails. The study of population composition helps in understanding the socio-economic and demographic structure of population.

On the basis of ecology, linguistic and origin, the population of the district are distinguished as Aryan, Aryo- Mongolian and Mogolian, (Bista 1980). All the main ethnic of the district viz, Nepali, Bhutia, Lepcha and Sherpa fall in the mentioned three categories of races. Besides, people from plains usually called Kanya, Madishey, (Marwaris, Biharis and Bengalis) are also found but their number is less comparing to the four main communities. According to 2001 Census, Nepali community consists of 70 percent of the district. They are scattered all throughout the district. The second community Bhutias constitute around 10 percent of the population of the district and they are mostly found in the Ravongla sub-division. The Lepchas also constitute same percentage like Bhutias but they are mostly found in Namchi Sub- division. Sherpas on the other hand constitutes only 4 percent of the total population of the district and they are concentrated only in few pockets like Parbng , Jaubari and Damthang. Other communities account around 6 percent of the population of the district. They are mostly concentrated where the rural trade centre or market centres exist. The largest community Nepali has been divided into various communities. They include, Bahuns (Bhrahmins), Chettri (Khetriyas), Pradhan (Newars), Rai, Gurung, Tamang, Limboo, Sunwar. Mukhiya, Mahji, Manger, Thapa, Dami, Kami, Bhujel, Sarki, Thakuri, Thami, Yakha etc. The Bahuns are again divided into twelve gotras, Pradhans are also known as Newar. They have their own language

and they are sub-divided into six clans. They follow exogamy, Rais are known as Kirats or Jamdars. Rais are divided into clans and sub-clans. They have their own language and script which belongs to Tibeto-Burman family, Gurung has been divided into two main groups as i) four clans ii) sixteen clans. Tamangs now days come under the scheduled tribe along with Bhutia, Lepchas, Sherpa and Limboo. They are divided into twenty six clans. Tamangs have their own language and script which also belongs to Tibeto-Burman family and they follow endogamous. The Limboo are also known S Subbas, they also have their own language and script which belongs to same family with Tamangs. Limboos are divided into clans, they follow exogamous and patrilineal. The Mukhiyas are lesser in number; they also have their own Language and script called Koicha. They are divided into three sub-groups as i) Barathares ii) Dasthars and iii) Terek, Mahji has small population mostly concentrated in Mahjigoan near Jorethang, they belong to scheduled caste community and have own language. Other communities like Damai, Kami are lesser in number and their distribution is insignificant.

The second largest group Bhutia community is divided into two groups as i) Tondu-rus-Shi and ii) Bed-ten- Chechu. The first group again has sub clans and second has eight sub-groups. These sub-groups are differentiated socially and territorially. The first group is superior to the second group.

Lepchas are minority group, even historically the entire state is belong to them. They are mostly settled in high attitude regions. Lepchas have their own language and script. Sherpas are also divided into two groups as i) Sherpas ii) Yukpas. They follow exogamy.

2.3.1 Sex Ratio

Sex ratio is one of the basic demographic characteristics of population. It indicates number of female per thousand male; usually it is also considered as an indicator of dependency ratio. The study of sex ratio is very important because it has direct bearing to various planning and other analysis of other demographic characteristics such as natality, mortality, migration, marital status, economic characteristics etc. The relationship of sexes affects the social and economic relationship within the community.

Sex Ratio. South District

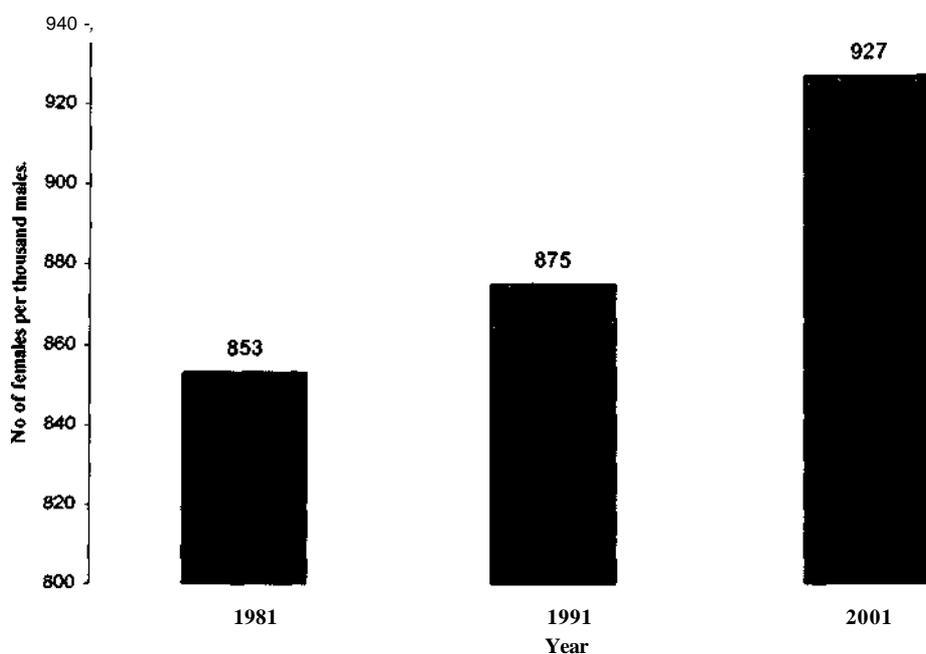


fig2.a ,

The sex ratio in the district is increasing for the last three decades. (fig2.a) it is 853 in 1981, 875 in 1991 and 927 in 2001. The picture is different in the revenue blocks.

Table 2.3 Sex Ratio, South District.2001

Sex Ratio	Category	No of Revenue Blocks	Revenue Blocks (%)
<800	Low	07	4.84
801 - 900	Medium	40	27.58
901 - 1000	High	77	53.10
>1000	Very High	21	14.48
Total		145	100.00

Source: Census 2001, Sikkim.

According to 2001 Census (Table 2.3) out of the total blocks the low (< 800) category sex ratio has occupied only 3.45 percent in five blocks. Of which three blocks are Damthang, Singtam and Tingrithang in Namchi Sub- division and Kewzing and Hingdam in Ravongla sub-division. Medium category (801 - 900) constitutes around 27 percent of the total revenue blocks and is found twenty two blocks in Namchi sub-divisions and sixteen in Ravongla sub- division (fig2.1). The important blocks which fall in this category are Pajer, Kamrang, Denchung, Assangthang, Rong, Pancha Gharey, Turuk, Thangsing etc. There are more than 55% revenue blocks in the high category sex ratio (901 - 1000). Of these 80 revenue blocks forty five blocks are

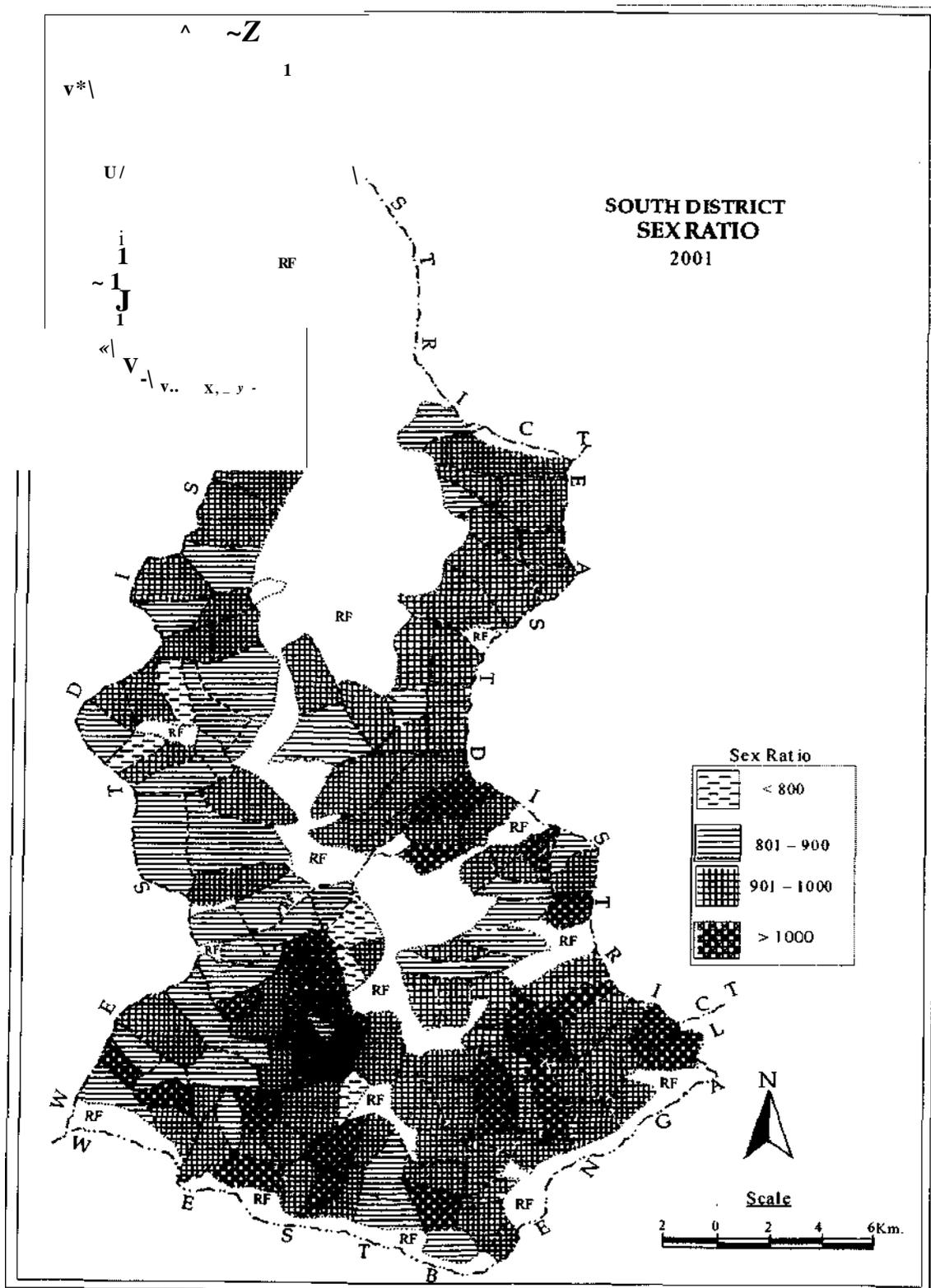


Fig2.1

found in Namchi sub-division and 35 blocks are in Ravongla sub-division. In the very high category sex ratio (1001 - 1100), there are twenty two revenue blocks constituting around 15% of the total revenue blocks. All the revenue blocks in this category are in the Namchi sub - divisions. Some of the important revenue blocks in this category are

Mamley, Tinzer, Chisopani, Dharagoan, Mikhola, Bikmat, Paleytam, Nagi, Tokal, Gangchung, Doring, Tsalumthang, Mamring etc.

The distribution pattern of sex ratio in the district is that there is low sex ratio in the district headquarter where as the urban area exit and medium and high sex ratio are found in rural and remote areas.(fig 2.2)

2.3.1a Decadal Changes of Sex ratio: (1991-2001)

Table 2.4 Decadal Change of Sex Ratio South District (1991 to 2001)

Sex ratio	Increased		Decreased	
Changes (%)	No of Revenue Blocks	Revenue Blocks (%)	No of Revenue blocks	Revenue Blocks (%)
<50	39	28.88	27	20.00
51-100	27	20.00	12	8.88
101-150	10	7.40	5	3.70
151-200	9	6.66	0	0.00
>200	5	3.70	1	0.74
Total	90	66.60	44	33.40

* Source: Census of Sikkim 1991 &2001.

The decadal changes of sex ratio of population of the district is represented by (Table 2.4) revealing another picture. Out of the total revenue blocks, there are 90 revenue bocks or more than 66 % of the total revenue blocks which have registered in creased in the sex ratio. Of these 39 revenue blocks or around 29% are under the category of (<50 %) changes. Another 20% of the total revenue blocks, fall in the increased category of (51 -100), of which 17 blocks are in Namchi Sub-division and another 10 revenue blocks are in the Ravongla Sub-division.. In the increased category of (101 -150) altogether ten blocks are in both the sub-divisions and occupies more than 7% of the total population of the district. Around 7 percent of the total revenue blocks are in the category of (151 -200) change. Of which nine are in the Namchi Sub-division. Only one block is in Ravongla Sub-division i.e. Pepthang. In the high increased category (>200), there are 6 revenue blocks constituting around 4percent of the total revenue blocks.

In the decadal decreased there are 44 revenue blocks occupying 33.40% of the total revenue blocks. Out of these revenue blocks around 20 percent are in the category of (<50%). Of which 14 revenue blocks are in the Namchi Sub-division and 13 revenue blocks are in the Ravongla Sub-division. More than 8 % of the total revenue blocks are in the category (51-100%) changes. These blocks are mostly found in Namchi Sub-division. The decreased (100 -150%) constitutes around 4% of the

total revenue blocks and are mostly found in Ravongla Sub-division. In the category of (150-200%) decreased there is not a single revenue blocks. About 1 percent of the total revenue blocks have decreased sex ratio of (150-200). One of the interesting facts is that there are no changes of sex ratio in the Nalam -Kolbong block.

The facts indicate the following points that there is a disparity amongst the sexes. The blocks which have low sex ratio are tends to concentrated in the northern parts of the district and low participation of woman folk in the income earning. This low sex ratio is mainly cause by lack of social mobilisation especially for the female child as well as the higher female mortality rate. The low sex ratio is also indicates lack of health care facility especially the pre and post natal care in the far lung areas of the district. The over all picture of the district's sex ratio is that of male dominance. Lower sex ratio cause different problems like socio-economic imbalance. This arouses the need of proper planning for achieving balance sex ratio in the district.

2.3.1b Sex Ratio (0 -6) ages

Table2.5. Sex Ratio (0-6) years, South District 2001.

Sex ratio (0-6) years	Category	No of Revenue . Blocks	Revenue Blocks (%)
<900	Very low	42	31.11
901 - 1000	Low	34	25.18
1001-1100	Medium	29	21.48
1101-1200	High	16	11.85
> 1201	Very High	14	10.37
Total		135	100.00

*Source: Census of Sikkim.2001.

The sex ratio for (0-6) years gives another picture in the district. Table 2.5 represent the districts sex ratio for (0-6) years. In the category of very low (< 900) sex ratio, there are 42 blocks having 31.11% of the total revenue blocks. The low (901-1000) sex ratio (0-6 years) constitutes more than 25 % of the total revenue blocks or 34 revenue blocks of the district. Out of these, 18 revenue blocks are in the Namchi Sub-division and 16 blocks are in Ravongla Sub-division. The medium sex ratio (1001 -1100) constitutes 22.22% of the total revenue blocks. Most of these revenue blocks are located near the sub-divisional headquarters. The high (1101-1200) sex ratio is around 12% only. The very high (>1200) sex ratio in the age group of 0-6 occupys around 10% of the total revenue blocks.

It is interesting to note that, in the age group of 0-6 years, very low and low sex ratio groups altogether constitute about 56.85% of the total revenue blocks. This higher concentration percentage in the two categories is may be due to low literacy in the remote areas, where the gender discrimination still prevails, and prejudice of male child as assets to rural folk. The remaining three category i.e. medium, high and very high altogether share only 43.15% of the total revenue blocks and are mostly located near the district headquarters, where the gender discrimination is insignificant with higher literacy rate as well as more free society leads to higher sex ratio. In order to change the scenario more policy and planning like incentive for female child when she stay unmarried up to 25 years of age will get monetary incentives with free education facility will certainly encourage the growth sex ratio.

2.3.1c Decadal Changes of Sex ratio (0-6) years, 1991-2001

Table 2.6 Decadal Changes of Sex Ratio (0-6) years, South District. (1991-2001)

Sex ratio in (%)	Increased		Decreased	
	No of revenue Blocks	Revenue Blocks (%)	No of revenue Blocks	Revenue Blocks (%)
<15	35	25.92	35	29.92
15-25	14	10.67	08	5.93
25-35	05	3.70	08	5.93
35-45	03	2.40	04	2.98
>45	22	16.30	01	0.80
Total	79	58.99	56	41.56

* Source: Census of Sikkim, 1991&2001

The study of decadal changes in sex ratio (0-6) years is very significant from the economic point of view as this will replace the reproductive age group as well as the working population in near future. Out of the total revenue blocks, 5 revenue blocks has recorded more than 100 percent growth. Around 59% of the revenue blocks, has registered growth rate, where as 41% of the revenue blocks recorded decreased in the sex ratio (0-6) years (Table 2.6). The lowest growth rate is recorded in the Sokpey revenue block. Only a single revenue block i.e. Bui does not changes in sex ratio (0-6) years. The highest decreased in percentage is found in the revenue blocks of Chemchey, Turuk, and Aifaltar. The large percentage of increased trend indicates further growth in the reproductive age group in near future in the district.

2.3.2 Scheduled Caste Population.

The South District has small segment of the scheduled caste population to total population scheduled caste population includes, Damai, Majhi, Lohar, sonar and Sarki. According to 2001 Census the scheduled caste constitute 4.76% of the total population of the district. The composition of scheduled caste in both sub-divisions is different. The Namchi Sub- division has higher percentage of Scheduled caste being 5.51% and the Ravongla Sub-division has lower percentage having only 3.26%. The decadal growth of scheduled caste population is 99% in 1981-1991 and 150 in 1991-2001. Again, the decadal growth of scheduled caste population of both the sexes is also different. In the male scheduled caste population, it was 103% in 1981-1991 and it becomes 150 in 1991-2001. In the female scheduled caste population change it was 98% in 1981-1991 but it rise to 149% in 1991-2001. But in absolute number the male scheduled caste population has decreased during 1981-1991 were 71 persons, where as in the case of female it is increased from 2039 of 1981 to 2007 in 1991 increasing 38 persons. In 1991-2001 both the male and female scheduled caste population were increased

Table 2.7 Scheduled Caste Population, South District 2001

Schedule Caste (%)	Category	No of Revenue Blocks	Revenue Blocks (%)
<2	Very Low	28	20.24
2 - 3	Low	09	6.60
3 - 4	Medium	13	9.60
4 - 5	High	09	6.60
>5	Very High	44	34.00
Nil		32	22.96
Total		135	100.00

•Source: Census Sikkim, 2001, Population provisional.

The distribution of scheduled caste population within the district is very uneven (fig2.2). According to 2001 Census there were 32 revenue blocks which do not have any scheduled caste population: this account around 23% of the total revenue blocks. There are 44 revenue blocks in the district which have a high (>5%) scheduled caste population to their respective blocks population. This category constitutes 34 percent of the total revenue blocks. Out of these, 33 revenue blocks are in Namchi Sub- division and eleven blocks are in Ravongla sub-division. Nearly 7% of the revenue blocks have high (4 - 5) scheduled caste population. Of which, Namchi Sub-

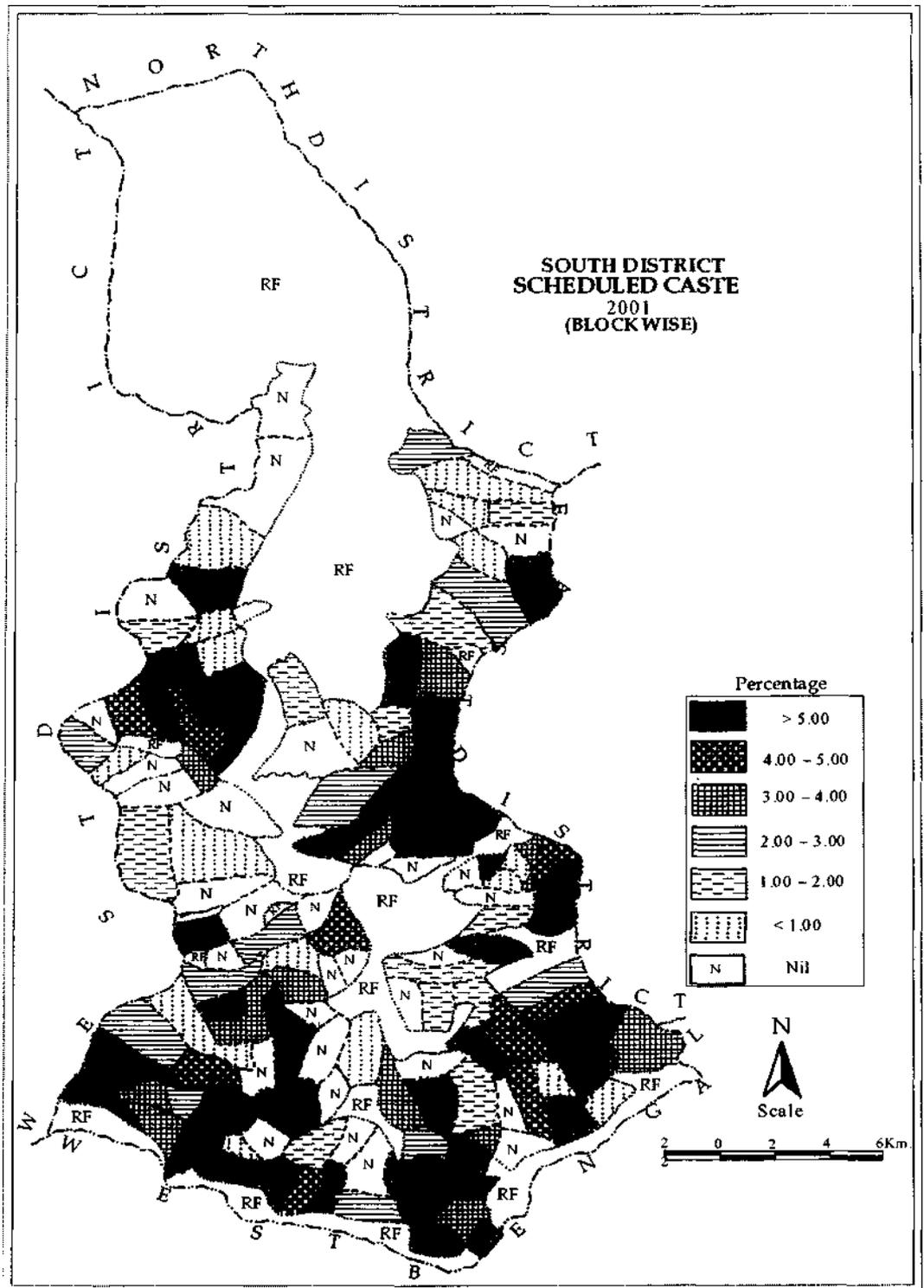


Fig2.2

division has eight blocks and one block is in the Ravongla sub- division. More than 9% of the revenue blocks have the scheduled caste population in between (3-4 %) to their respective blocks population. Another 6.6% of the revenue blocks are in the category of low (2-3) scheduled caste pfpopulation. The category of very low (< 2%)

occupies more than 20% of the total revenue blocks of the district. As a whole the highest percentage of scheduled caste population is found in the Pamphok having 29.30% and the lowest is in the Chuba having 0.14%. Both these blocks are in the Namchi sub- division. This reveals that there is relationship between the distribution of scheduled caste and scheduled tribe population, in these blocks where the high concentration of scheduled caste population has low concentration of scheduled tribe population and vice-versa.

The concentration index of scheduled caste population of South District also co- relates the same characteristic with scheduled caste distribution. The Pamphok has the highest concentration index having concentration index of 6 and Chuba has the lowest concentration having only 0.02. The over all characteristics of the scheduled caste population in the district is that Namchi Sub-division has more scheduled caste population than Ravongla Sub-division.

2.3.2a Decadal Changes of Schedule Caste (1991-2001)

Table 2.8 Changes of Scheduled Caste Population South District, (1991-2001)

Change in (%)	Increased		Decreased	
	No. of Revenue Blocks	Revenue Blocks %	No. of Revenue Blocks	Revenue Blocks %
<15	09	7.00	08	6.00
15-25	08	6.00	07	5.18
25-35	04	2.96	04	2.96
35-45	05	3.75	05	3.75
>45	05	12.11	35	26.93
Total	41	31.82	59	43.77
No Changes	02	1.48	00	00.00
Nil	30	22.43	00	00.00

•Sources: Census of Sikkim, 1991, 2001

The decadal change of scheduled caste population in the South District has a unique character (Table2.8). Out of the total revenue blocks 2 revenue blocks has no change Dorop and Shyampani. Another 30 revenue blocks did not have any scheduled caste population which accounts 22.43 percent of the total revenue blocks. All these blocks have the higher percentage of scheduled tribe population. Out the remaining revenue blocks, 59 revenue blocks or almost 44% has recorded increase in schedule caste population. Highest increase is found in the revenue blocks of Karek, Pabong, Burul, Likship, Gumpa gurpishy, Yangang and Tokdey etc. Another 41 revenue blocks or around 32% has recorded decrease in the scheduled tribe population. Of

these blocks highest decreased is recorded in the revenue blocks of Tinzer, Manpur, Bikmat, Ralong, Tinkitam and Lingi etc.

Another interesting fact of the decadal changes in scheduled caste population in the South District is that, out of the total revenue blocks, 5 had no scheduled caste in 2001, those had scheduled caste population in 1991 Census, 4 revenue blocks those had no any schedule caste population in 1991 Census, but recorded schedule caste population in 2001. This intra decadal shifting of schedule caste population is due to inter block migration of population as initiated by the forces of wanting to live in those areas where the socio-cultural affinities are exists and another factor is inter block labour migration. It can be rightly concluded that the scheduled caste population in the South District is increasing slowly.

2.3.3 Scheduled Tribe Population

According to 2001 Census, the South District has 15.57 percent scheduled tribe population. Out of these, Namchi Sub-division has 11.79 percent and 23.05 percent is in Ravongla Sub-division. This indicates that the distribution of scheduled tribe population is marked different from scheduled caste. The concentration of scheduled tribe population is more in Ravongla Sub-division than Namchi Sub-division and in the case of scheduled caste; the concentration is more in Namchi sub-division than Ravongla Sub-division. An appraisal of the distribution pattern of the tribal communities shows that, their spatial distribution is characterised by a striking tendency of clustering and concentration in pockets, which have suffered from isolation and are situated in those areas where environmental setting is by and large not suitable for settled agriculture. Ravongla Sub-division has the physical condition of isolation, rugged topography and severe climate which attract the tribal population; and another factor is that the sub-division has higher concentration of scheduled tribe population which lack in infrastructural development in comparison to Namchi Sub-division. The general distribution pattern of scheduled tribe population in the district is that, western part of Ravongla and northern part of Namchi Sub-division have higher concentration, where the southern part of Namchi and eastern part of Ravongla have lesser concentration of scheduled tribe population.

Table 2.9 Scheduled Tribe Population South District, Sikkim. 2001.

Scheduled Tribe in (%)	Category	No of Revenue Blocks	Revenue Blocks %
<10	Extremely low	50	37.05
10-20	Very low	29	21.48
20-30	Low	19	14.07
30-40	Medium	09	6.66
40-50	High	06	4.44
>50	Very high	08	5.92
Nil		14	10.37
Total			100.00

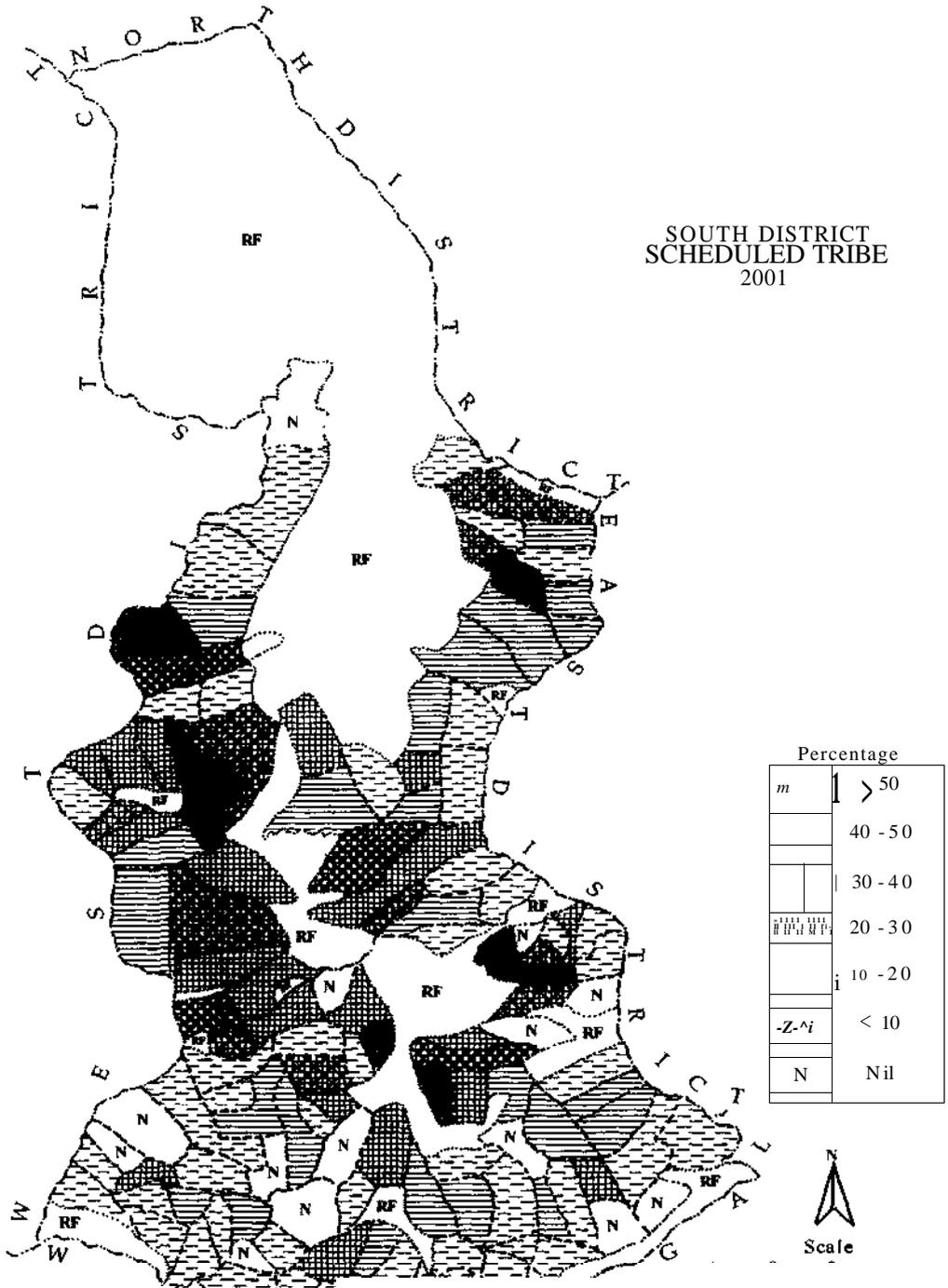
* Source: Census of Sikkim. 2001.

Ravongla Sub-division has the physical condition of isolation, rugged topography and severe climate which attract the tribal population; and another factor is that the sub-division has higher concentration of scheduled tribe population which lack in infrastructural development in comparison to Namchi Sub-division. The general distribution pattern of scheduled tribe population in the district is that, western part of Ravongla and northern part of Namchi Sub-division have higher concentration, where the southern part of Namchi and eastern part of Ravongla have lesser concentration of scheduled tribe population.

The scheduled tribe population in the district for the last three decades i.e. 1981, 1991, and 2001 show the fluctuating trend. In 1981 the scheduled tribe constituted 17.51 percent but becomes 12.15 percent in 1991 decreasing almost 5.36 percent. Again it increased in 2001 it becomes 15.57 percent increasing 3.42 percent.

The distribution pattern of scheduled tribe population is also uneven (fig2.3). According to 2001 Census (Table2.9), more than 10 percent of the revenue blocks has no scheduled tribe population of which Ravongla Sub-division has only a single revenue block i.e. Sada and Namchi Sub-division has the remaining revenue blocks in this category. Around 37 percent of the blocks are in the category of extremely low (<10). These revenue blocks are located in northern and eastern part of Ravongla sub-division and western southern and eastern part of Namchi-Sub-division. About 22 percent of the revenue blocks are in the very low category (10-20%) of scheduled tribe population. These blocks are located in eastern and southern part of Ravongla sub-division and northern, north eastern part of Namchi Sub-division. Nearly 14 percent of the revenue blocks are in low (20-30%) scheduled tribe population. These

SOUTH DISTRICT
SCHEDULED TRIBE
2001



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Fig 2.3

revenue blocks are mostly concentrated in the southern and northern parts of both the sub-division. Almost 7 percent of the revenue blocks have medium (30-40%). Of which, 5 blocks are in Namchi Sub-division and remaining are in Ravongla Sub-division. More than 4 percent of the total revenue blocks are found in the high category (40-50%) of scheduled tribe concentration. About 6 percent of the revenue blocks have very high (> 50%) scheduled tribe population.

2.3.3a Decadal Changes of Scheduled Tribe Population: (1991 -2001).

The decadal changes of scheduled tribe population in the South District have a unique character. Out of the total revenue blocks 83 revenue blocks or 61.27% has registered positive increased in scheduled tribe population from 1991 to 2001 and another 34 revenue blocks or 25.43% has recorded decreased in scheduled tribe population. Besides there are 18 revenue blocks or 13.33% of the total revenue blocks which does not change during this period. (Table2.10)

Table 2.10 Decadal Changes of Scheduled Tribe Population, South District. (1991-2001)

Changes in (%)	Increased		Decreased	
	No of Revenue Blocks	Revenue Blocks %	No of revenue Blocks	Revenue Blocks %
<15	17	12.59	13	9.63
15 - 25	13	9.62	02	1.48
25 - 35	11	8.14	04	2.96
35 - 45	10	7.40	05	3.70
>45	32	23.70	10	7.40
	83	61.27	34	25.43
Nil	18	13.33		

* Source: Census of Sikkim. 1991 & 2001

The increase is highest in the very high (> 45%) category, having 32 revenue blocks (23.70%). The highest percentage of decrease is found in the category of very low (< 15%) having only 13 revenue blocks ((9.63%). There are also another 8 revenue blocks which have scheduled tribe population in 1991 but has no scheduled tribe in 2001. Besides, 3 revenue blocks registered scheduled tribe populated areas, which did not record any scheduled tribe in 1991 Census. This absolute change of scheduled tribe population is due to inter-block migration and has the some factor for shifting of population with the case of scheduled caste migration. Nevertheless the scheduled tribe population has an increasing trend in South District.

The study of scheduled tribe population distribution suffers from serious abnormalities in the South District because the Government has recently included

Tamang and Limboo communities in the scheduled tribe list. Their actual figure is not available as these communities were earlier enumerated as general Nepali community. Nevertheless, the district has an inverse relationship in the distribution of scheduled tribe and scheduled caste population (fig2.3). The map depicts that, in the Namchi Sub-division the distribution of scheduled tribe population is dispersed concentrating only in few pockets. Where as Ravongla Sub-division scheduled tribe concentration is very high and uniform in most of the blocks.

2.4 LITERACY

Literacy is one of the important characteristics of population; improvement in the literacy rate is an important index of social and cultural advancement as well as economic transformation that any area /block undergo. The acceleration of literacy transformation could provide the area/ region much needed break through in its socio-economic development.

Table 2.11 General Literacy Rate, South Distinct. 2001

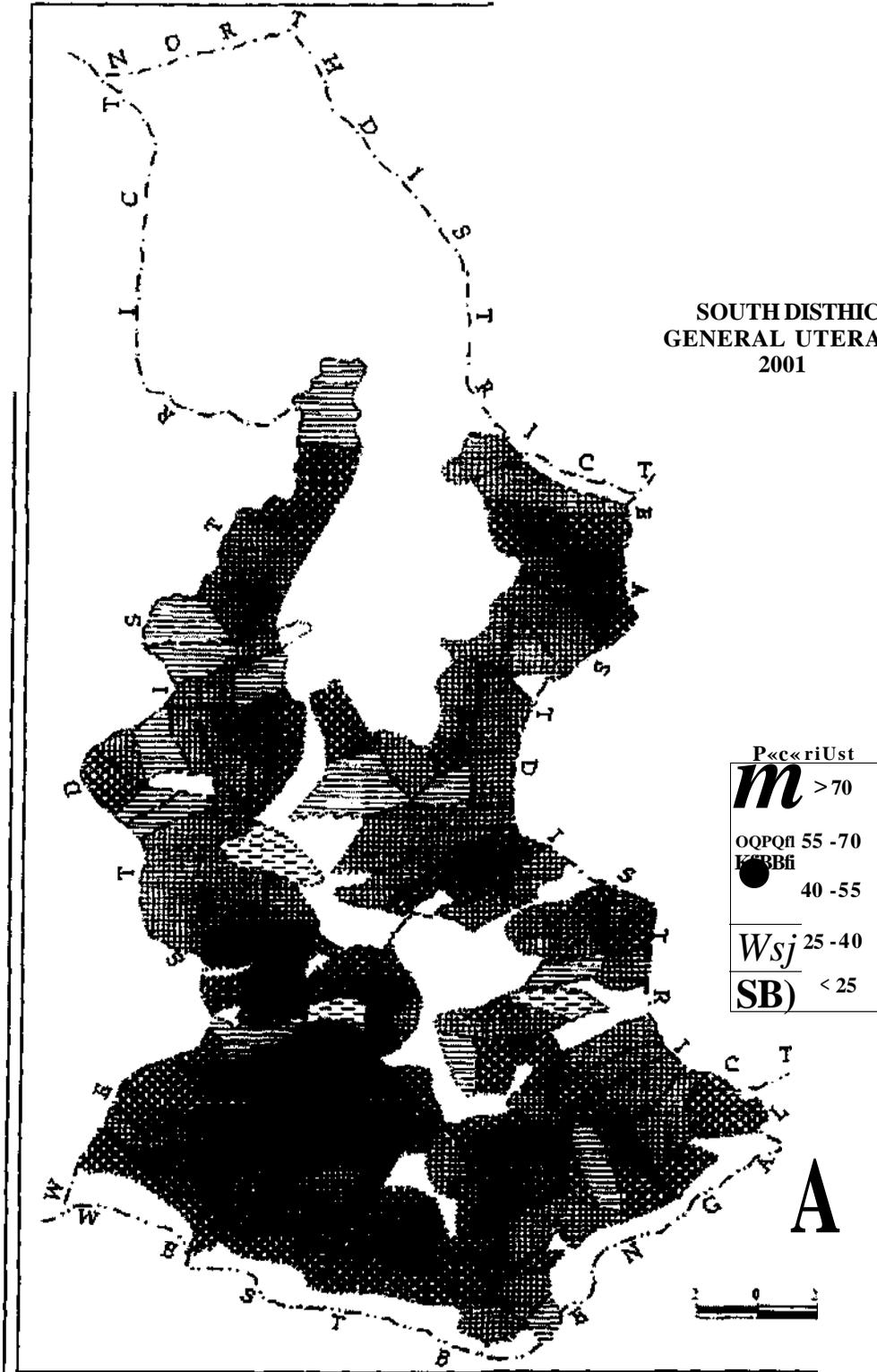
Percentage	Category	No of Revenue Blocks	Revenue Blocks %
<30	Very low	03	2.14
30-45	Low	07	5.00
45-60	Medium	40	28.57
60-75	High	63	45.00
>75	Very high	27	19.28
Total			100.00

*Source: Census of Sikkim, 2001.

According to 2001 Census (fig 2.4) and Table 2.12 shows that more than 2 percent of the revenue blocks have very low literacy rate (<30%) in the South District. The low category (30 -45%) of literacy rate constitute 5percent of the total revenue blocks, then 28 percent of the revenue blocks have medium literacy rate (45 -60%). The high category (60 - 75%) of literacy rate occupies 45 percent of the revenue blocks of which 44 blocks are in the Namchi Sub-division and Ravongla Sub-division has 19 revenue blocks. Around 20 percent of the revenue blocks have very high rate (>75%) literacy rate.

The general characteristics of literacy rate in the district is that, southern part of the district i.e. Namchi Sub-division has higher rate of literacy than the Ravongla Sub-division as more number of blocks in the higher literacy rate are found in the Namchi Sub-division. Medium and low literacy are mostly observed in Ravongla

**SOUTH DISTRICT
GENERAL UTILITY
2001**



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Sub-division. Nevertheless the literacy rate in the district is increasing. The highest literacy rate is found in Tinzer revenue block (86.1%) and lowest is found in the revenue of Burul (17%). The male literacy is highest in Omchu block (92%) and highest literacy rate is in Gumpa Gurpishey (77%). But much emphasis has to be given for more literacy rate increased especially in the northern part of the district i.e. Ravongla Sub-division, where the un-conducive conditions have been discourages the increase in literacy.

2.4.1 Decadal Change of Literacy: (1981-2001);

Table 2.12 Decadal Changes of Literacy. South District.(1991-2001)

Year	Literacy in (%)	Decadal Changes	Male	Decadal Changes	Female	Decadal Changes
1981	34.19		41.63		18.87	
1991	46.18	35.06	51.03	22.57	34.36	80.02
2001	56.72	22.82	62.25	21.98	50.12	45.68

*Source: Census of Sikkim. 1981, 1991 &2001.

Literacy rate in the South District has increased. Table 2.11 shows that there has been considerable improvement in literacy rate since 1981. It was 34.19 percent in 1981 which reached to 46.18 in 1991 and again it rose to 56.72 percent in 2001. The decadal changes of the literacy rate are 35.06 percent in 1981- 1991 and 22.72 percent in 1991-2001. The decadal change is different both the decades as it was more in the first decade and little lower in the next decades. The growth of literacy rate for both the sexes is also different. In the case of males it was 41.63 percent in 1981 and rose to 51.03 percent in 1991 and still increasing up to 62.25 percent in 2001. The growth of literacy rate in the male sex is gradual, where as in the case of females it is almost double in 1991 from 1981 ascending from 18.87 percent to 34.36 percent in 2001. The decadal changes of literacy rate for both males and females are also different. In the case of males it was rose to 22.57 percent during 1981 to 1991 and 21.98 percent during 1991 to 2001. But in the case of females it was 80.02 percent and 45.68 percent during 1981 to 1991 and 1991 to 2001 respectively. The general trend of literacy rate in the district is increasing and for both sexes it has a different trend. Female literacy rate is increasing more than male literacy rate.

2.5 DENSITY OF POPULATION

The density of population is one of the important determinants of man land ratio. In other words, it is the indicator of how much of pressure has been given upon the natural resources by man in a particular area. The picture of density of population in the South District is increasing means that the pressure on the natural resources of the district is also increasing due to various factors.

SOUTH DISTRICT DENSITY OF POPULATION

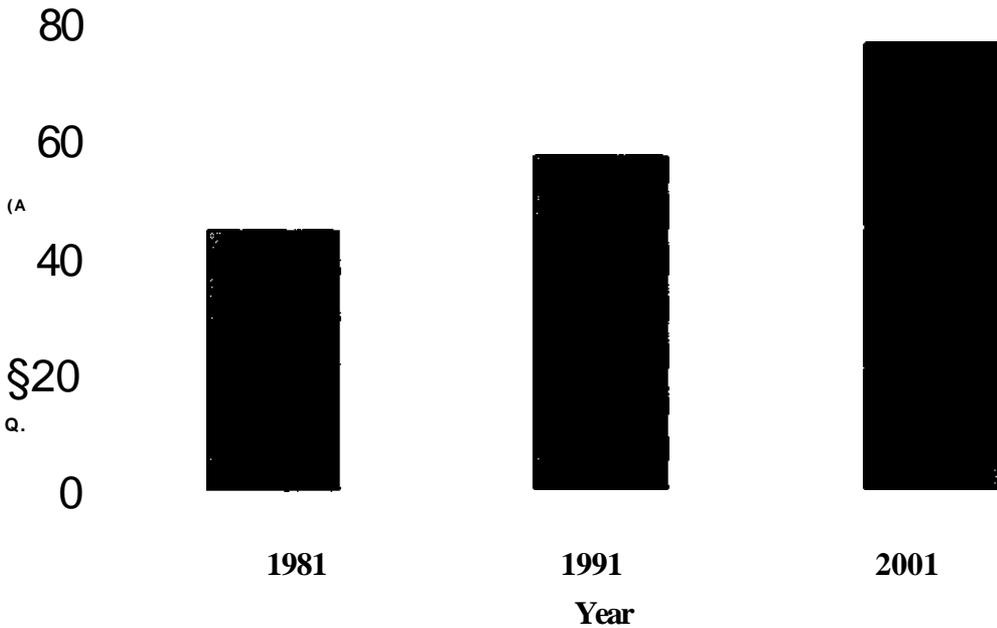


Fig 2.b

The (fig2.b) reveals that the density of population in the South District is increasing as 44, 57 and 76 persons per km² in 1981, 1991 and 2001 respectively. The density of population is high in most of the revenue blocks and increasing decades after decades. Within the district northern portion of Ravongla Sub-division and north-eastern portion of Namchi Sub-division has lower density of population and southern parts of both the Sub-division have higher density of population.

2.5.1 Density of Population: 2001

Table 2.13 Density of Population, South District, Sikkim 2001

Persons per km ²	Category	No of Revenue Blocks	Revenue Blocks %
< 100	Extremely low	15	10.25
100-200	Very low	40	27.45
200 - 300	Low	38	26.21
300-400	Medium	21	14.70
400 - 500	High	13	8.98
>500	Very high	18	12.41
Total		145	100.00

Source: Census of Sikkim, 2001

According to 2001 Census, in the South District, density of population varies from fewer than 100 persons per km² to more than 2000 persons per km². The extremely low and very high density of density of population is also not much. (fig2.5). Table 2.12 reveals that around 10 percent of the revenue blocks have extremely low (<100 persons per km²) of population. All of these revenue blocks are located in remote areas and are not easily accessible. They have been isolated by forested tracts or main drainage channel. Very low density of population (100- 200 persons per km²) occupies around 27 percent of the revenue blocks of the district. More than 26 percent of the revenue blocks have low (200 - 300 persons per km) density of population. In Namchi Sub-division, the blocks which fall in this category are mostly found in the north eastern and north western parts and in Ravongla Sub-division they are located in the north eastern and south eastern parts. Around 15 percent of the revenue blocks have the density of population between (300 - 400 persons per km²). Most these blocks are located in the lower hills (600 - 1880mt), easily accessible and in the dry belt of the district. The high (400 - 500 persons per km) density of population constitutes around 9 percent of the revenue blocks of the district. All of these revenue blocks are located in the lower hills altitude (< 600mt). In these revenue blocks, high density of road net work also helps the higher concentration of population. Almost 14 percent of the revenue blocks are in the very high (>500 persons per km²) density of population. Out of these 4 revenue blocks i.e. Gumpa gupishey, Bomtar, Singithang, Salghari, have high density of population due to nearness of district headquarters and Melli is being a smaller area and as well as it is the gate way of South District to the nearest metro city Sillguri. Most of the rural agricultural products like ginger, broom, cardamom are exported though Melli bazaar

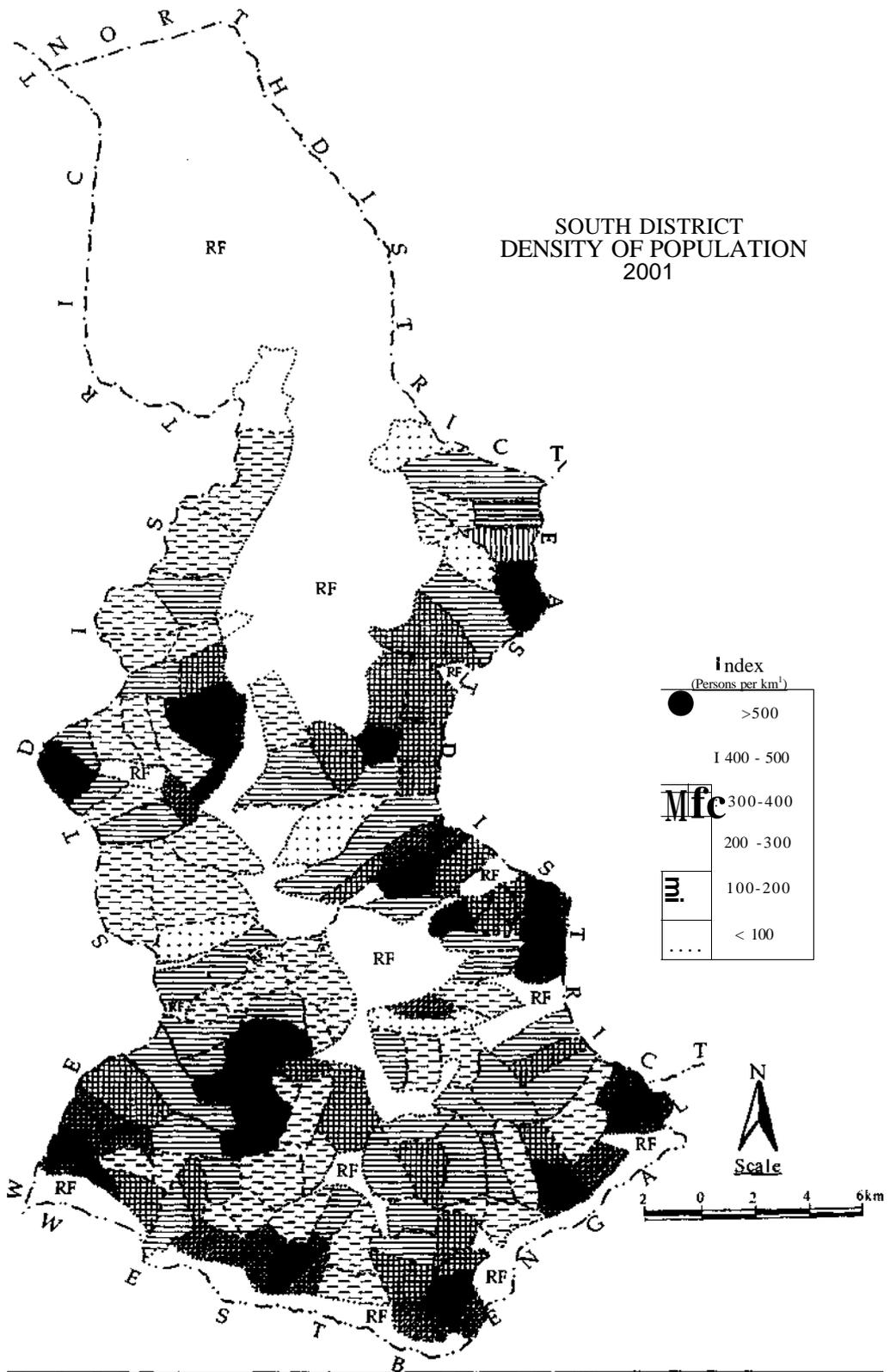


Fig 2.5

and location of two important factory of beer also help high concentration of population. Another block i.e. Mamring which is also has very high density of population is due to its emergence as industrial growth centre as location of factory like food packaging, mining and establishment of high security ink manufacturing. In South District transports and communications plays a vital role for the distribution of population. The low density of population in the district is accompanied by low accessibility and vice -versa.

2.6 POPULATION GROWTH

The study of human resources is very important for socio-economic and cultural development of a society. Man is the main movers and sacker of any society. The growth of population is adversely affected by the utilization of the natural resource and degree of exploitation. The basic components of natural population growth are mortality, fertility and migration.

Table 2.14 Decadal Growth of Population, South District 1981-1991 & 1991 -2001.

Change in (%)	Category	1981- 1991		1991 -2001		Changes 1981-1991 to 1991-2001
		No.of Revenue Blocks	Revenue Blocks %	No.of Revenue Blocks	Revenue Blocks %	
<10	Very low	7	5.18	12	8.88	71.42
10-20	Low	19	14.07	26	19.25	36.81
20-30	Medium	28	20.74	35	25.23	21.64
30-40	High	23	17.04	23	17.04	00.00
>40	Very high	50	37.04	33	24.44	-34.01
Negative Growth		8	5.92	6	4.44	-25.00
Total		135	100.00	135	100.00	

* Source: (Census of Sikkim, 1981, 1991 & 2001)

2.6.1 Decadal Changes of Population: (1981 -1991)

The decadal growth rate of population in South District of Sikkim is high during the last three decades. During 1971 -1981, the changes of population were 42.85 percent, 29.78 percent in 1981-1991 and again 33.38 percent in 1991 -2001. The decadal growth of urban population is highest in 1991-2001 being 53.60 percent.

The growth rate of population for the last two decades is very different. Table 2.13 shows that there are 7 revenue blocks, which occupy 5.18 of the total revenue blocks, where the decadal change of population is very low (<10 %) in 1981- 1991.

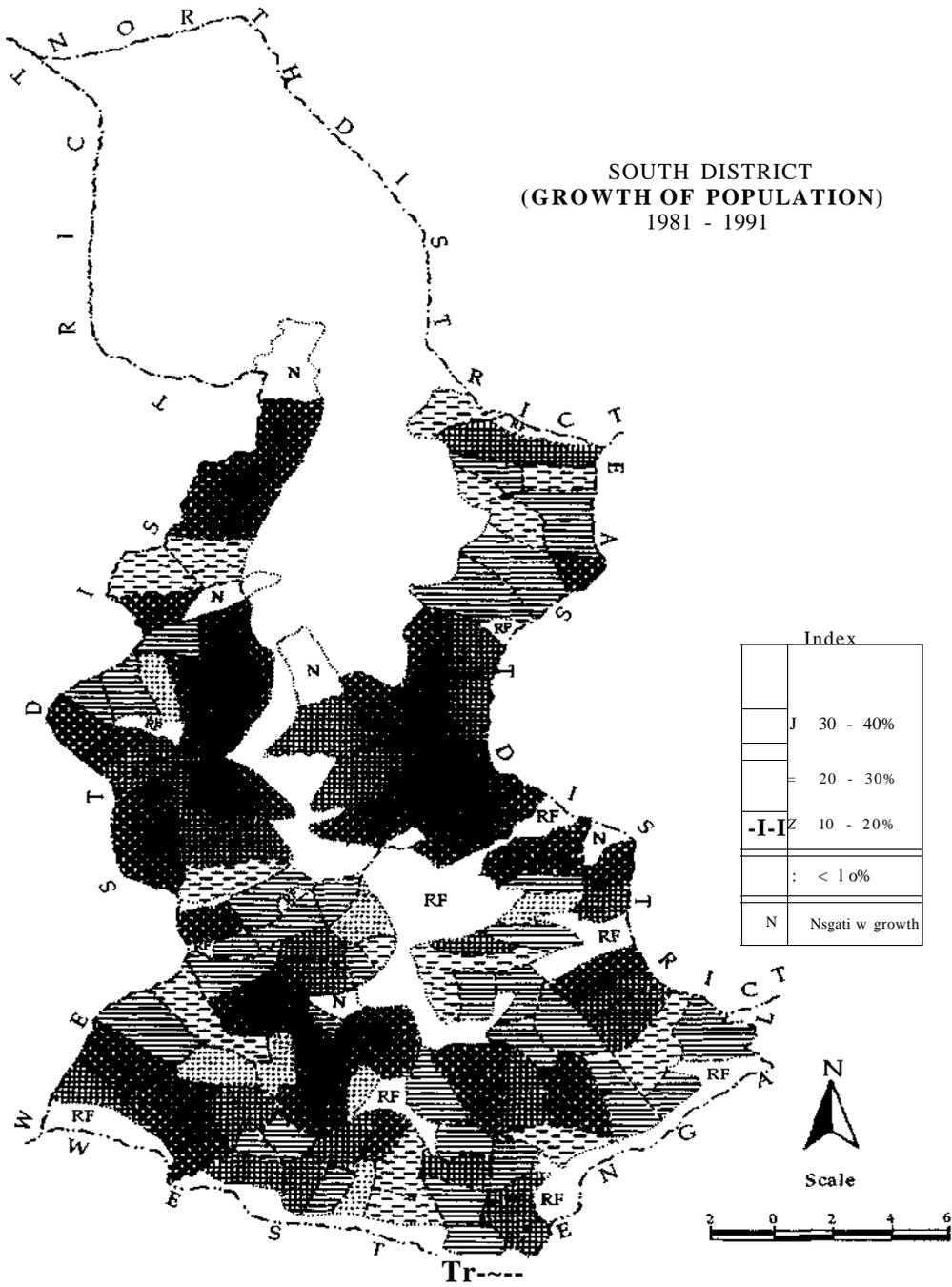


Fig 2.6

There are another 19 revenue blocks which recorded the low decadal growth of population (10 -20%) constituting 14.07 percent of total revenue blocks. Most of these revenue blocks are located in the western and central parts of Namchi Sub-division (fig.2.6) and western parts of Ravongla Sub-division. More than 20 percent of the revenue blocks have the decadal changes of medium (20 -30 %). Out of these, Namchi Sub-division has 23 revenue blocks and 5 revenue blocks are in Ravongla

Sub-division. Around 17 percent of revenue blocks are under the category of high (30-40%) decadal growth. The very high decadal growth (> 40%) has occupied more than 37 percent of revenue blocks. Besides, in the entire district there are 8 revenue blocks which have recorded negative decadal population growth in 1981-1991, constituting around 6 percent of the revenue blocks, these blocks are Rabikhola, rayong, Tokal, Sada, Ralong, and Rabong. During the decade, the highest growth rate of population is recorded in Shalghari in Namchi Sub-division and Barfung in Ravongla Sub-division. Both of these cases are due to inter- state migration.

2.6.1a Decadal Changes of Population: (1991-2001)

The decadal growth population in this period (1991-2001) differs from the previous period (1981-1991). About 9 percent of the revenue blocks has recorded very low (< 10%) decadal growth. In the category of low (10 -20%) decadal growth in this period constitutes 19 percent of total revenue blocks. More than 25 percent of the revenue blocks are found in medium (20 -30%) decadal growth. These blocks are located in western, south western parts of Namchi Sub-division. The very high (> 40%) decadal growth has around 25 percent of the revenue blocks, Most of these revenue blocks have very high growth due to high rate of rural to rural and rural to urban migration in the case of Gumpa Gurpishey, Bomtar, Singithang, and development of educational institution as well as increased in road connectivity. In the case of Likship the construction of hydro-electricity plant by NHPC leads to high immigration of labours. In this period, there are 6 revenue blocks which has recorded negative growth rate; they are Turuk, Passi, Tinkitam, Ben, and Namphrik in both the sub-division, (fig.2.7)

This shows the rural to urban migration have an increasing trend in the district. The trend is more significant in the coming years as the pull factors of immerging town in the district is increasing, due to the development of towns and most of the infrastructure facilities are concentrated in the small town. The factors cause a vacuum in the rural areas especially in the labour sector, where most of the revenue blocks have facing the problems of acute labour shortage during the cultivating seasons.

**SOUTH DISTRICT
(GROWTH OF POPULATION)
1991-2001**

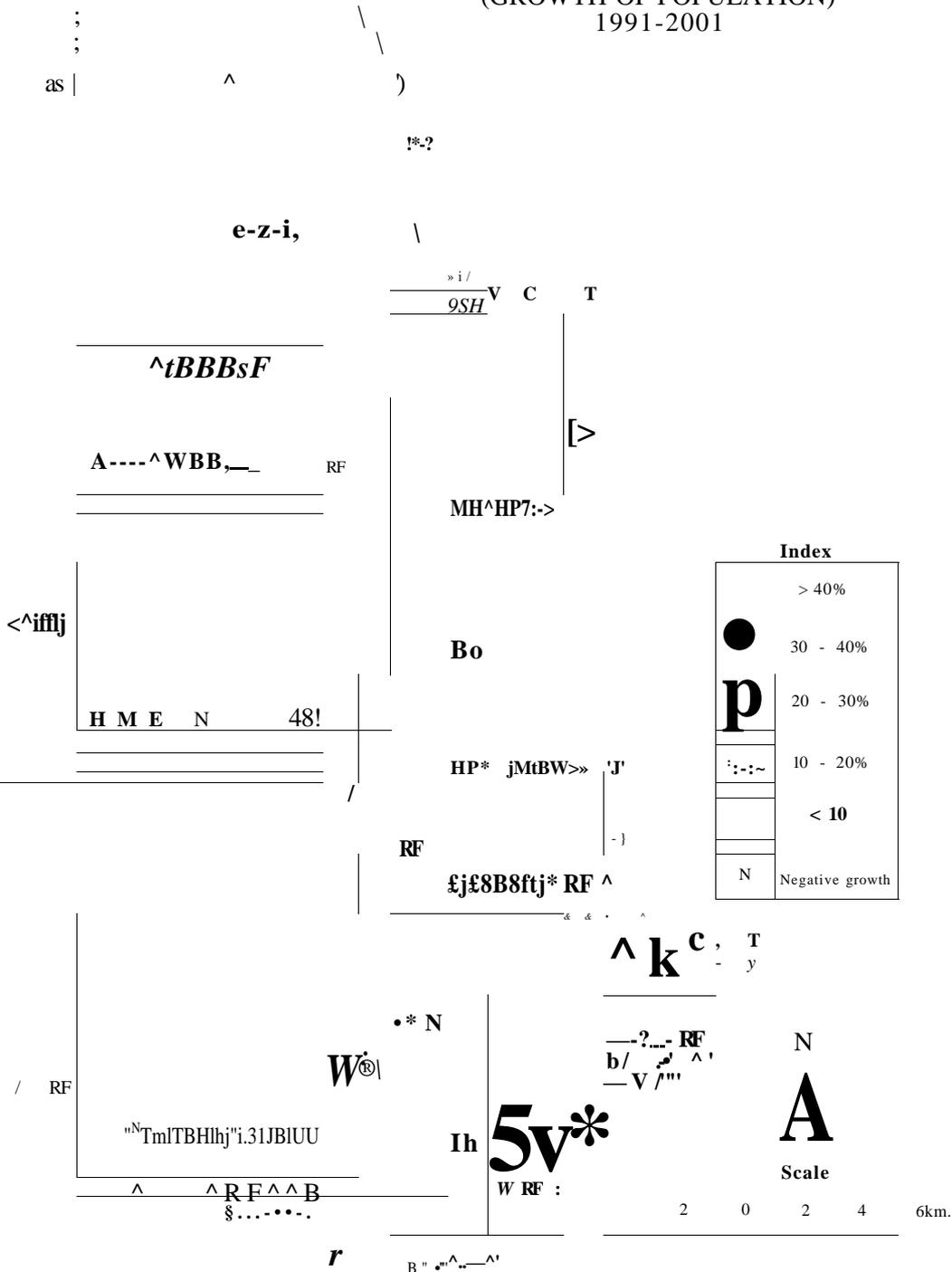


Fig 2.7

2.6.3 Changes of Population :(1981-1991 to 1991-2001)

The comparison of the two decadal growth of population has revealed the following facts :-

- i). All the revenue blocks which have recorded negative growth during (1981-91) have changed to positive growth in (1991-2001)
- ii) In the very high category decadal growth rate of population in (1981 -1991), all the revenue blocks except three blocks have recorded negative growth in (1991-2001). These three blocks are Tern (51.02%), Deythang(52.19%) and Likship (54.97%) in 1981-1991, becoming (57.65%),(57.57%) and (20.70%) in 1991-2001. The changes percentage value of these three revenue blocks are (6.63%), (26.65%) and (152.03%) respectively.
- iii) Around 57 percent of the total revenue blocks which recorded positive decadal growth during 1981-1991 have witness negative growth of population in 1991-2001. The highest change in negative growth is recorded in Singithang block. It was (81%) during 1981- 1991 and (38.84%) in 1991-2001. Another revenue blocks which shows high negative growth is Barfung in Ravongla Sub-division having (87.52%) in 1981-1991 and (35%) in 1991-2001. Besides, these two other revenue blocks which have recorded negative growth but in low percentage are. Tinzer, Gom, Sumbuk.Suntalry etc.
- iv). More than 47 percent of revenue blocks have changed from positive to positive during 19981-1991 to 1991-2001. The highest positive to positive population growth during the period is recorded in Likship revenue block. Besides, Pajer, Gumpa Gurpishey, Kopchey ralong etc are some of the revenue blocks which also recorded positive to positive growth of population. The positive to positive growth of population is due to various factors exist in the district, like development of power glass factory at Bomtar, Hydro-power in Likship, carpet weaving in Barfung, Establishment of power glass factory in Bomtar, construction of industrial training centre at Shalghari, establishment of high security and copper mining at Manning initiate inter block migration. Besides emergence of rural market centre as well as tourist centre in some of the blocks.

2.7 WORKING POPULATION

The economically active population is known as working population. The study of working population is of immense significance for planning and development. Among the major factors responsible for low percentages of working force are high birth rate and consequent large portion of children below 15 years of age, prejudice against the female education, mobility, and employment. The composition of working population again varies with sex, residence and age. The disparity among participation of male and female are quite significant in the district.

Table 2.15 Working Population Revenue Blocks, South District, Sikkim 2001

Percentage	Category	No of revenue Blocks	Revenue Blocks %
<40	Very low	15	10.34
40 - 50	Low	18	12.41
50 - 60	Medium	58	40.00
60 - 70	High	38	26.21
>70	Very high	16	11.04
Total		145	100.00

*Source: Census of Sikkim. 2001

According to 2001 Census, there are 10.34 percent of the revenue blocks which fall in very low category (< 40%) of working population. More than 13 percent of the revenue blocks have low (40 - 50%) working population, (fig. 2.8). Another 40 percent of the revenue blocks are under the category of medium (50 -60 %) working population. Out of these, Namchi-Sub-division has 38 revenue blocks and 20 revenue blocks are in Ravongla Sub-division. The high working population concentration (60-70%) ha occupied 26.21 percent of the total revenue blocks. Of these, 28 revenue blocks are found in Namchi Sub-division and 11 revenue blocks are in the Ravongla Sub-division. The very high participation of population in economically gainful activity has occupied 11.04 percent of the total revenue blocks of the district.

The over all picture of working population or participation ratio in the South District is that, Namchi Sub-division has high concentration of revenue blocks of high participation rate. The economic diversifications and comparatively high rate of urbanisation leads to high opportunities in Namchi Sub-division than the Ravongla Sub-division.

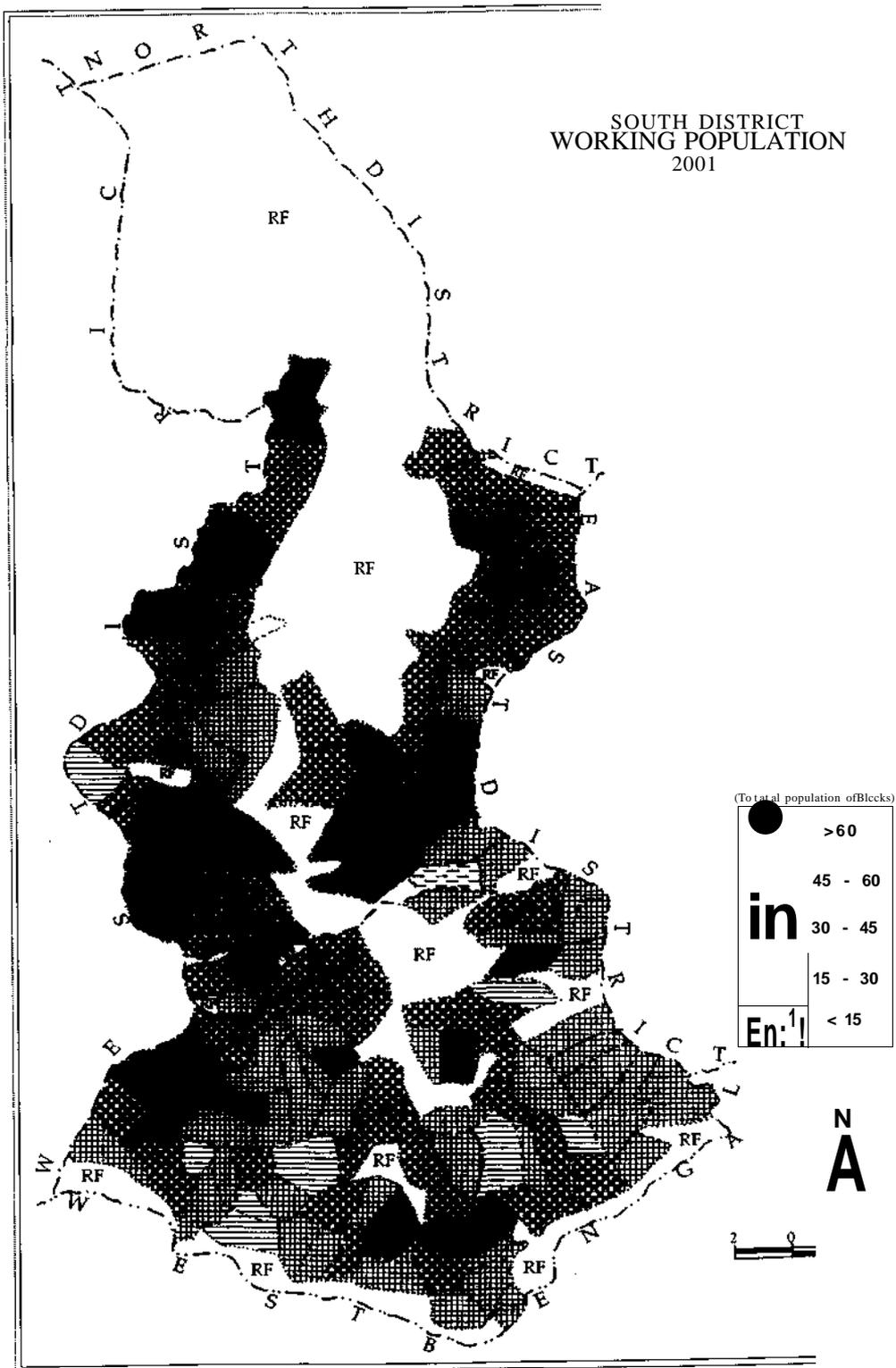


Fig 2.8

2.7.1 Decadal Change of Working Population: (1981-2001)

The decadal change of working population in the South District shows a fluctuating trend (Table 2.15), both yearly and as well as sex wise.

population for both the sub-division are 34.40% and 18.58 percent for Namchi and Ravongla Sub-division respectively.

Table 216. Decadal Change of Working Population, South District Sikkim (1981-2001)

Year	Total Changes	Changes in(%)	Male	Change in (%)	Female	Changes in (%)
1981	47.79	—	30.98	—	16.37	—
1991	42.12	-11.86	26.66	-13.94	15.46	-5.55
2001	52.98	+25.78	30.56	+14.62	22.42	+45.05

* Source: Census of Sikkim. 1981,1991 & 2001

The sex difference in the working population is also observed in the district (fig.2.9) .In the case of males, it was 30.98% in 1981 and become 26.56%in 1991 decreasing almost 13.94 percent. In the same period, the females working population change was from 16.37% in 1981 to 15.46% in 1991 decreasing only 5.55%. In the decade of 1991 to 2001, male working population becomes 30.56% increasing around 23% from the previous decade. In the same period, the percentage of female working population is 45 percent increasing 22.22% from the previous decade.

The working population for both sexes has increasing trend in the district. Due to rapid expansion of educational facility and the communication, the change is very rapid in the case of female than male.

2.8 DEPENDENCY RATIO: 2001

It is very relevant to study about the dependency ratio while discussing the working population, because it is also another economic indicator and both are inter-related and interdependent.

Table 2.17 Dependency Ratio, South District. Sikkim 2001

Percentage	Category	No of Blocks	Revenue Blocks %
<20	Low	2	1.48
20-35	Medium	29	21.48
35-50	High	76	56.29
>50	Very high	28	20.74
Total		135	100.00

*Source: Census of Sikkim. 2001.

The revenue block wise dependency ratio is represented by Table 2.16. It reveals that there are only 2 blocks which fall in the low (<20%) category, occupying only more than 1 percent of the total revenue blocks. The medium category (20- 35%) dependency ratio has 21 percent of the blocks. Of these, Namchi Sub-division has 21 revenue blocks and Ravongla Sub-division has 8 blocks, (fig.2.10). the high dependency ratio (35-50%) has constituted more than 56 percent of the total revenue

SOUTH DISTRICT
DEPENDENCY RATIO
2001

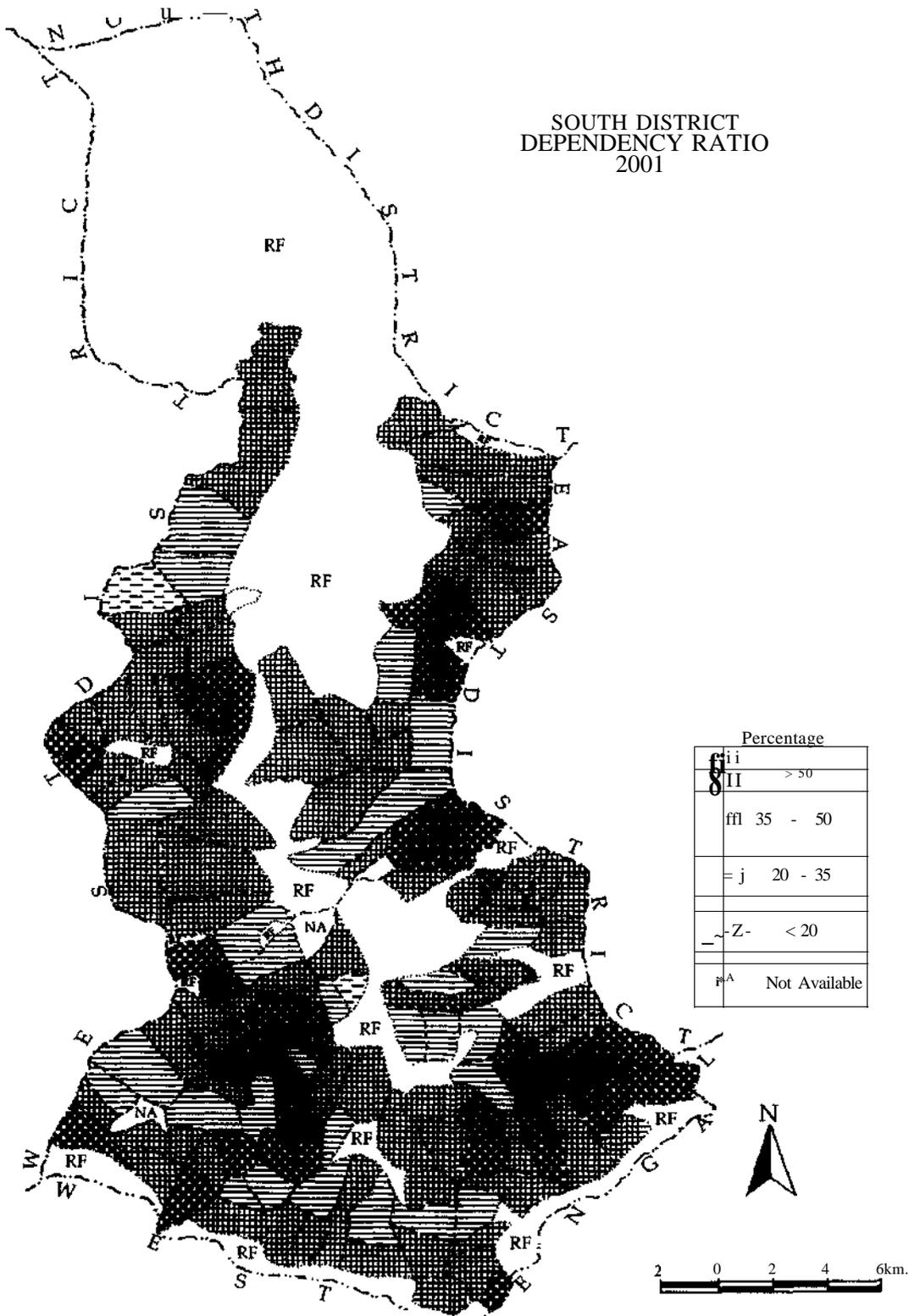


Fig 2.10

blocks. Out of these, Namchi Sub-division has 49 revenue blocks and Ravongla Sub-division has 27 revenue blocks. More than 20 percent of the revenue blocks are found in the very high category (> 50%). The dependency ratio in the district is very high because, the high and very high category together occupied more than 70 percent of the total dependency ratio.

2.8.1 Changes of Dependency Ratio: (1981-2001)

The decadal change of dependency ratio in South District shows ups and down for the last three decades (Table 2.17). In the year 1981, it was 49.66 percent to total districts population and it increased to 57.60 percent in 1991. The decadal change is (+15.98%). But the next decade change is negative as the total percentage in 2001 is 47% decreasing (-18.40%) in this period 1991-2001.

Table 2.18 Decadal Change of Dependency Ratio South District Sikkim.(1991-2001)

Year	Dependency Ratio.	Decadal change	Male	Changes	Female	Changes.
1981	49.66		22.63		27.03	
1991	57.60	+ 15.98	25.78	+13.97	31.82	+17.72
2001	47.00	- 18.40	30.55	+18.50	22.42	-29.54

•Source: Census of Sikkim 1981, 1991&2001

The dependency ratio for both males and females are also not similar. In the case of males it is decreasing continuously from 1981 to 2001 as the percentage was 22.63 percent in 1981, 25.78% in 1991 and 30.55% in 2001. The decadal change for male dependency, during 1981- 1991 is (+13.97) and (+18.50) in 1991-2001. Where as in the case of female, the trend is fluctuating as it was 27.03% in 1981, 31.82% in 1991 and 22.42% in 2001. The decadal changes during 1981-1991 was (+13.97) and (+18.50) in 1991-2001.

The over all scenario of dependency ratio in the district is that, those blocks where the literacy is very high, the dependency rate is also very high. Another important fact is that in those blocks where the female literacy rate is low the dependency rate is also low. It also true that the blocks which are located near by the sub-divisional headquarters the dependency ratio is high.

2.9 OCCUPATIONAL STRUCTURE

The occupational structure is also an important indicator of economic development. The South Districts occupational structure is mainly dominated by primary sector like other rural and remote areas of the county. The occupational

structure of the district is composed of primary, (cultivators, agricultural labours) secondary, (household industry) and tertiary workers (business, transport and communication and other white colour job). Table 2.18 represents the occupational structure of South District for the last two decades. The primary sectors of occupation occupied 73.81%, 75.70% and 74.51% 1981, 1991 and 2001 respectively. These indicate that the composition of primary occupation to the total population is fluctuating trend. And still more than 70 percent of the total population of district is depend on primary occupation.

Table 2.19 Occupational Structure (South District) .2001

Year	Primary			Secondary			Tertiary		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
1981	42.83	30.98	73.81	0.73	0.08	0.81	17.80	3.42	21.22
1991	42.70	33.00	75.70	0.53	0.03	0.54	17.10	6.66	23.76
2001	42.07	32.44	74.51	0.60	0.27	0.87	18.60	5.40	24.00

* Source: Census of Sikkim. 1981, 1991 & 2001

The secondary occupation in the district has occupies negligible portion. This is may be due to lack of income generation opportunities and losing importance of traditional cottage industry. The composition in this sector for 1981, 1991 and 2001 were 0.81%, 0.54 and 0.87 respectively. But the tertiary sector of occupation occupies a sizable portion of working population. These were 21.22% in 1981 and 23.76 % in 1991 and again 24% in 2001. This is the only sector of occupation which has a steady increasing trend in the district.

The male and female participations in all the three types of occupation are also different. In all the sectors of economy male participation is more than the female percentage. Male participation in primary sector is decreasing from 42.83% in 1981 to 42.70% in 1991 further decreasing to 42.07% in 2001. Where as in the case in the case of female participation in this sector is fluctuating, from 30.90% in 1981 and increased to 32.85% in 1991 and again further increased to 33.62% in 2001. The third category of occupational structure both the participation rate of male and female is less than 1% in all the census years. The male participation in this sector for the last three consecutive decades i.e, 1981, 1991 and 2001 are 0.73 %, 0.51% and 0.60% respectively. But, the female participation rate shows different trend, it was 0.07 %, 0.03 % and 0.27% in 1981, 1991 and 2001 respectively. The participation in the tertiary sector of occupation for both male and female is more significant, because in this sector male have 17.08% in 1981, 17.13 % in 1991 and 18.60 in 2001. The

females occupied 4.14% in 1981, 6.33% in 1991 and 5.40% in 2001. An increased by female in this sector is significant in comparison to male percentage.

The facts and figure reveal that in all the three sectors of occupation male dominance is still observed in the district, except a sizable presence of females in the primary sector. This disparity is due to various factors, like less female literacy, social obligation of females to work outside or far away from home etc. In order to increase the female participation some women oriented policies like encourage girls education, establishment of women self help group, mass mobilisation for changing attitude for social obligation against the women and revival and encourage of traditional cottage industry, and training and support for small scale industry, like handloom and handicraft, tailoring and embroidery are to be encourage.

2.9.1 Primary Occupation (Cultivators)

Table 2.20 Percentage of Cultivators.(South District.2001)

Percentage	Category	No of Revenue Blocks	Revenue Blocks %
<50	Very low	21	14.58
50-65	Low	10	6.94
65-80	Medium	30	20.83
80-95	High	62	42.38
>95	Very high	22	15.27
Total		145	100.00

* Source: Census of Sikkim.2001

According to 2001 Census, Cultivators have large composition for most of the revenue blocks (fig.2.11). Around 15 percent of the revenue blocks are under the very low (<50%) cultivators category. Most these revenue blocks are located near the district headquarters. More than 6 percent of the revenue blocks have low (50 -65%) cultivators. Around 23 percent of the total revenue blocks have medium (65-80%) cultivators. The high cultivators (80 -95%) consists more than 42 percent of the total revenue blocks. Out of these 42 revenue blocks are in the Namchi Sub-division and another 21 revenue blocks in Ravongla Sub-division. The very high (>95%) category of cultivators have more than 15 percent of the total revenue blocks. (Table2.19)

The distribution of cultivators in the district has a unique trend that, the percentage that the percentage of cultivators is increased in places away from the sub-divisional headquarters. Most the very high concentration blocks of cultivators are located in the Ravongla Sub-division, which is comparatively remote and less develop in comparison with Namchi-Sub-division.

district. The highest male cultivators are found in Pamphok (98%) and the lowest is in Melli (2%).

2.9.2 Primary Occupation (Agricultural Labours)

Table 2.21 Percentage of Agricultural Labours (South District 2001)

Percentage	Category	No of Revenue Blocks	Revenue Block %
< 1	Very low	33	22.80
1 - 2	Low	19	13.10
2 - 3	Medium	7	4.83
3 - 4	High	15	10.83
> 4	Very high	41	28.30
Nil		30	20.78
Total		145	100.00

- Source: Census of Sikkim. 2001.

The agricultural labourers had constituted a negligible portion in the working population of the South District (Table 2.21). There are more than 20 percent of the total revenue blocks where there is no agricultural labour. Out of these 18 revenue blocks are in the Namchi Sub-division and another 12 revenue blocks are in Ravongla Sub-division.. Another 20 percent of the total revenue blocks have very low (<1%) of agricultural labourers to their working population, of which 19 revenue blocks are in the Namchi Sub-division and 10 revenue blocks are in Ravongla Sub-division. In the category Suntaley revenue block has the lowest (0.01%). The second category of low (1-2%) agricultural labourers constitutes 23 percent of the revenue blocks of the district. Out of these Namchi-Sub-division has 13 revenue blocks and Ravongla Sub-division has 5 revenue blocks. The medium (2-3%) category of agricultural labours occupies 4.83 percent of the total revenue blocks. In the high agricultural labours category (3 -4%), there are 11 percent of the total revenue blocks. Another 28 percent are under the category of very high (>4%) agricultural labours.

The male and female composition percentage in agricultural labourers has also varied. There are 44 revenue blocks all together where the female agricultural labourers have out numbered the male. Deythang in Namchi Sub-division has the highest having 49.5 percent. And there are 45 revenue blocks where there is no female agricultural labour. Besides there is another 28 revenue blocks where there is no male agricultural labours.

2.9.3 Decadal Changes of Primary Occupation (1991 -2001)

Table 2.22 Decadal Changes of Primary Occupation, South District (1991-2001)

Changes in (%)	Increased		Decreased	
	No of Revenue Blocks	Revenue Blocks %	No of revenue Blocks	Revenue Blocks %
<20	20	15.00	15	11.11
20-30	10	7.41	7	5.00
30-40	11	8.20	4	3.06
40-50	09	6.70	5	3.70
>50	47	34.82	5	3.70
Total	99	72.53	36	27.47

* Source: Census of Sikkim, 1991 & 2001.

Decadal Changes of primary occupation in South District is represented by the Table 2.22. It shows the general increased trend as the percentage of increase (72.53%) is more than decrease (27.47%). This figure reveals that still most of the working population of the district is constituted by the primary occupation i.e. (cultivators, and agricultural labours. It means that the main economy of the district is depends on agriculture. The highest increased in primary occupation is recorded 9 revenue blocks and lowest is found in 6 revenue blocks. The highest decreased is in the revenue blocks of Sorok, Kopchey, Paleytam, Kanamtek, etc. The lowest decreased is found in the revenue blocks of Singithang, Lingi, and Namphrik.

The trend shows unique characteristics that, those revenue blocks which are located near the peripheral areas of the town and district headquarters have recorded the low increased in primary occupation and the revenue blocks which are located far away from the towns and district headquarters have recorded high percentage of increase in primary occupation and vice-versa. Primary Occupation has the highest increased percentage among the occupational structure. This suggested two facts, one that there is need for strong policy and planning for development of agriculture and allied activities to strengthen the main economy of the district and two lack of opportunity leads to low diversification of occupational structure in the district.

2.9.4 Secondary Occupation (House hold industry)

The secondary economic activity (house hold industry) has also negligible portion to the total working population of the district. Table 2.23 reveals the variation of all the categories. Around 36 percent of the revenue blocks do not have any workers engaged in house hold industry and more than 26 percent of the revenue blocks are in the very low (< 0.5%) category. Of these revenue blocks, 24 are in the

Namchi Sub-division and 14 are in the Ravongla Sub-division. Another 13 percent of the total revenue blocks are in the category of low (0.5 -1.00 %) participation in house hold industry. Out of these 13 blocks are in Namchi Sub-division and 6 blocks are in the Ravongla Sub-division.

Table 2.23 Percentage of House Hole Industry (South District.2001)

Percentage	Category	No of Revenue Blocks	Revenue Blocks %
<0.5	Very low	38	26.22
0.5-1.00	Low	19	13.10
1.00-1.50	Medium	09	6.21
1.50-2.00	High	04	2.76
>2.00	Very high	23	15.86
Nil		52	35.86
Total		145	100.00

* Source: Census of Sikkim 2001.

The moderate category (1.00-1.50%) constitutes more than 6 percent of the revenue blocks. High (1.5 - 2.0%) and very high (>2.0%) category of house hold industry constitutes 2.76% and 15.86% of the revenue blocks of the South District respectively. Some of the important revenue blocks which fall in the very high category are Sorok, Manpur, saleumbung, Tangi etc. Most of these revenue blocks are found in Namchi Sub-division. One of the important facts of very high house hold industry is that, in these revenue blocks still traditional industry like carpet weaving, goldsmith, ironsmith are exist.

Like other sectors of economy, in the secondary occupation, the male and female participation ratio is also different in the district. There are 22 revenue blocks or more than 16 percent of, where the female percentage has out number the male. Another 71 revenue blocks or almost 50% of total revenue blocks in which the female participation in this sector of economy is nil. Again 37 percent of the revenue blocks have no male participation in the house hold industry. The picture of house hold industry in the district is very grime. The economy support by this sector in the district is very low.

2.9.4a Decadal change of Secondary Occupation (1991- 2001)

Table 2.24 represents the decadal changes of secondary (house hold industry) workers. It shows discouraging sign as the percentage of decrease has almost 39 percent in comparison to increase which has around 37 percent.

Table 2.24 Decadal Change of Secondary Occupation, South District (1991-2001)

Change in (%)	Increased		Decreased	
	No of Revenue Blocks	Revenue Blocks %	No of Revenue Blocks	Revenue Blocks %
<50	7	5.60	9	7.00
50-60	1	0.74	3	2.22
60-70	4	2.96	9	7.00
70-80	2	1.56	5	4.20
>80	35	26.93	25	18.52
Total	49	37.74	51	38.26
Nil	24	17.72		
No Changes	7	5.60		

* Source: Census of Sikkim 1991& 2001.

Another discouraging point is that number of revenue where not a single secondary worker is recorded is 24 or 18 % of the total revenue blocks. This trend indicates less importance or small scale, cottage and other type of house hold industries as well as lake of policies in the district. Besides another important fact is that, the number of revenue blocks where the secondary workers were recorded in 1991 Census, but not have a single secondary worker in 2001 is 18 revenue blocks. The highest increase of secondary worker is recorded in the revenue blocks of Chemchey, Maniram, Tangji, Karek etc. The highest decrease is recorded in the revenue blocks of Tingmo, Ramabong, Barfung, Bhakhim etc. the last two blocks is very important because traditionally carpet weaving industry is flourish, but these decreasing trend certainly effect further development of the industry.

The scenario of secondary occupation in South District is very pathetic as the number of persons in the traditionally secondary occupation dominated is decreasing.

2.9.5 Tertiary Occupation (Other workers)

The tertiary sector includes the construction, carpentry, trade and commerce, transport and communication, and storage. This sector of occupation occupies a sizable percentage of working population of the district. (Table2.25). There are more than 46 percent of the revenue blocks which are in the category of very low (< 10%) of tertiary worker in the South District. More than 24 percent of the total revenue blocks are in the low category (10-20%) of tertiary sector.

Out of which 26 percent of the revenue blocks are in the Namchi Sub-division and remaining 7 revenue blocks are in the Ravongla Sub-division. Around 12 percent

of the revenue blocks are in the moderate category (20 -30%) of tertiary workers to the total working population of blocks.

Table 2.25 Percentage of Tertiary Occupation, South District (2001)

Percentage	Category	No of Revenue Blocks	Revenue Blocks %
<10	Very low	68	46.93
10-20	Low	35	24.56
20-30	Medium	17	11.27
30-40	High	05	3.45
>40	Very High	20	13.79
Total		145	100.00

*Source: census of Sikkim.2001

About 3 percent of the revenue blocks fall in the category of high (30-40 %) workers composition to total revenue blocks. Some of the important blocks are Gom, Tokal, Hingdam etc. Almost 14 percent of the revenue blocks are in the category of very high (>40 %) concentration of other workers.

In this category of occupation the precipitation is dominated by male sex. Highest participation in this sector by female is found in Melli revenue block having 87.30% and lowest is in Nujameng with 0.60%. High male participation is found in Melli (94.2%) and lowest is in the revenue block of Rabitar (1.0%). Besides Babong, and Pamphok revenue block does not have any male participation in this sector of economy.

2.9.5a Decadal Change of Tertiary Workers (1991-2001).

The decadal change of tertiary workers in the South District is represented by table 2.26 and shows an encouraging trend. As the number of tertiary workers increase in 103 revenue blocks occupying 77.05 percent of the total revenue blocks. The revenue blocks which has recorded decreased in the tertiary is only 22.21 percent. The highest (> 80%) increase is found in 38 blocks of Wak, Pajer, Sorok etc.

Table 2.26 Decadal Change of Tertiary Workers, South District (1991-2001)

Change in (%)	Increased		Change in (%)	Decreased	
	No of revenue Blocks	Revenue Blocvks %		No of Revenue Blocks	Revenue Blocks %
<50	20	14.81	<10	4	2.96
50-60	11	8.15	10-20	8	5.92
60-70	16	11.85	20-30	5	3.70
70-80	19	14.07	30-40	3	2.22
>80	38	28.15	>40	10	7.40
Total	104	77.05		30	22.21
No charge	1	0.74			

* Source: Census of Sikkim 1991&2001.

One of the important factors for the high increase in tertiary workers is due to the emergence of rural market centres as locally known as hat, which leads to expansion of trade and commerce in rural areas and infra- structural development of rural tourist centres. The highest decrease in tertiary sector is found in the revenue blocks of Bhakhim, Pabong and Rayong. Only a single revenue block do not have any in tertiary workers i.e. Mangzing. The over all scenario of the tertiary workers in south District is positive, but still more plan has to be work out for further development of this sector of economy, because this sector is the second largest economy next to the primary sector.

CONCLUSION

The occupational structure shows that the economy of South District is entirely rural nature as in all the revenue blocks the percentage of primary (cultivator) sector of economy is very high. Another feature of primary occupation is dominance of females. The Agricultural labourers and House hold industry support lesser population and participation in this sector by female is very negligible. This leads to low income generation. There is no much diversification of economy in the district. The third sector of economy i.e. tertiary has sizable population but it is also rural nature, most of the tertiary worker is concentrated by public employment. The district needs agro-base industrial development policies for more diversification in occupational structure for more sound economic development. Lack of proper planning and policies leads the declining of even the carpet weaving industry which is one of the traditional cottage industries of the district. Some of the important fields where the economy can be diversified are horticulture, floriculture, cultivation of herbal medicinal plant, wood carving and rural tourism. Besides, strengthening of agricultural sector of economy is very urgent.

Another feature is that the South District is the second mostly densely populated district in Sikkim. The growth rate is also very high but growth rate between the sexes is also different, females have higher than males. The population pressure or man land ratio is very high only next to east district. The economy is entirely rural in character as the participation rate is very high in primary occupation like cultivation, agricultural labourers, and lumbering and forestry among the working population. Female participation in agricultural and allied activities is also high. The other sectors of economy like tertiary house hold industry have low participation.

Lack of diversification in other leads t high dependency rate. The dependency ratio is second highest among the four district of the state. The distribution of population is uneven as some blocks have higher concentration of population as exemplified in the blocks like Bomtar, Singithang, Likship, and Barfung. Some of the blocks where the population pressure is very negligible as the physical conditions discourage the high concentration of population. This leads to regional imbalance in development among the blocks. Besides, those blocks with high population pressure are facing the problem of deforestation, landslide, soil erosion and acute shortage of dinking water. There arise the question of positive planning and policies, like diversification of job, encouragement of scientific methods of cultivation and water harvesting etc. Otherwise the district will become the over- crowded hilly town like Kalimpong and Darjeeling which have been facing the environmental problems. The problem of rural migration is also manifested as severe problem. This problem leads to the analysis and utilization of one of the important resources of the district i.e. land resources and it exploitation by main economic sector agriculture which will be delineated in the next chapters.

CHAPTER-III

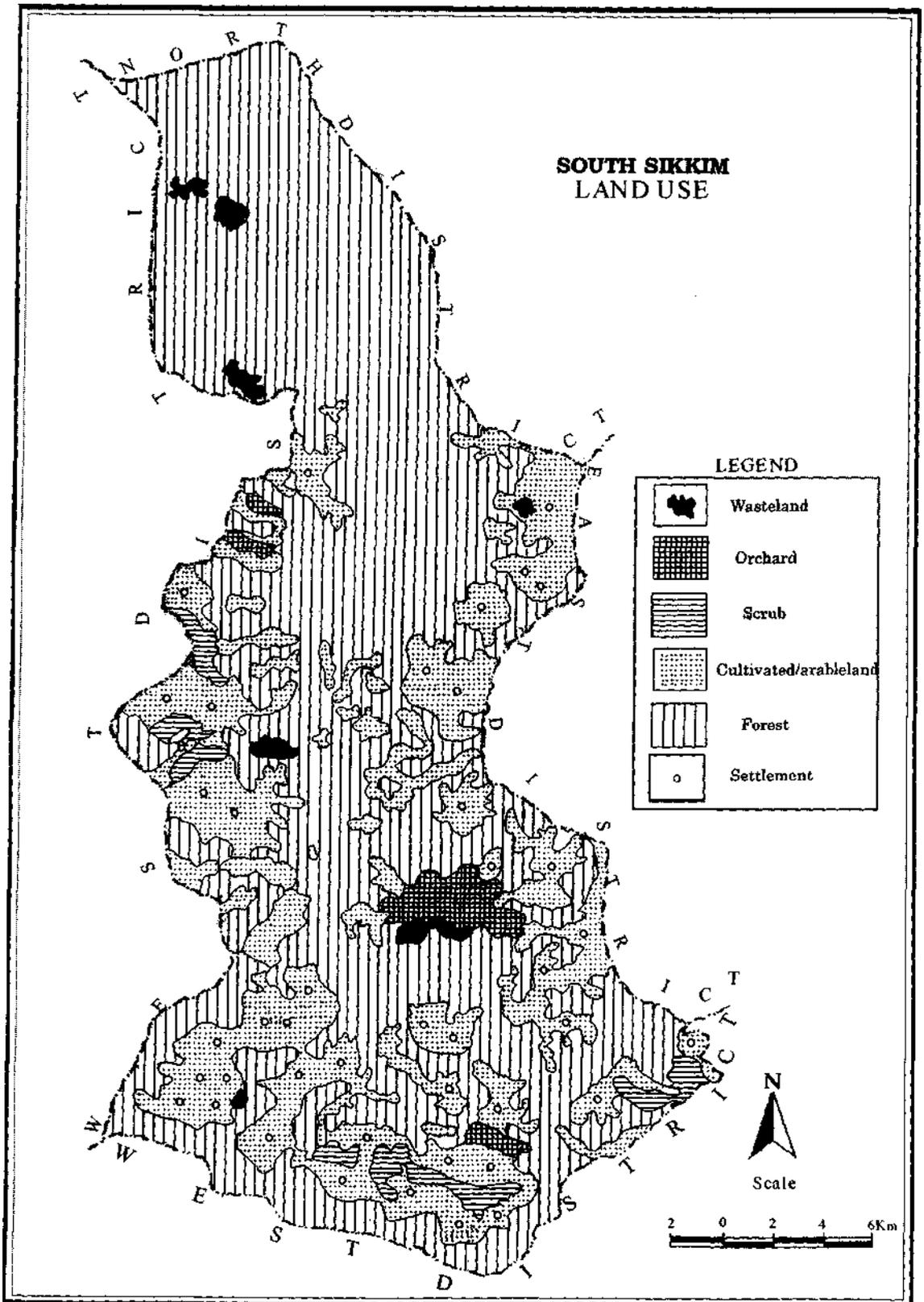
GENERAL LAND USE

INTRODUCTION

Land use may be defined as the where the human activities are evolved on a specific point and at a given time and space. Land is primarily used for crops, forest, pasture, mining, gardening, and residential, industrial, and commercial purposes. Land use is also related to conversion of land from one major use to another general use. Land use changes to fulfil man's needs. Man's needs can be classified into six major categories viz. the need of wood, house, food, transport, communication, defence and recreation. To fulfil his needs, man utilizes the land into various forms. The need of food means conservation of good agricultural land for production of food and cash crops. Again, the land has to satisfy another basic need of man i.e. shelter in various forms as build up areas. This same land has again to satisfy the need of transport and communication. Besides land is used for recreational purpose in the shape of parks, play ground, garden, and club etc. Above all, use of land in the modern context of human survival arising the need of conservation of land as natural resource is prime need of man because man's need has to be cared from these land only not only fulfilling his needs, it has to be protected and conserved as a part of environment as well as of future generation also.

To meet the increasing demand of food for ever increasing population, land is to be used carefully and judiciously. Here arises the concept of land use capacity. It refers to the ability of any given piece of land resources to produce a net return above the production cost associated with its use. The spatial distribution of land covered information and its changes are desirable of any planning, management and monitoring programme at local, regional and national level, especially at grass root level. The information not only provide a better understanding of land utilization aspects but also plays a vital role in formulation of policies and programme required for developmental planning. Planning means the assessment for future use and making provision for it. For sustainable development, it is necessary to monitor on going changes in land use pattern and land covered areas over a period of time.

In the South District of Sikkim, agriculture is the mainstay of economy. Agriculture contributes to development in many ways, agriculture contributes to



Source NATMO,DPS(S)

Fig 3.1

development as an economic activities, as a livelihood, environmental source, making the sector a unique instrument for development (World Bank 2008). About 12 percent of the total area of land is devoted to agricultural and allied activities. But the actual area available for agricultural purpose is declining due to conversion of cultivable land into non- agricultural purposes like establishment of industries, township expansion, construction of roads, hydel-projects, educational institution etc. Farming has considerably been hampered by small and fragmented holding, limited irrigation, lack of farm mechanization, rough topography and frequent occurrence of natural calamities like land slide, heavy rainfall and earthquake. In view of these facts emphases is being given to intensive and judicious use of limited available land, so that the per capita land productivity and over all production are maintain at desire level.

3.1 GENERAL LAND USE

The South District has total geographical area of 75.000 hectare. Out of these, total operated area is 29.498 hectare. It is estimated that 60.30 percent or 45.520 hectare of geographical area is covered by forest as reported by statistical profile 2002. The general land use type of South District of Sikkim can be classified in to six main category viz. waste land, orchards, scrubs, cultivated/ arable land, forest, and settlement (fig 3.1). Out of these forest occupies lion share having 60 percent of the total area and second highest category is cultivable/ arable land constituting 30 percent and this category is mostly concentrated in the gentle slope and river valleys. The third category i.e. orchard occupy around 3 percent of the total area of the district. These orchards is mainly consist of orange plantation and are found in pocketed blocks of Borong, Poley, Sadam, Suntaley, Burul, Gangchung, etc. The waste land are found in the form of barren land, landslide, rough stony dissected trough at head water of streams and exists in the blocks of Shyampani, Pepthang, Mangbue and north western parts of the district. Settlement areas are existed in between the forested tract, cultivated field and river valleys, where easily accessible for fertile land water sources available

Table 3.1 General Land Use Pattern (in hectare) South District, Sikkim 1995-96 & 2005

Types of Holding	1995	Total holdings %	2005	Total holdings %	Changes 1995-2005 in %
Irrigated land	972.75	1.30	2167.00	2.88	122.80
Un-irrigated	13689.61	18.25	16360.87	21.50	19.51
Non agricultural use	1170.27	1.56	1614.27	2.15	37.90
Pasture	1110.90	1.48	1283.54	1.71	15.54
Scrub	1597.90	2.13	1457.48	1.73	-8.97
Barren land	1906.00	2.54	2386.12	3.18	25.18
Fallow land	804.78	1.08	641.59	0.85	-20.27
Cardamom Plantation	4200.00	5.60	4500.00	6.00	7.14
Total operational use	25452.21	33.94	30300.87	40.00	19.05
Forest	49547.79	66.06	44699.13	60.00	-9.78
Total	75000.00	100.00	75000.00	100.00	

*Source: Sikkim, Land Utilization Statistics 1995-96, Crop area statistics 2005

Table 3.1 shows the comparative changes of land use pattern the South District. Out of the various types of land use, irrigational land use, un-irrigated use, non agricultural use, pasture, barren land, cardamom plantation has registered increased. The highest increase is registered in irrigational land use (122.80%) and lowest is in cardamom plantation (7.14%) in 1995 to 2005. The type of land use which registered decrease are scrub, fallow land and forest, decreasing 8.97%, 20.27% and 9.78% respectively. One of the important point shown by the changes of land use pattern is that of fallow land and forest, as these two types of land use pattern have decreasing means that due to increased in population pressure on land is also increasing, there is no question of leaving land without utilization and in the case of forest conversion of forest land into cultivated field is increasing.

The operational use of land is also increasing as it was 33.94 percent in 1995 increasing to 40 percent in 2005. The scenario of general land use in the district is that the man land ratio is increasing and indicates further increasing in land utilization. But the big question is that whether the utilization will be sustainable or simply sedentary only. In order to gets sustainable farming proper planning and policy is required.

3.1.1 Cultivated Area

Cultivated area means area under different crops in a particular year. The percentage of cultivated area in the South District has a variation trend as well as decreasing, since 1977-78 when the first agricultural census was conducted. It was 83%, 78%, 58% and 73% respectively for year 1977-78, 80-81, 91-92 and 2001.

Table No.3.3 Cultivated Area in South District (1995-96)

Percentage	Category	No. of Revenue Blocks	Revenue Blocks %
< 25	Very Low	09	6.66
25 - 40	Low	22	16.30
40 - 55	Medium	60	44.44
55 - 70	High	28	20.75
>70	Very High	16	11.85
		135	100.00

*Source: Land Utilization Statistics. 1995-96

Table 3.3 reveals the distribution of cultivated area in South District of Sikkim. There are around 7 percent of the revenue blocks which have very low (< 25) percent of cultivated area (fig 3.3). The blocks which fall in this category are Lingi, Aifaltar, Burul, Phong, Turuk, Singithang and Sorok. In the second category i.e. low (25-40%) has occupy more than 16 percent of the revenue blocks having 22 numbers of revenue blocks. These blocks are Sada, Pamthang, Lingding, Tingmo etc. in Ravongla sub- division and Omchu, Tinzer, Assangthang, Bui, Palum and Salgahai etc. in Namchi sub-division. The medium (40 - 55%) cultivated area occupies around 45 percent of the total revenue blocks. But the high (55 -70%) cultivated area has shares almost 21 percent of the total revenue blocks. The very high (>70%) consists of only 11.85 percent of the total revenue blocks.

It is observed that around thirty percent of the revenue blocks has higher percentage of cultivated area are remaining seventy percent of the revenue blocks has lesser percentage. The disparity of cultivated area is due to different in size of the revenue blocks.

3.1.2 Cultivable Waste Land

The category designated as other uncultivable land excluding fallow together with forest constitute cultivable waste land. The percentage of cultivable land in South District is 0.33, 0.66, 10.16 and 6.32 in 1976-77, 1980-81, 1991-92 and 2001-02 of the total reporting area. This figure indicates the fluctuating trend. (Table 3.4)

Table 3.4 Cultivable Waste Land in South District, Sikkim(1995-96)

Area in Percentage	Category	No of Revenue Blocks	Revenue Blocks %
<5.0	Very low	55	40.74
5.0-10.0	Low	46	34.09
10.0-15.0	Medium	24	17.77
15.0-20.0	High	04	2.96
>20.0	Very high	06	4.44
Total		135	100.00

* Source: Land Utilization Statistics, 1995-96.

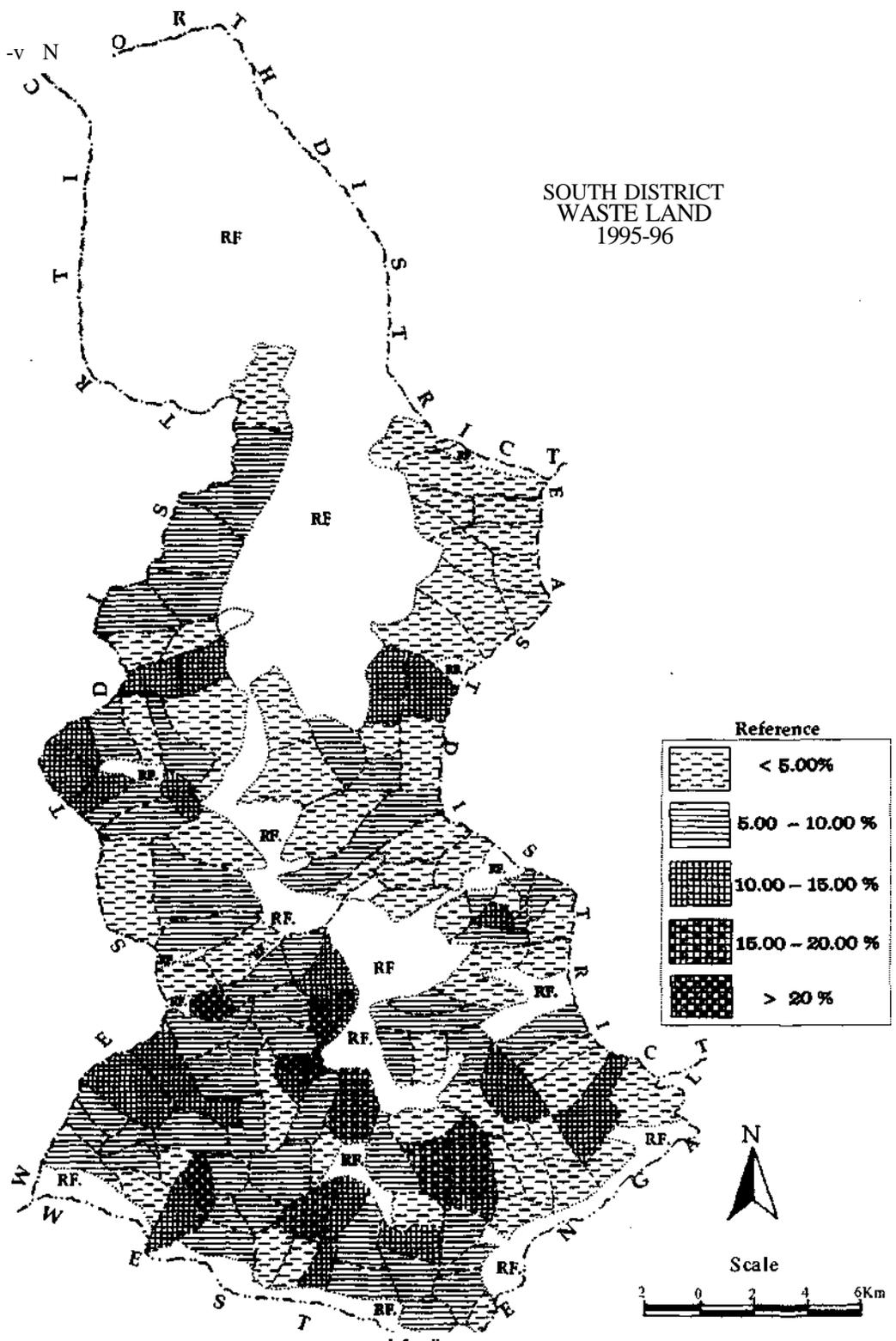


Fig 3.3

The very low (< 5.0%) cultivable waste land category occupy 41 percent of the total revenue blocks of the district. Out of which 23 revenue blocks are in the Ravongla Sub-division and 32 revenue blocks are in the Namchi Sub-division. In the low category (5.-10.0%) of cultivable waste land there are 34 percent of the total revenue blocks. It is observed that number of revenue blocks which fall in this category is more in Namchi Sub-division than Ravongla sub-division. Around 18 percent of the total revenue blocks have medium (10-15%) cultivable waste land of which Ravongla Sub-division has 8 revenue blocks and Namchi Sub-division has 12 revenue blocks. More than 2 percent of the revenue blocks have high (15.-20%) cultivable waste land. All the revenue blocks which fall in the category are found in Namchi Sub-division. Nearly 5 percent of the revenue blocks have very high (> 20%) Cultivable waste land and they are also found only in Namchi Sub-division. One of the important facts in the distribution pattern of cultivable waste land in the district is that, the high and very high category of cultivable waste land is found in the southern part of the district is due to the larger concentration of dry land. In other to utilise the colourable waste proper irrigation facility is required and for this proper planning should be implemented. And on the other hand the northern parts of the district where higher concentration of low cultivable waste land means maximum utilization of land this also indicates the exhaustible of soil fertility as the soil fertility is very easily exhausted in hilly and mountainous area proper cultivation methods should be implemented and encourage.

3.1.3 Fallow land

This category of land use is one of the important type of land use, especially from the point of judicious use of land as through this means only land can be rejuvenated. In South District, fallow land has been classified into two types as:-

- i) Fallow land other than current fallow.
- ii) Current Fallow.

The first i.e. fallow land other than current fallow includes all land, which are taken up for cultivation but are temporarily out of cultivation for a period not less than one year and not more than five years. The second type i.e. current fallow includes only those lands which kept fallow during current year.

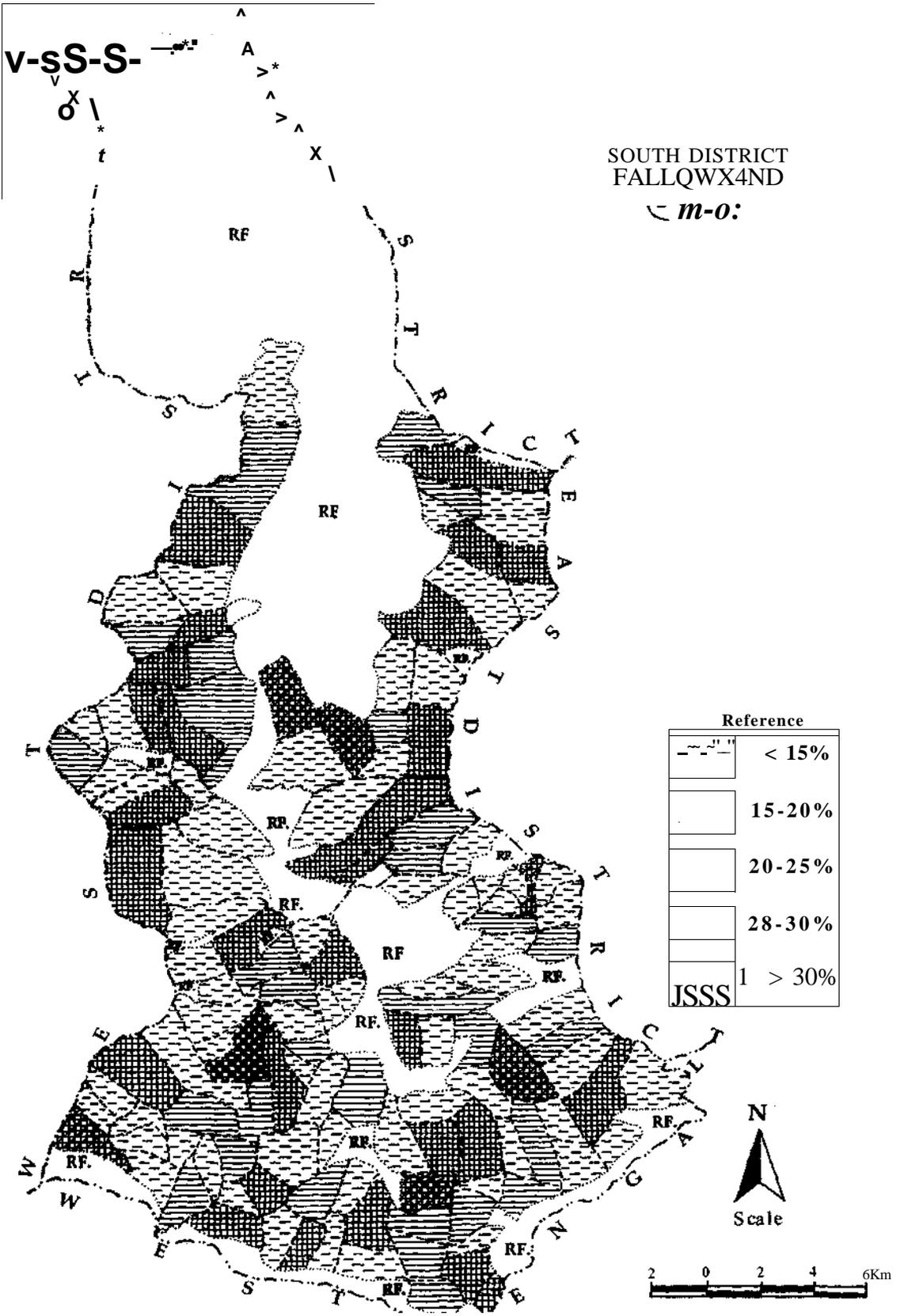


Fig.3.4

Table 3.5 Total Fallow Land in South District (1995-96)

Area in Percentage	category	No of Revenue Blocks	Revenue Blocks %
<15	Very low	51	37.77
15-20	Low	32	23.72
20-25	Medium	22	16.29
25-30	High	14	10.37
>30	Very high	16	11.85
Total		135	100.00

*Source: Land Utilization Statistics, 1995-96.

In South District, per capita total fallow land is 0.07 hectare. Table 3.5 shows the salient feature of fallow land distribution in the district. Around 38 percent of the revenue blocks have very low (<15%) fallow land. Of which 40 revenue blocks are found in Namchi Sub-division and remaining 11 revenue blocks are in Ravongla Sub-division. Around 24 percent of the revenue blocks have low category (15 - 20%) fallow land (Map 3.4). Most of these revenue blocks are located in medium altitude of both the sub-division. More than 16 percent of the revenue blocks have medium category of (20 -25%) fallow land. Out of these revenue blocks, 16 blocks are found in Namchi Sub-division and 6 blocks are in Ravongla Sub-division. The high (25 - 30%) category of fallow land constitutes more than 10 percent of the revenue blocks. Almost 12 percent of the revenue blocks have very high (>30%) category of fallow land. These revenue blocks are also mostly found in the southern part of the district especially in Namchi Sub-division.

The facts and figure show that an interesting picture of fallow land in the South District, that most of the very low and low fallow land blocks are located in northern part of the district. The high and very high category is found in the southern part of the district.

This may be to the reason that these blocks farmer do not get adequate amount of water for cultivation. So the farmers are compelled to leave out the land as fallow land, which leads the farmers to intensify the agricultural practice to a small piece of land. Another important fact is that higher percentage of fallow land is found in those revenue blocks where the rough topography with steep dissected slope is found. So it is important to encourage the farmers to cultivate crops of lesser moisture tolerant with mountain and hilly suitable kind in the South District.

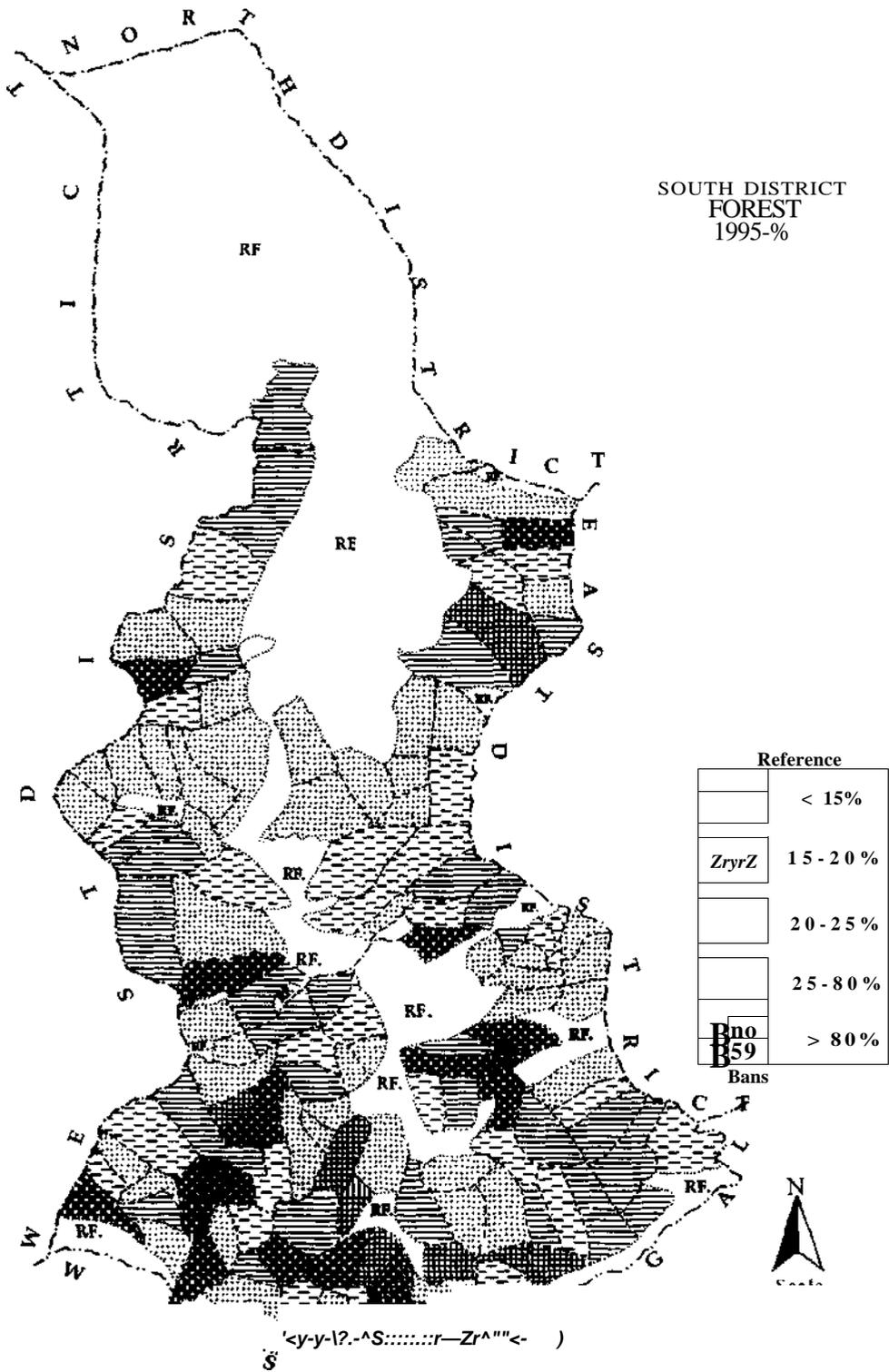


Fig 3.5

3.1.4 Forest:

It is one of the most important type of land use and means of livelihood in South District. Besides extraction of timber, forest is also a source of herbs and plants that have been traditionally used as medicine. This is a potential area of South

District, if proper planning and policy is implemented for further development of medicinal plants. In the district, total per capita forest land is 0.09 hectare.

Table 3.6 Forest Cover Area in South District (1995-96)

Area in Percentage	Category	No of Revenue Blocks	Revenue Blocks %
<15	Very low	50	37.03
15-20	Low	26	19.25
20-25	Medium	35	25.95
25-30	High	10	7.40
>30	Very high	14	10.37
Total		135	100.00

* Source: Land Utilization Statistics, 1995-96.

The table 3.6 represent the forest covered area in South District. The very low (<15%) category occupy around 37 percent of the revenue blocks. Some of the important revenue blocks which fall in the category are Deythang, Sokpey, Kitam etc. More than 19 percent of the total revenue blocks are in low category (15 -20 %). Most of these revenue blocks are located in western part of Namchi Sub-division and south-eastern part of Ravongla Sub -division. Another 26 percent of the total revenue blocks have medium (20 -25%) category forest cover. The high category (25 -30%) of the forest cover has less than 8 percent of the total revenue blocks. Most of these blocks are located in the Namchi Sub-division. More than 10 percent of the revenue blocks are in the category of (>30%) forest cover. Of which two blocks are in Ravongla Sub-division and 12 are in Namchi Sub-division.

The facts and figures reveals that in South District more than 80 percent of the revenue blocks fail to maintain the standard norms of ecological balance i.e. 33 percent of the individual blocks area should be under forest cover.

It also indirectly point out that excessive exploitation of forest resources. The government in the name of so called scientific policy and development fells tree in the district which leads to deforestation. This problem of deforestation has been the most critical environmental danger for the fragile ecosystem of the district. Another factor which has directly encouraged the decreasing of forest cover area and deforestation is need of agricultural land in response to the increasing population in the district. It has been characterised by large scale clearance of land up to an altitude of 2000mt. The depletion of forest resources has wide ranging impact on the ecological balance ranging from the extinction of rare flora and fauna to changes in climate,

desertification, and lack of rain fall, flash flood and landslide. This processes leads to extinction of Numbers of endanger inhabitants in the district.

3.1.5 Pasture Area

The pasture land is very important type of land use from the economic point of view as it support live stock as well as helps to maintain the ecological balance to some extent. The agriculture is the mainstay of the South District, the animal labour in agriculture is very important while ploughing due to the lack mechanization as the terrain of the district does not favourable. The pasture coverage is very low in the South District. Out of the total revenue blocks only 43.70 percent has pasture land but varying degree of 2.5 percent to 10 percent.

Table 3.7 Pasture Land in South District Sikkim. (1995-96)

Area in Percentage	Category	No of Revenue Blocks	Revenue Blocks %
<2.5	Very low	19	14.07
2.5-5.0	Low	15	11.11
5.0-7.5	Medium	12	8.88
7.5-10.0	High	03	2.22
>10.0	Very high	10	7.43
Not Available		76	56.19
Total		135	100.00

* Source: Land Utilization Statistics. 1995-96

Table 3.7 shows varying percentage of pasture land coverage in South District. In the very low (< 2.5%) there are around 14 percent of the total revenue blocks. Out of these 7 blocks are in Ravongla Sub-divisions and 12 are in Namchi Sub-division. Another 11 percent of the total revenue blocks has low (2.5 -5.0%) pasture area. Of these 6 blocks are in Ravongla Sub-division and 8 are in Namchi Sub-division. Almost 9 percent of the revenue blocks has medium (5.0 -7.5%) pasture land. There are 2.22 percent of revenue blocks which fall in high (7.5 - 10.0%) pasture land. All the revenue blocks which fall in this category are located in Namchi Sub-division only. The scenario is same in the very high category (>10.0%) pasture land all the revenue blocks which fall in the category are also found in Namchi Sub-division only.(fig 3.6).

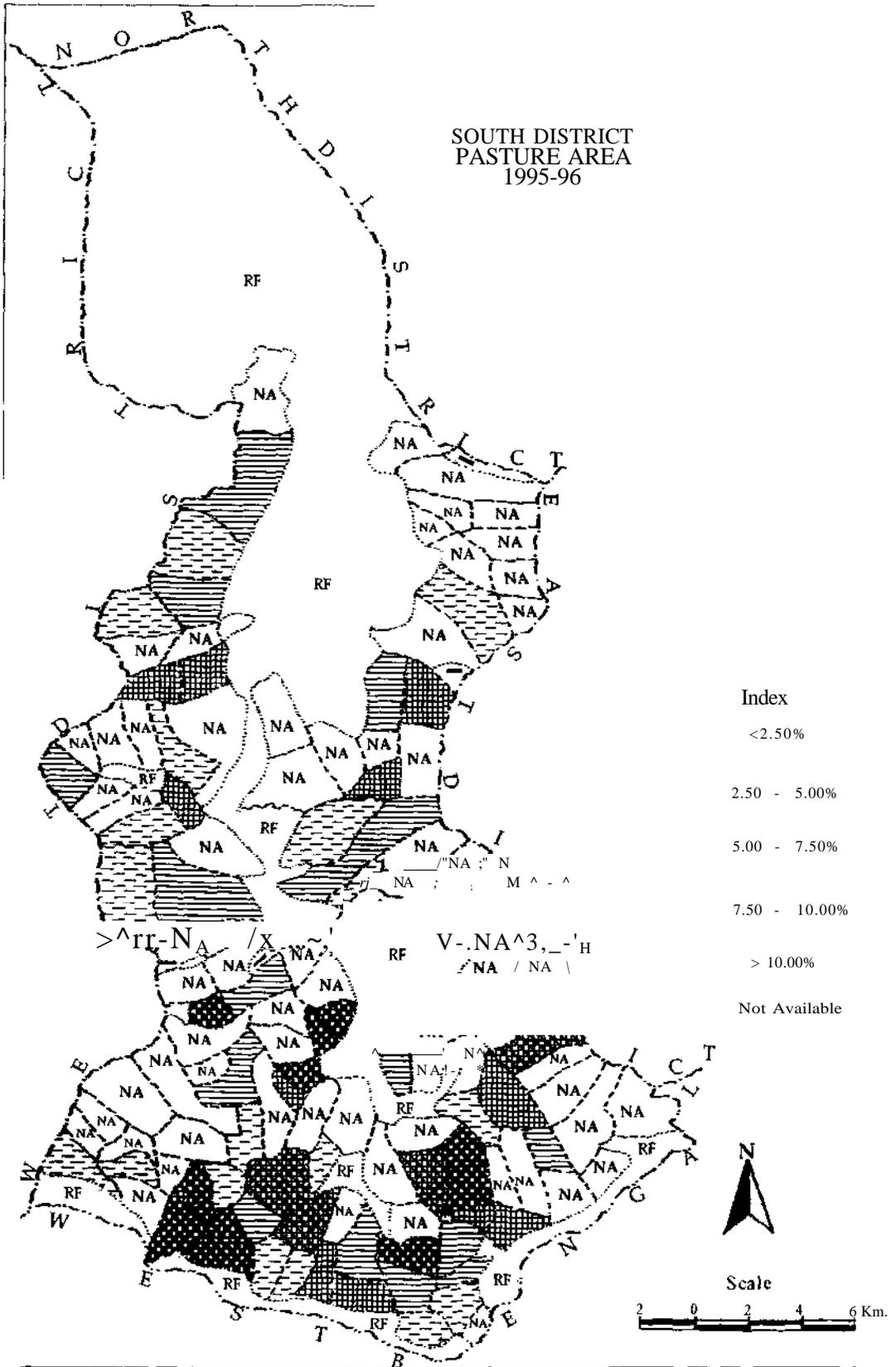


Fig. 3.6

It is observed that the lesser percentage of pasture land indicates low percentage of live stock population which means low animal labour support.

Traditionally in India animal labour is one of the major components of agricultural practice. In the South District due to low population of live stocks human labour is more dependent, this major dependent on the human labour do not fulfil the labour requirement in the hilly and rough topography like South District of Sikkim and it adversely affect to the agricultural development of the district. Here farm mechanization is a big problem due to steep slope, small holding and socio-economic condition of the farmers.

3.1.6 Area Not Available for Cultivation.

This category of land use is also known as land not available for cultivation, as the area under the category has been engaged for other purposes by building as build up area, road and railways, or any other form of man made construction or occupied by water bodies i.e. rivers, streams, canal and pond etc. as well as barren and uncultivated land like dissected steep slope, stony rough cliff, desert and swampy area. The per capita land not available for cultivation in South District is very negligible i.e. 0.02 hectare.

Table 3.8 Area Not Available for Cultivation in South District Sikkim (1995-96)

Area in Percentage	Category	No of revenue Blocks	Revenue Blocks %
<5.0	Very low	73	54.57
5.0-7.5	Low	29	21.60
7.5-10.0	Medium	13	9.63
10.0-12.5	High	11	7.54
> 12.5	Very high	09	6.66
Total		135	100.00

* Source: Land Utilization Statistics. 1995-96

Table 3.8 represents the distribution of Area not available for cultivation in south District. Nearly 55 percent of the revenue blocks fall under very low (<5.0%) category. These revenue blocks are located in the north western, south western parts of the Namchi Sub-division and south eastern part of the Ravongla Sub-division (fig 3.6). Almost 22 percent of the revenue blocks fall in the low (5.0 - 7.5%) category of area not available for cultivation. More than 9 percent of the revenue blocks have medium category (7.5 -10.0%) area not available for cultivation. About 8 percent of the revenue blocks have high category (10.0 - 12.5 %) area not available for cultivation.

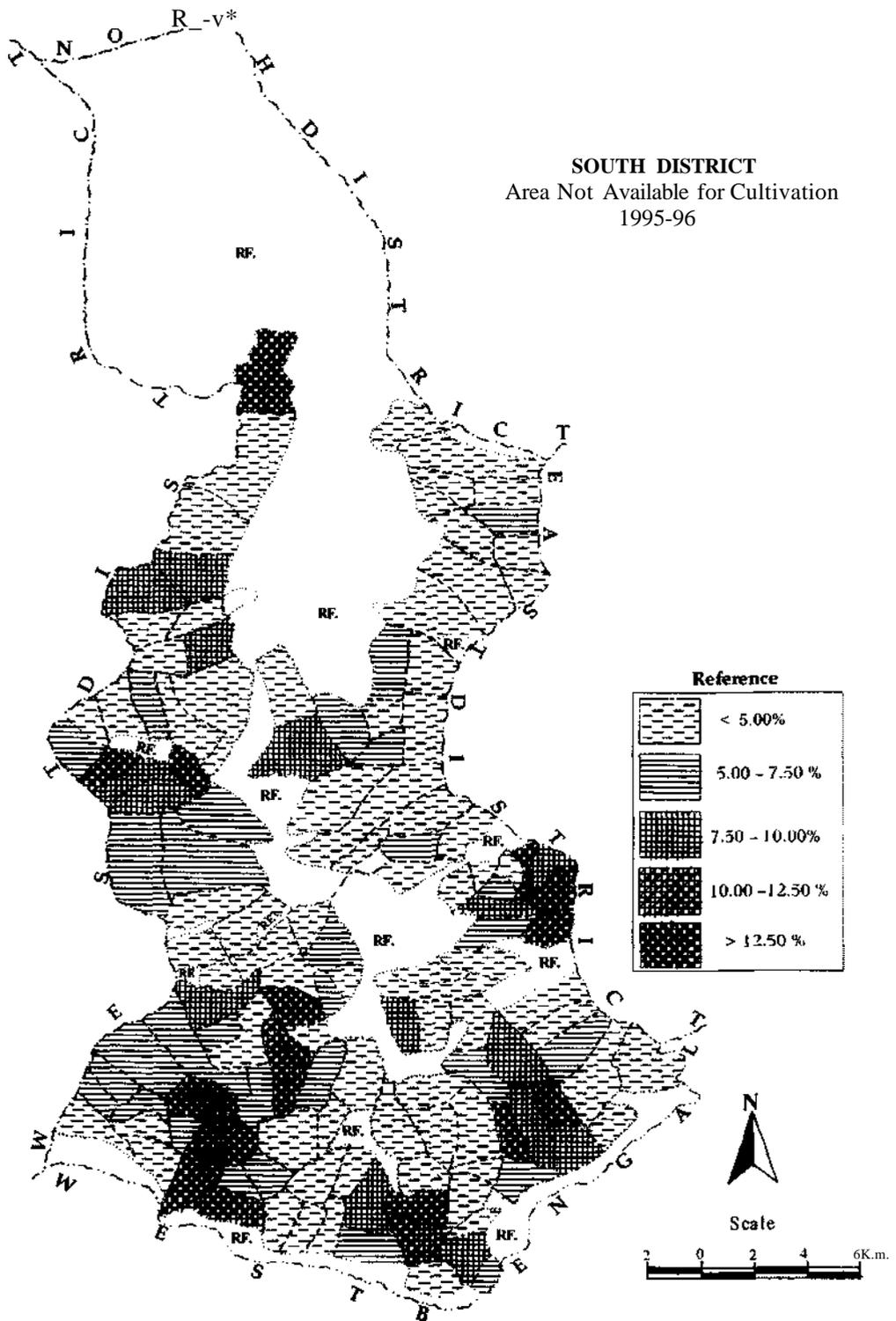


Fig 3.7

Another 6 percent of the revenue blocks have very high category (>12.5%) area not available for cultivation. Some of the important revenue blocks found in this category are Sorok, Paleytam, Sada, and Hingdam etc.

The discussion reveal that distribution of area not available for cultivation in the district is very much influence by topography and relief feature. In those revenue blocks where the steep slope and rough stony, landslide prone area as well as soft rock fall, rockslide occurs the percentage of area not available for cultivation is higher.

3.1.6a Build- Up Area 2004-06

This classification of land use occupies a pivotal place in the study of land use in hilly and mountainous terrain where the area of cultivation is very limited. On the other hand the increased of build up area indicates the decrease of good cultivated land and conversion to other uses especially for the construction of building, road network etc. The (fig 3.7) reveals the scenario of the distribution of build up area in the district.

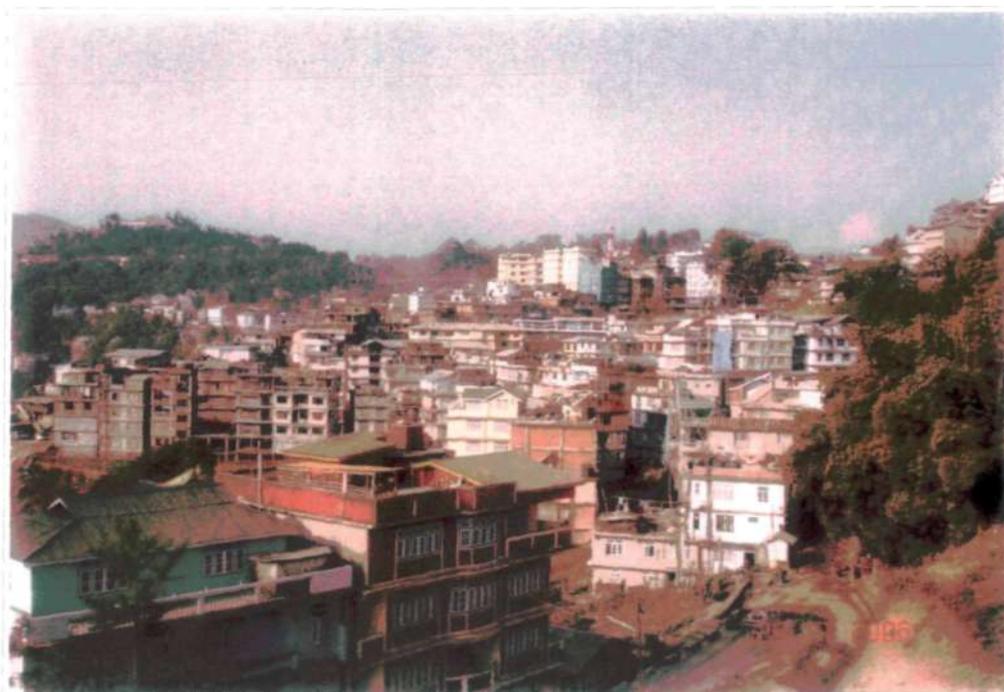
Table 3.8 Build Up Area in South District.:2004-06)

Area in Percentage.	Category	No of Revenue Blocks	Revenue Blocks %
<8.0	Very low	40	27.59
8.0-12.0	Low	37	25.52
12.0-16.0	Medium	21	14.48
16.0-20.0	High	22	15.17
>20.0	Very high	25	17.24
Total		145	100.00

* Source: Land Revenue and Disaster Management Department.2006

Table 3.9 shows the underlying facts of distribution of build up area in South District. The very low category (< 8%) of build up area constitutes 28 percent of total revenue blocks. Out of these, 28 revenue blocks are in the Namchi Sub-division and 12 blocks are in Ravongla Sub-division. Another 26 percent of revenue blocks have low (8.0 -12.0%) build up area, most of these revenue blocks are located in western, south western and eastern part of Ravongla Sub-division and in Namchi Sub-division they are concentrated in the southern part. More than 15 percent of the revenue blocks has medium (12.0 -16.0%) percent of build up area. Around 16 percent of the revenue blocks have high (16.0 -20.0) percent of build up area. Almost 12 percent of the revenue blocks have very high percentage (>20.0 %).

The socio-economic development of the state mostly influence in increasing the percentage of build up area in the district. All the revenue blocks recorded increase in the percentage of build up area. It is also inciting that the encroachment of cultivated area in the district is increasing.



Photograph 3.1 Urbanization

3.1.7. Net Sown Area

This category represents the total area sown with crops and orchards, counting the area sown more than once in the same year. It is very important because of the fact that, it is currently useful as engaged land for production of food crops.

Table no. 3.2 Net Sown Areas in South District (1995-96)

Area in Percentage	Category	No. of Revenue Blocks	Revenue Blocks %
<20	Very Low	15	11.11
20 - 40	Low	73	54.07
40 - 60	Medium	37	27.41
60 - 80	High	08	5.93
> 80	Very Low	02	1.48
Total		135	100.00

*Source: Land Utilization Statistics, 1995 - 96

According to Land utilization statistic 1995-96, more than 11 percent of the total revenue blocks have very low (< 20%) net sown area (Table 3.2). These blocks are Sanganath, Omchu, Singithang, Salghari, Shayampani, Kitam, and Manpur etc. All these blocks are located in the Namchi Sub-division except Sanganath. The low category (20-40%) has constituted 54.07 percent of the revenue blocks. The blocks which fall in this category are Sada, Pamthang, Borong and Lingding etc. Another 27 percent of the revenue blocks have medium (40 - 60%) net sown area. But it is interesting to note that not a single block is found in the Namchi Sub-division which

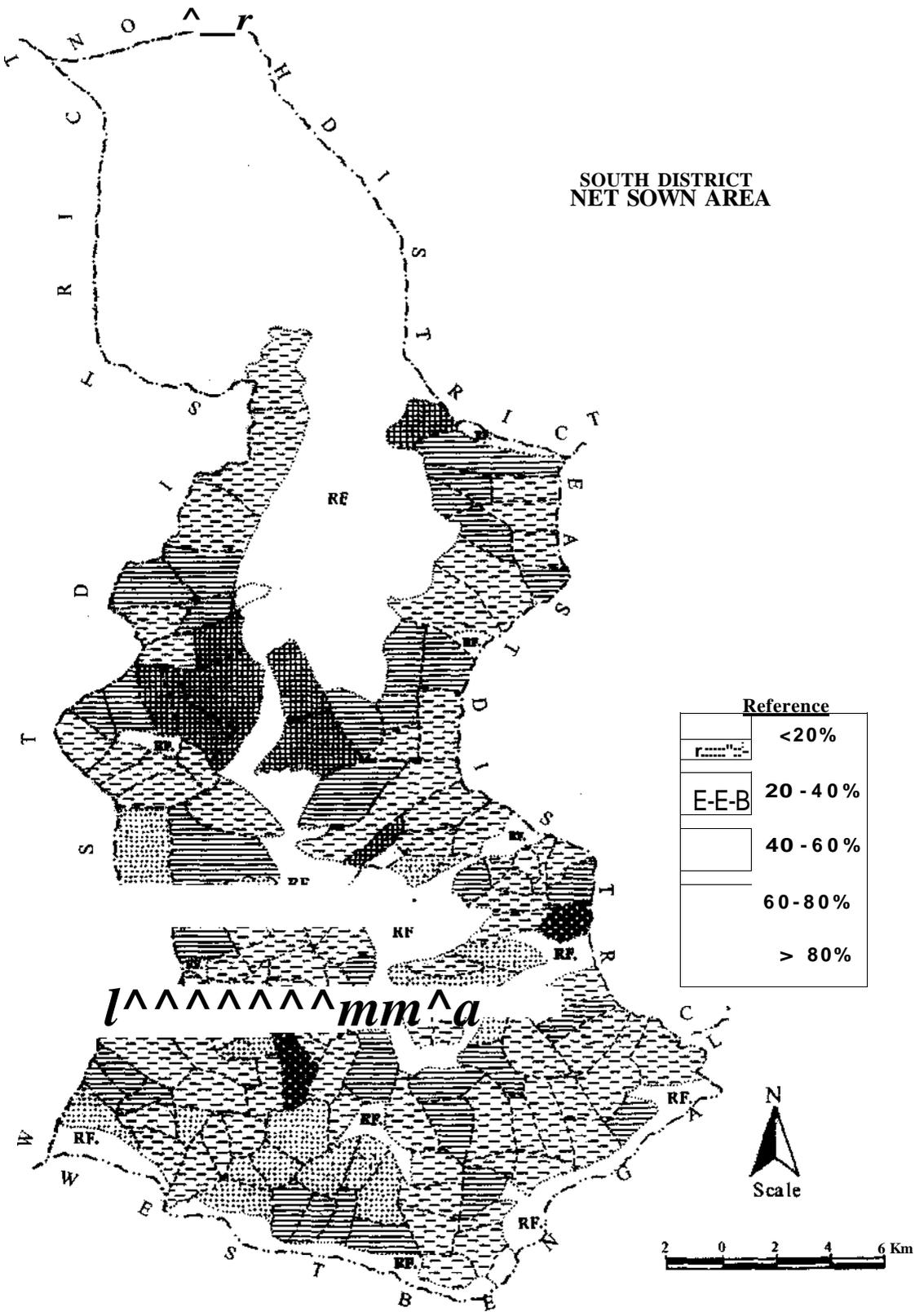


Fig3.2

have the high (60-80%) net sown area ,occupying only 6 percent of the total revenue blocks. Another striking feature of net sown area in the South district is that, there are only two blocks which have very high (>80%) net sown are and found in the block of Boomtar and Tshalumthang. The overall picture of net sown area in the South District is not very encouraging (fig 3.2), because of the fact that the percentage of very low and medium category together consist more percentage than the percentage of both high and very high together.

3.1.7a Irrigated Area

Irrigation is one of the most important pre-requisite for successful practice of agriculture. Out of 12 months natural sources of water (moisture) provide only six months. Remaining sixth months have to depend upon other means and during the lean seasons extra provision of water is required especially in the drier belt extending from Shalghri to Mangzing revenue blocks. The major sources of irrigation for agricultural practice in South District are natural springs locally known as Jhora and sweep flowing streams. But these sources are also not adequate for cultivation as waters can not be reserved for longer duration as slopes are not favourable for reservation. Another problem is the problem of retaining water in the cultivated field due to slopes and seepage. Besides availability of water during rainy is very huge usually causing landslide. This create hurdle to agricultural development in the South District.

Table 3.10 Irrigated Areas in South District. 2001.

Area in Percentage	Category	No of Revenue Blocks	Revenue Blocks %
< 2.0	Very low	49	33.79
2.0-4.0	Low	25	17.24
4.0 - 6.0	Medium	11	7.59
6.0-8.0	High	05	3.45
>8.0	Very high	29	20.00
Not available		26	17.93
Total		145	100.00

* Source: Land Revenue and Disaster Management Department. 2001

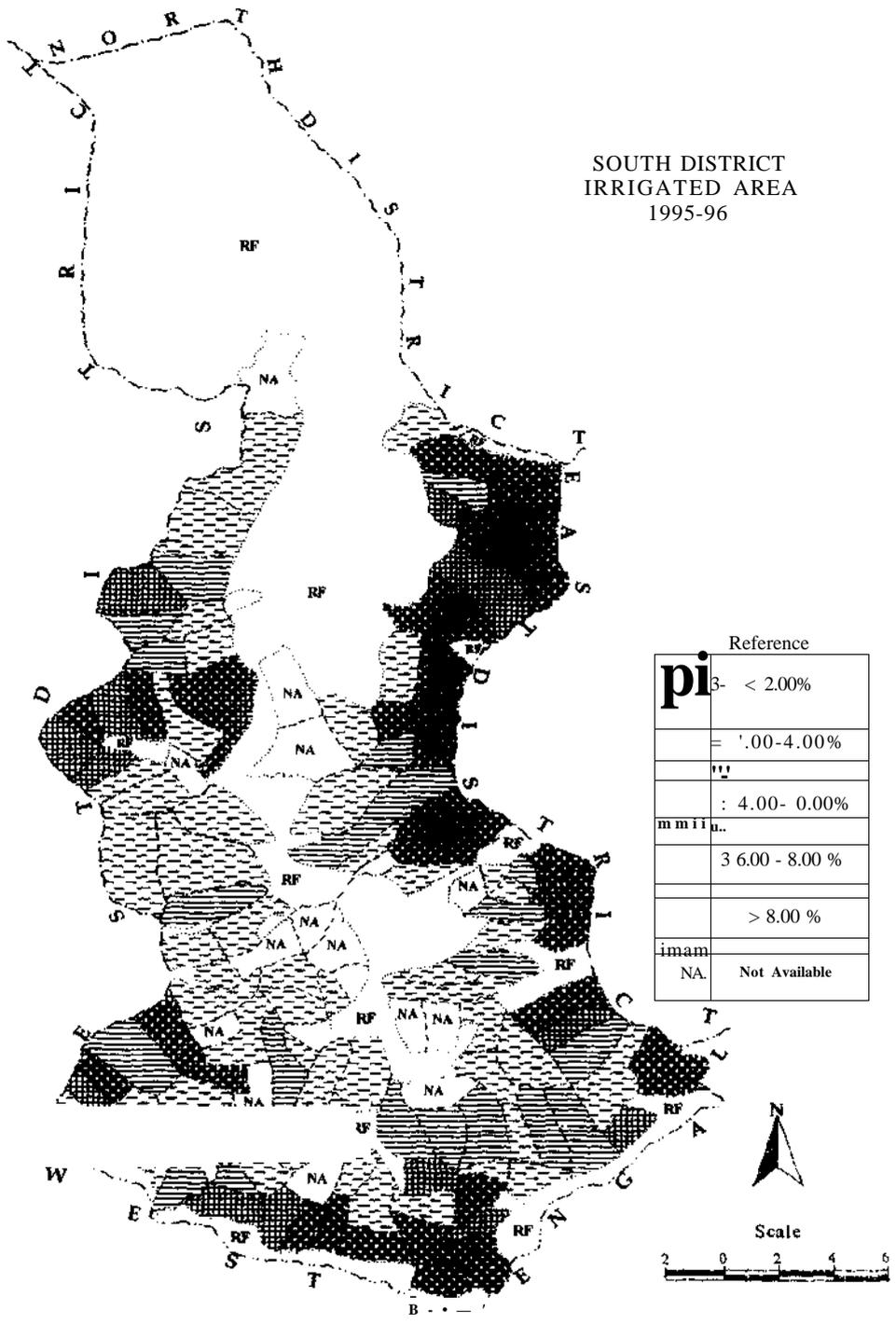


Fig3.9

Most of these revenue blocks are located in Namchi Sub-division. Nearly 9 percent of the revenue blocks have medium (4.0-6.0%) irrigated area. Almost 4 percent of the revenue blocks have high (6.0 -8.0%) category of irrigated area. Some of the important blocks which fall in the category are Denchung, Kartikey, Ramabong, Suntaley, Donok and Barfung. The very high category (>8.0%) of irrigated area occupies 13 percent of the total revenue blocks.

The facts shows that the irrigation facility in the district is not encouraging, as the percentage of highest irrigated percentage is 8 percent which also lesser percentage. So far some diversion canals and some minor irrigation projects have been develop but still lack of irrigation facilities hamper the development of agriculture.

3.1.7b Un- Irrigated Area.

The study of un- irrigated areas is very important from the view point of agricultural development because these areas if irrigation facility is provided can increase the agricultural productivity. The percentage of un-irrigated area to total area of the district varies from less than 20 percent to more than 80 percent. The distribution pattern reveals the fact that most of the cultivated areas of the district are un-irrigated, even through the district is very suitable for growing certain groups of agricultural crops including crops like maize, soybean, ginger, potato, large cardamom, orange, guava, and passion fruits.

Table 3.11 Un-irrigated Area in South District. 2001.

Area in Percentage	Category	No of Revenue Blocks	Revenue Blocks %
<20	Very low	09	6.21
20 - 40	Low	40	27.58
40 - 60	Medium	71	48.96
60 - 80	High medium	11	7.59
>80	Very high	14	9.66
Total		145	100.00

* Sources: Land Revenue and Disaster Management. 2001

The distribution of un-irrigated area in the district is represented by Table3.11. More than 6 percent of the revenue blocks have very low percent (< 2.0) of un-irrigated area. These are found in the northern part of Namchi Sub-division and north eastern part of Ravongla Sub-division. Almost 28 percent of the revenue blocks have low (20 -40%) un-irrigated area. Most of these blocks are found in southern western part of both the sub-division. More than 48 percent of the revenue blocks have medium (40-60%) category of un-irrigated area. In fact this category constitutes the largest percent of the area are mostly concentrated in the Namchi Sub-division. Another 8 percent of the revenue blocks have high (60 -80%) un-irrigated cultivated area. Around 10 percent of the revenue blocks have very high (>80%) un-irrigated area.

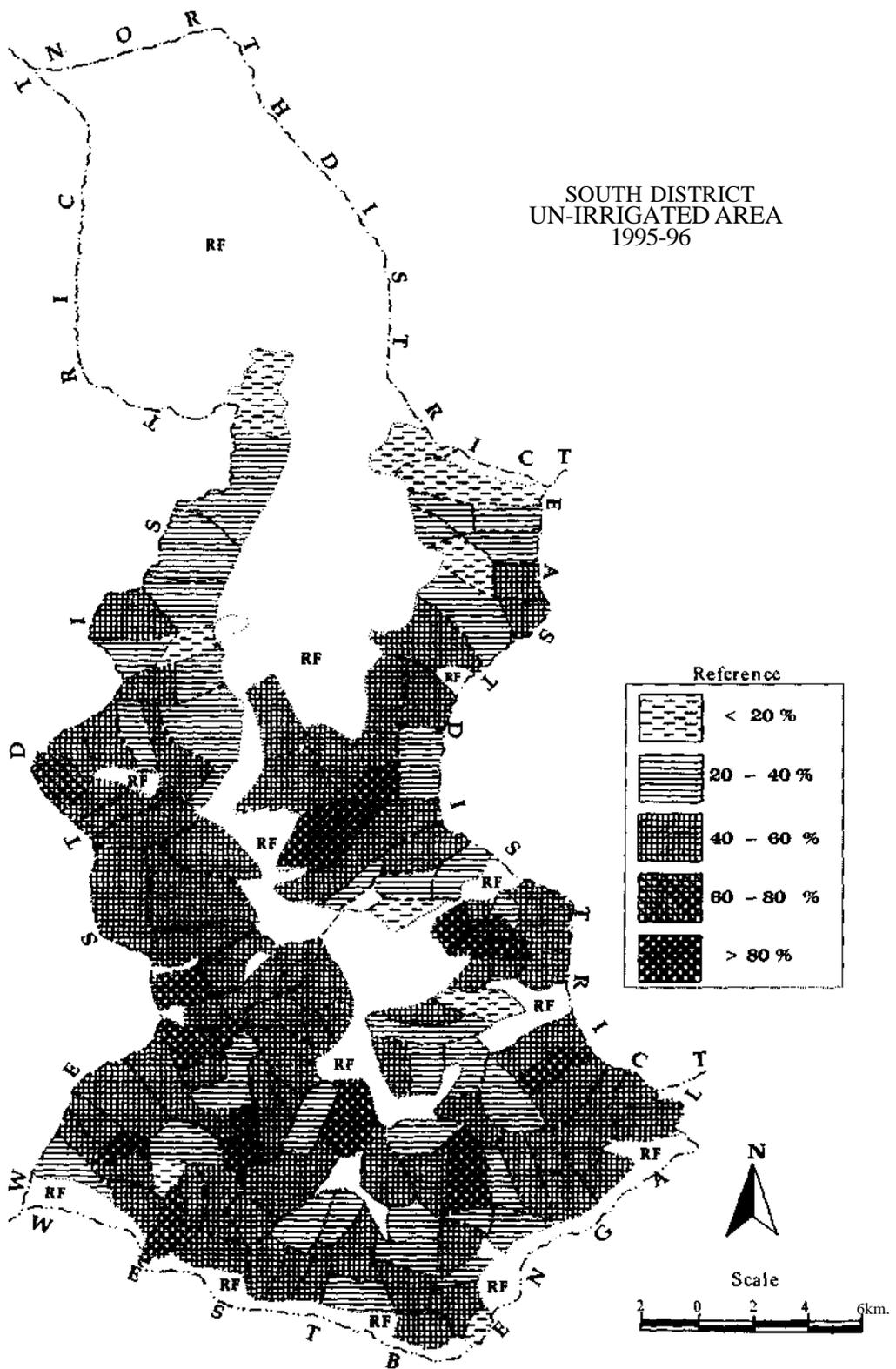


Fig.3.10

The discussion reveals that the area of un-irrigated cultivated area in South District is very high as the category of medium, high and very high concentrated more than 70 percent of the total revenue blocks. It also shows that maximum un-irrigated

cultivated area in the district is located in southern and south eastern parts. Most of these blocks are located in the drier belt of the district. This situation arises one fact i.e. immediate planning and policy is required for covering cultivated areas in to irrigate one, besides the existing programme like water diversion channel, construction of water reservoir etc. for the further development of agriculture in the district.

3.2 CHANGES IN GENERAL LAND USE

The study of changes in land use pattern has been made so that the imbalance can be located in utilization of resource and measures to correct them could be formulated. Such a study would help on the simultaneous development in crop production, forest and pasture for live stock. More over, it will also reflect the shift in land from a less profitable use to more profitable and sustainable one. The physical, economic and institutional frame works determine the land use pattern of South District. The existing land use pattern of South District has evolved as a result of the action and interaction of various factors. The changes of land use in South District can be discussed in three types of broad holding.

3.2.1 Changes in Cultivated Area: (1995 to 2005)

Table 3.12 Changes in Cultivated Area in South District. (1995-2005)

Changes in (%)	Category	No of revenue Blocks		Revenue Blocks in %	
		Positive (+)	Negative (-)	Positive(+)	Negative(-)
<0.05	Very low	15	09	11.83	7.08
0.05-0.50	Low	43	30	33.86	23.62
0.50-1.00	Medium	03	10	2.37	7.87
1.00-1.50	High	03	05	2.37	3.93
>1.50	Very high	05	04	3.93	3.14
Total		69	58	54.36	45.64

* Source: Land Utilization Statistics 1995 & Land revenue and Disaster Management Department. Govt.ofSikkim.2005.

Table 3.12 shows that out of the total revenue blocks sixty nine revenue blocks have recorded positive increase in cultivated area. The percentage of increase varies. There are only around 12 percent in the category of very low (<0.05%).some of the revenue blocks which recorded low positive changes are Bui, Sorok, Suntaley and Sadam etc. In the low category (0.05-0.50%) positive changes of cultivated area occupy almost 34 percent of the total revenue blocks. They are found in the northern

and eastern part of the Namchi Sub-division and eastern part of the Ravongla Sub-division. The category of medium positive change (0.50-1.0%) constitutes more than 2 percent of the total revenue blocks. These blocks are Poklok, Namphing, Chumlock, etc. The high positive changes category (1.0 -1.5%) also occupies less percentage having only 2 percent. Of these two each are located both in the sub- division. About 4 percent of the revenue blocks fall in the category of very high positive changes (>1.5%) increase. The revenue blocks which fall in this category are Tokdey, Kau, and Lower Paiyong etc.

Negative changes in cultivated area are recorded in fifty nine revenue blocks of which 7 percent are in the very low (<0.05%) categories of negative changes. Some of the revenue blocks which record very low negative changes are Mikhola, Palum, Passi, and Mamring etc. The low (0.05-0.50%) category of negative changes occupies almost 24 percent of the revenue blocks. They are mostly found western part of Namchi Sub-division. Another 8 percent of the total revenue block have medium (0.50 -1.0%) categories negative changes. Some of the important revenue blocks which have recorded negative change are Mamley, Boomtar, Kopchey, Manpur, and Tuning etc. Almost 4 percent of the revenue has recorded high (1.0-1.5%) negative changes in cultivated area. They are found in the blocks of Dorop, Lingzo, and Pepthang. The very high (1.5%) negative changes have occupied only 3.14 percent of the total revenue blocks and are recorded in Sukrabarey and Pamphok revenue block.

The change of cultivated area in South District is very negligible as the percentage ranges between 0.05 and 1.5. So it can be rightly concluded that the cultivated area in the district is almost stagnant which means that man land ratio in the district is in the state of saturation point and this situation is not going to be change until and unless proper planning and policy like double cropping, reclamation of waste land and proper utilization of available water resources etc. Management of soil moisture is very important as the discussion shows that most of the very low and low positive changes are concentrated in the southern part of the district where the scarcity of water is very acute problem even though these areas has reported high cropping intensity. And in the case of medium, high and very high positive changes, the percentages is also very low which indicates that one fact that is degrading soil fertility as the cultivation in this part is from time immemorial.

3.2.2. Changes in Culturable Waste Land: (1995-2005)

The study of area under culturable is very important in the hilly agricultural economy, as the cultivated area is very much limited in hilly and mountainous area. Besides the ever increasing population have gave lot of pressure to the existing cultivated area. The culturable waste land can be brought under the cultivated area which can solve the problem of increasing population pressure in some extent.

Table 3.13 Changes in Culturable Waste Land in South District (1995-2005).

Changes in (%)	Category	No of Revenue Blocks		Revenue Blocks %	
		Positive (+)	Negative (-)	Positive (+)	Negative (-)
0 - 5	Low	76	04	56.29	2.96
5 - 10	Medium	47	01	34.80	0.74
10 - 15	High	04	—	2.96	
>15	Very high	03	—	2.22	
Total		130	05	96.27	3.70

* Source: Land Utilization Statistics 1995 & Revenue and Disaster Management Dept. Govt, of Sikkim.2005

Table 3.13 represents the changing scenario of culturable waste land in the South District. Out of the total revenue blocks 130 revenue blocks or 96.27 percent has registered in positive changes and another 5 revenue blocks or 3.70 percent has recorded negative changes. The low category of positive changes (0-5%) has the highest percentage of the total positive changes having 56.29 percent of the total revenue blocks. These revenue blocks are found in whole eastern parts of Ravongla Sub-division and south and south eastern part of Namchi Sub-division. Almost 35 percent of the revenue blocks are in the category of medium positive changes (5-10%) of culturable waste land. These revenue blocks are located in western part of Ravongla Sub-division and western and middle part of Namchi Sub-division. But the high category (10 -15%) of positive culturable waste land changes has very low percentage having only 2.96 percent. Again, the very high (>15%) positive changes culturable waste land also have very negligible percentage having only 2.22 percent of the total revenue blocks

Out of the total revenue blocks only 5 revenue blocks recorded negative changes in culturable waste land. Of which 4 revenue blocks are in the category of low (< 5%), they are found in Omchu, Kateng-borkhong, Ravongla and Lingmo. And only a single revenue blocks is in the category of medium negative category (5 -10%) of culturable waste land. The lone revenue block which fall in the category is Sokpey.

The over all character of cultivable waste land in the district is that. The percentage of positive changes is more than negative change means that some of the cultivated area of the district is preserving for natural reoccupation for soil fertility. The area under this category will certainly useful to meet the increasing demand for cultivated land in future.

3.2.3 Changes in Build up Area: (1995 to 2005)

This type of land use has maximum changes in South District. According to 1991 Census build up area constitutes 6.64 percent of the total geographical area. But in 2001 Census it becomes 10.24 percent of the total geographical area of the district.

Table 3.14 Changes in Build Up Area, South District. (1995-2005).

Changes in (%)	Category	No of Revenue Blocks		Revenue Blocks %	
		Positive (+)	Negative(-)	Positive (+)	Negative (-)
<5	Very low	48	Nil	35.55	Nil
5 - 10	Low	51	Nil	37.77	Nil
10 - 15	Medium	28	Nil	20.74	Nil
15 - 20	High	05	Nil	3.72	Nil
>20	Very High	03	Nil	2.22	Nil
Total		135	0.00	100.00	0.00

* Source: Land Utilization Statistics, 1995 and Land use and Disaster Management Department.2005

The changes in build up area have a unique picture as none of the revenue blocks record negative changes. (Table3.14). these pictures indicate the conversion of other land uses to build up area. The very low positive changes in build up area have occupies more than 35 percent of the total revenue blocks. These revenue blocks are located in northern south western and south-eastern part of Namchi Sub-division. In Ravongla Sub-division they are situated in western and north eastern parts. More than 37 percent of the revenue blocks are under the category of (5 - 10%). Of which 29 revenue blocks are in the Namchi Sub-division and another 22 revenue blocks are in the Ravongla Sub-division. The medium category (10 - 15%) of positive changes in build up area has occupies almost 21 percent of the total revenue blocks. In the high (15 - 20%) category of positive change in build up area there are only 3.72 percent of the total revenue blocks. These revenue blocks are namely Damthang, Tizer, Tuning, Poklok, Kitam and Yangang. But the very high category (>20%) of positive changes in build up area has only 2.22 percent of the total revenue blocks of the district.

The change in the build up area in South District is very significant. The changes percentage may be low but, this change in the hilly terrain like South District is very significant and will have certainly negative impact on the land use pattern of the district where large portion of the land is cover by forest, rough topography, steep slope etc with limited cultivated land.

3.2.3a Trend' of Changes in Land Use Pattern: (1977 to 2001)

Table 3.15 Changes of Land Use in South Sikkim. (1977-2001)

Land Use type/Year	1976-'77 Area in ha	(%)	1981-'82 Area in ha	(%)	1991-'92 Area in ha	(%)	2001-'02 Area in ha	%
Net shown area	19454	82.90	21643	73.37	15397	52.42	21463	69.04
Area under current fallow	81.46	0.34	1318	4.46	1587	5.40	1318	4.23
Net cultivated area	19536	83.25	22961	77.83	16966	57.83	22781	73.28
Other un-cultivated land(excluding fallow land)	1596	6.83	1503	5.09	3405	11.61	1503	4.83
Fallow land other than current fallow	210	0.89	2884	9.77	3015	10.27	2884	9.27
Culturable waste land	79.12	0.33	196	0.66	2981	10.16	1965	6.32
Total Un-cultivated land	1886	18.86	4583	15.54	9401	32.04	6352	20.43
Land not available for cultivation	2044	0.86	1954	6.62	2969	10.12	1954	6.28
Total holding	23466.66	100.00	29498.00	100.00	29336.00	100.00	31087.00	100.00

* Source: Agricultural Census, Sikkim 1976-77, 1981-82, 1991-92, & Sikkim Statistical Profile 2001-02

An interesting facts and figure were revealing by Table 3.15. Despite too much of planning and policy the net cultivated area in the South District is decreasing during the period (1976-'77 to 2001-'02) in spite of increase in total holding. One of the important factors of decreasing in this type of land use is due to encroachment of cultivated land by other types of land use, especially by the build up area. The percentage of net cultivated area to the total holding of the district is 82.90 % in 1976-'77, 73.37% in 1981-'82, 52.42% in 1991-'92 and 69.04% in 2001-'02 respectively. The highest decrease is observed in the period of 1981-82 to 1991-92. The percentage of current fallow land has fluctuated trend. As the percentage shows it is 0.34% in 1976-'77, 4.46% in 1981-'82 5.40% in 1991-92 and 4.235 in 2001-'02. In the case of

other un-cultivated land (excluding current fallow) the trend is also fluctuated, from 6.83 % in 1976-'77, it becomes 5.09% in 1981-'82, again increase to 11.61% in 1991-'92 and again decrease to 4.83% in 2001-'02. The category of fallow land other than current fallow is increasing from 1976-'77 to 2001-'0 having becoming from 0.98% to 9.27. the highest increase in this category is observed in 1981-'82 to 1991-'92. But in the case of culturable waste land and the land not available for cultivation the trend is fluctuating. The over all characteristics of land use pattern in the South District as a whole is not equal may be due to various factors.

CONCLUSION

The discussion show that, the land use in all the revenue blocks in South District is not uniform. It varies from one revenue block to another revenue block in accordance with the variation in quantity of land, its productivity potential and availability of water resource as soil moisture. Most of the revenue blocks in the district are facing the problem of acute water shortage. With the increasing population and higher trend of urbanization, the large agricultural plots are fragmented into several small plots and encroachment of cultivated field leads to small land holding. This problem of fragmentation leads to the discouragement of agriculture, ultimately leading to sedentary practice of agriculture, which will produce only for the household consumption only. If this system of practice continue without and proper planning, subsistence farming will ultimately dominate the whole agricultural system of the district. The picture is also same for the culturable waste land; the percentage of culturable waste land is increasing which means that some portion of the district is not engaging for production purpose leading to the decrease in agricultural production. The developments in socio-economic sectors in some extent and with enormous increase in population the percentage of build up areas also increase tremendously. This will leads to the over all decrease of good agricultural land permanently in the district.

It is clear that, the fragmentation of land holding due to increase in population, landslides, soil erosion, expansion of infrastructural facilities, and urbanization processes in one hand and lack of proper planning and policy which address the local problems leads decrease in agricultural land use in the South District. To redress this problems locally suited policy and planning is required. While formulation the policy and planning it should be keep in mind that the carrying capacity of land should be

maintain for proper utilization of land, proper planning measurement and evaluation of the capability of land of the district have become absolutely necessary to provide a strong planning and policy mechanism for the district. Here planning means the land has to be graded according to its productivity for raising the most suitable crops in consideration with availability of moisture, socio-economic and cultural factors as well as the availability of labour forces because the prevailing situation in the district does not permit the large scale mechanization of farming. This will increase the per capita out put of land in the district.

CHAPTER IV

CHANGING AGRICULTURE PATTERN AND IT'S IMPACT ON LAND USE

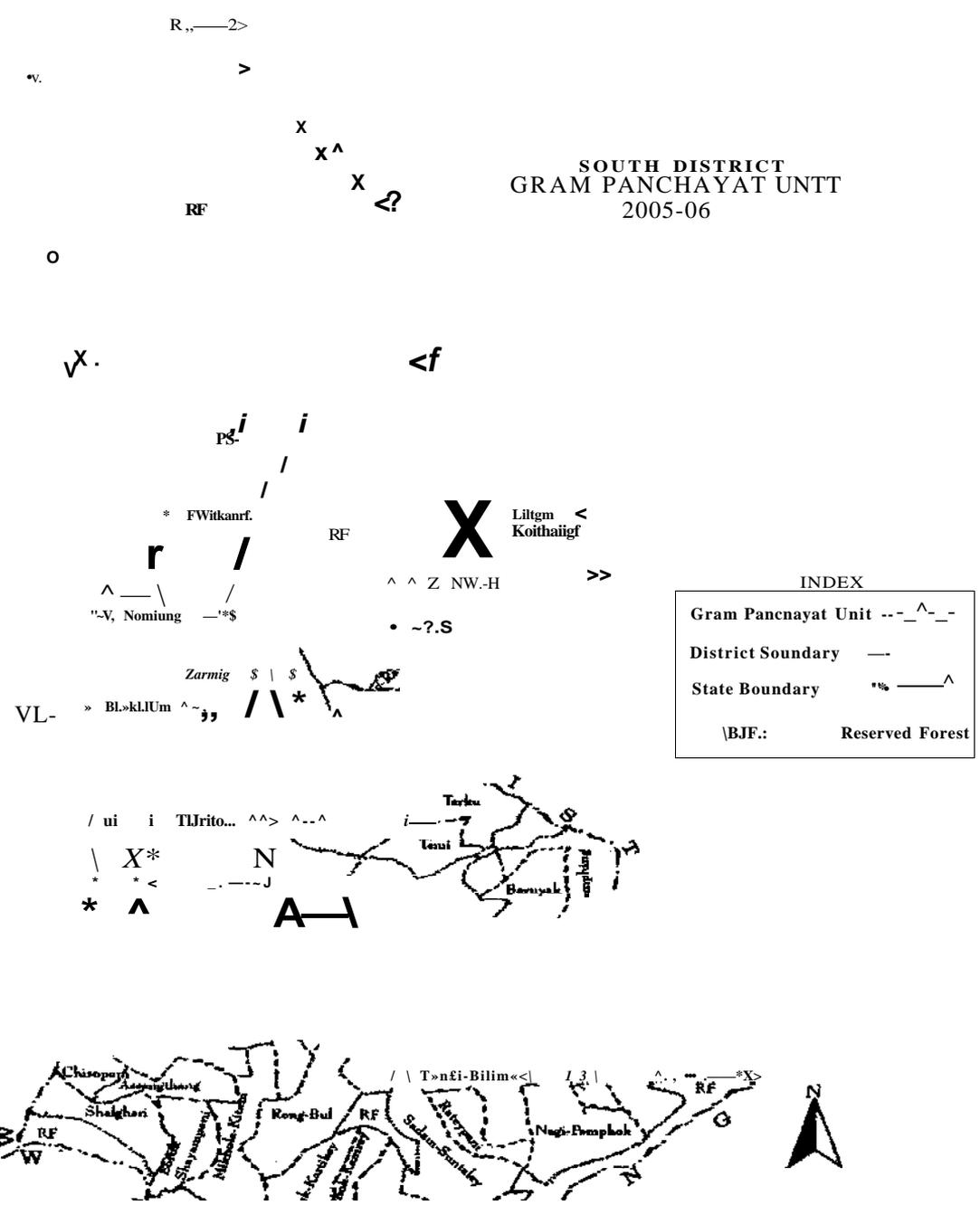
INTRODUCTION

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 foⁱ ^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

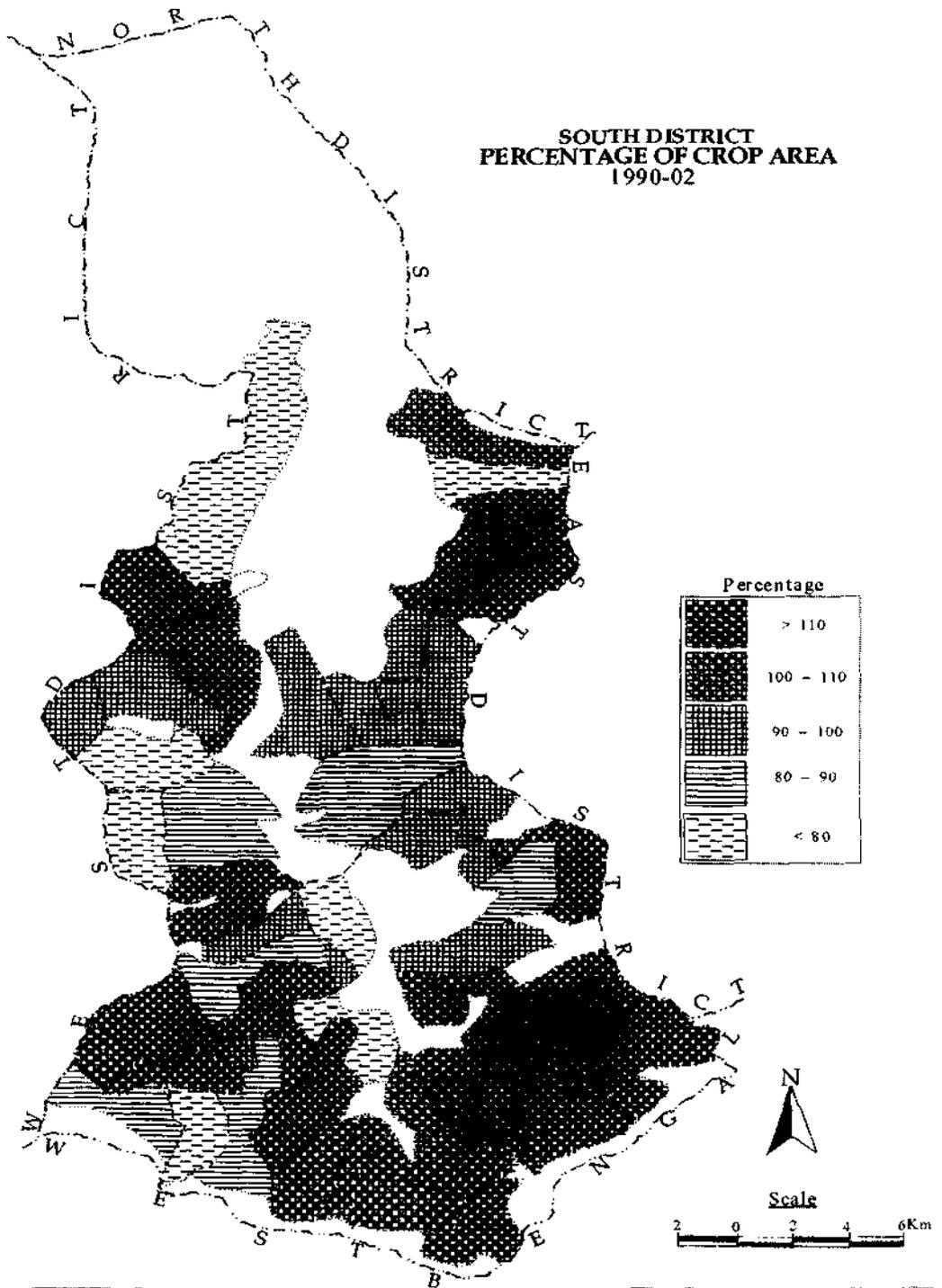


Fig4.2

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 throughout 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 Panchayat 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 and cultivation methods which are 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

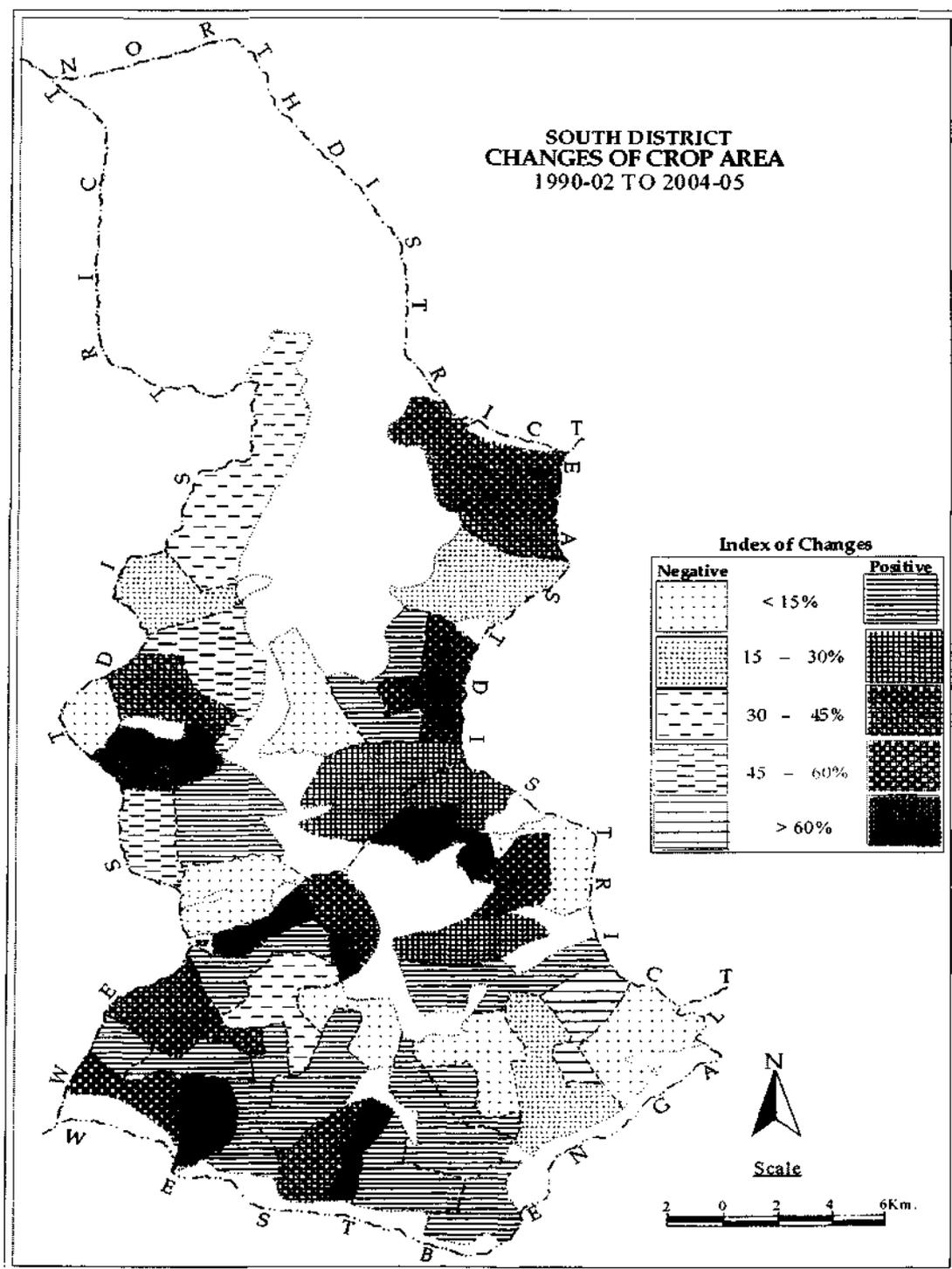


Fig4.4

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 feature 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

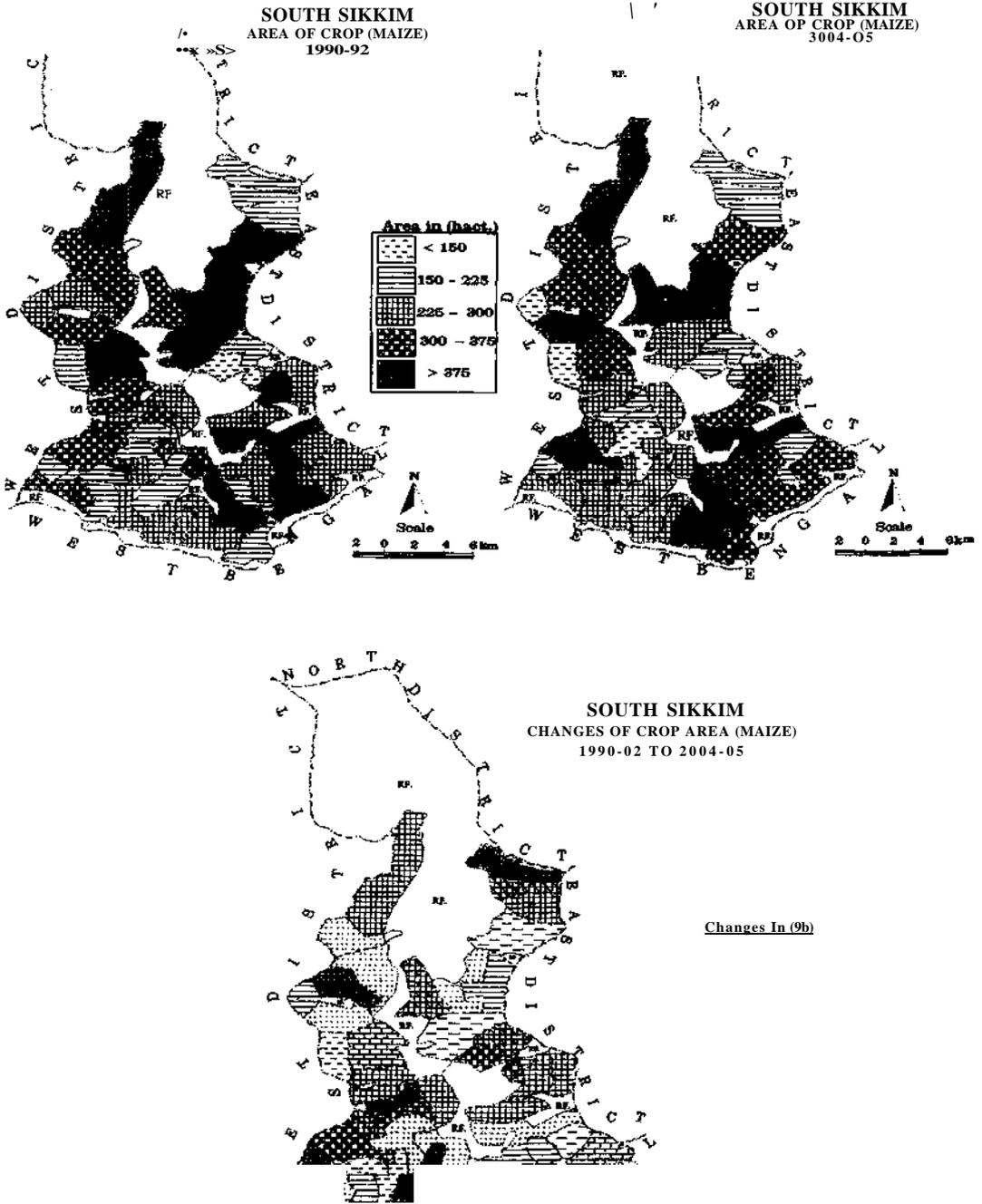
*Source: Crop Area Production Statistics, Department of Agriculture, Govt of Sikkim. 2004-05

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 over all character of rice cultivation in South District in 1990-92 is medium as the three category i.e. very low, low and non cultivated together accounts more than half of the total GPUs. This medium cultivation is 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 produce rice cost 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 area lack of lanour 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 face by the farmers of the district for the cultivation of the rice. These problems are more or less avoided if the improved in the traditional and locally practice method of farming as they are old age experience.

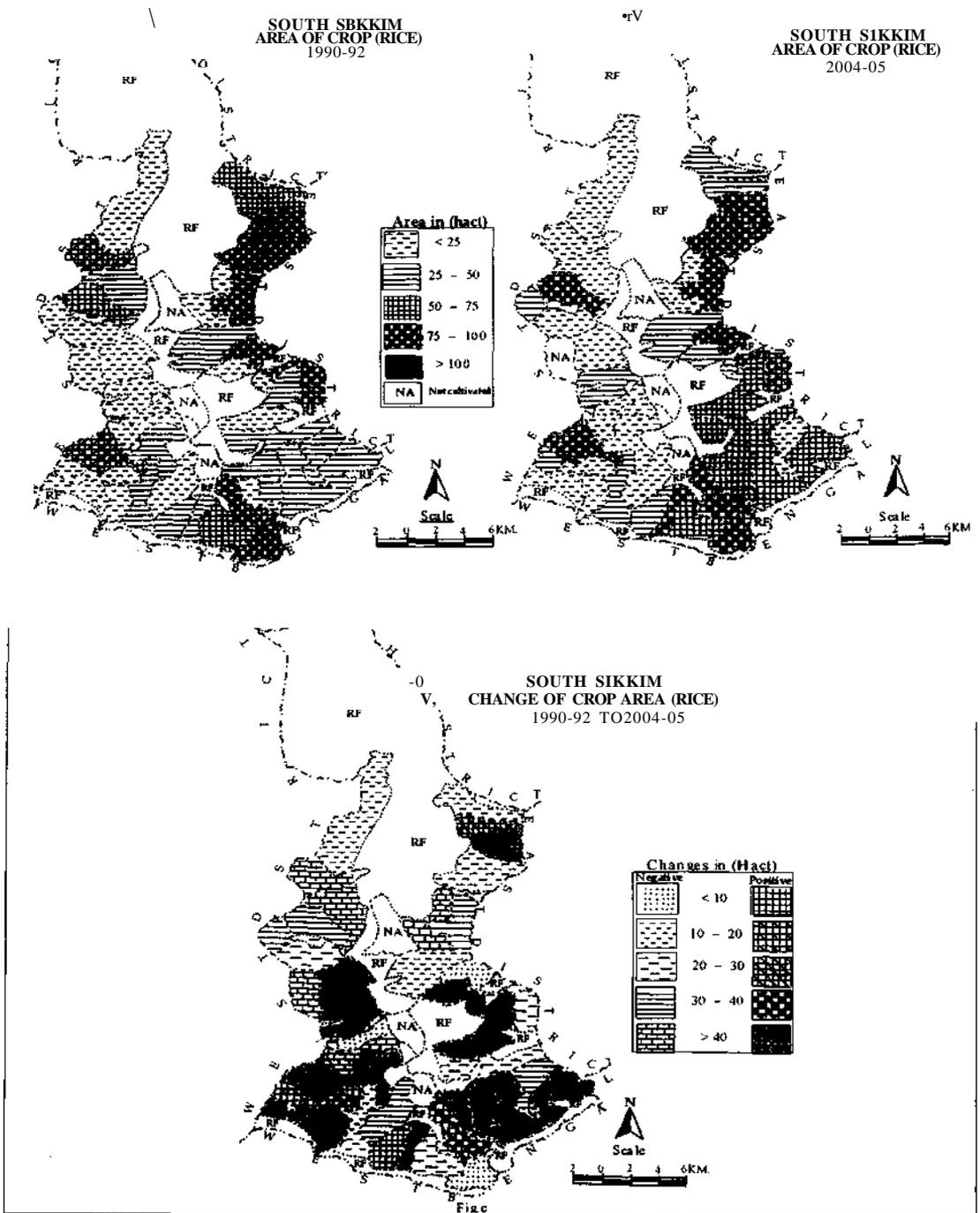


Fig 4.6

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

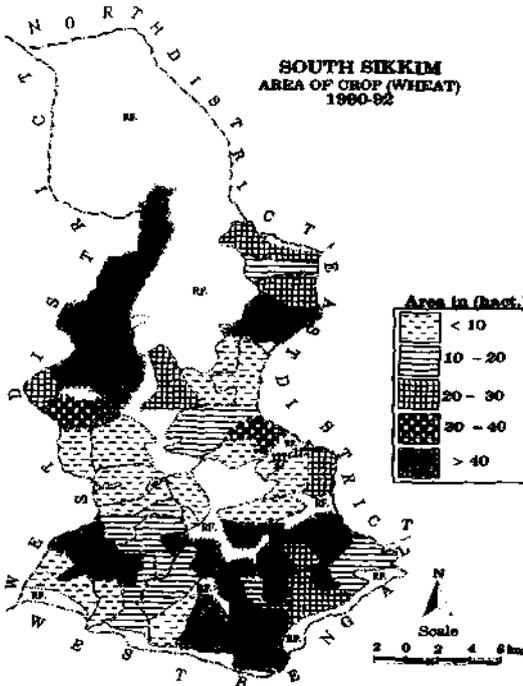


Fig. a

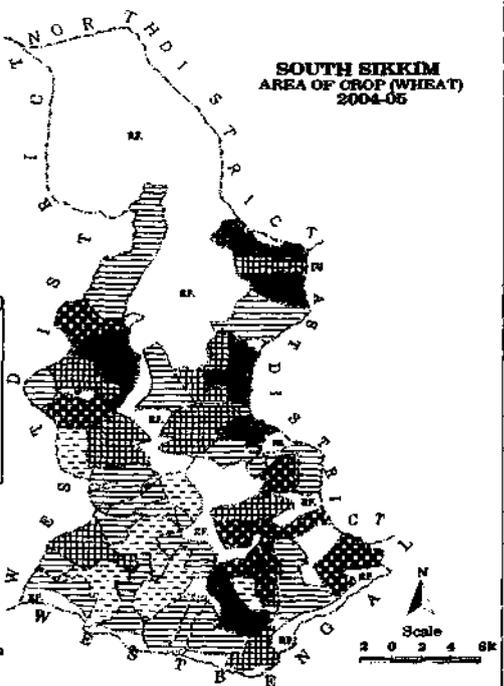


Fig. b

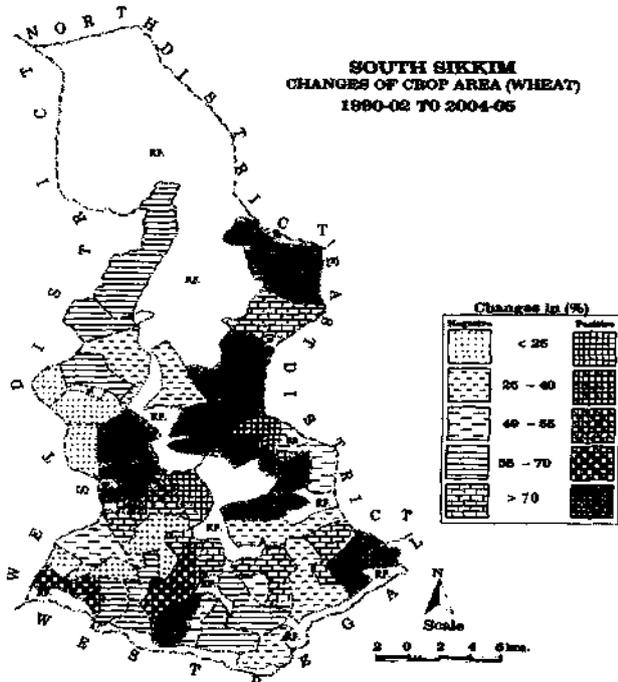


Fig. c

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.

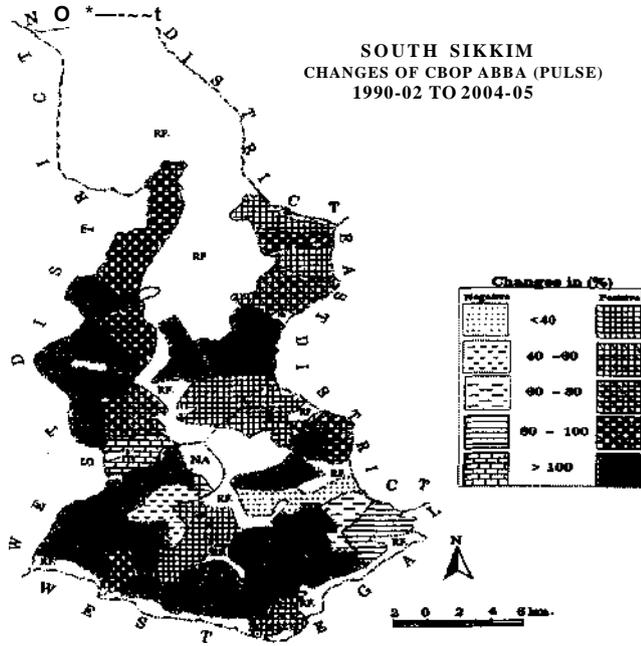
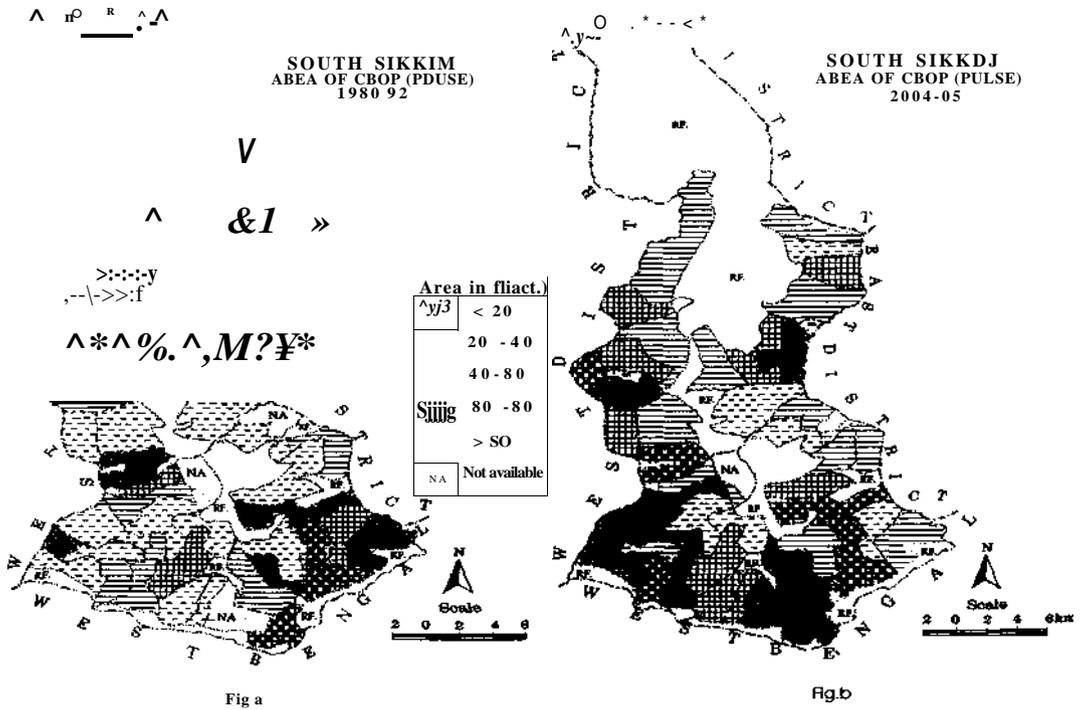
Table 4.13 Pulse Cropped Area, South District. 1990-'92

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

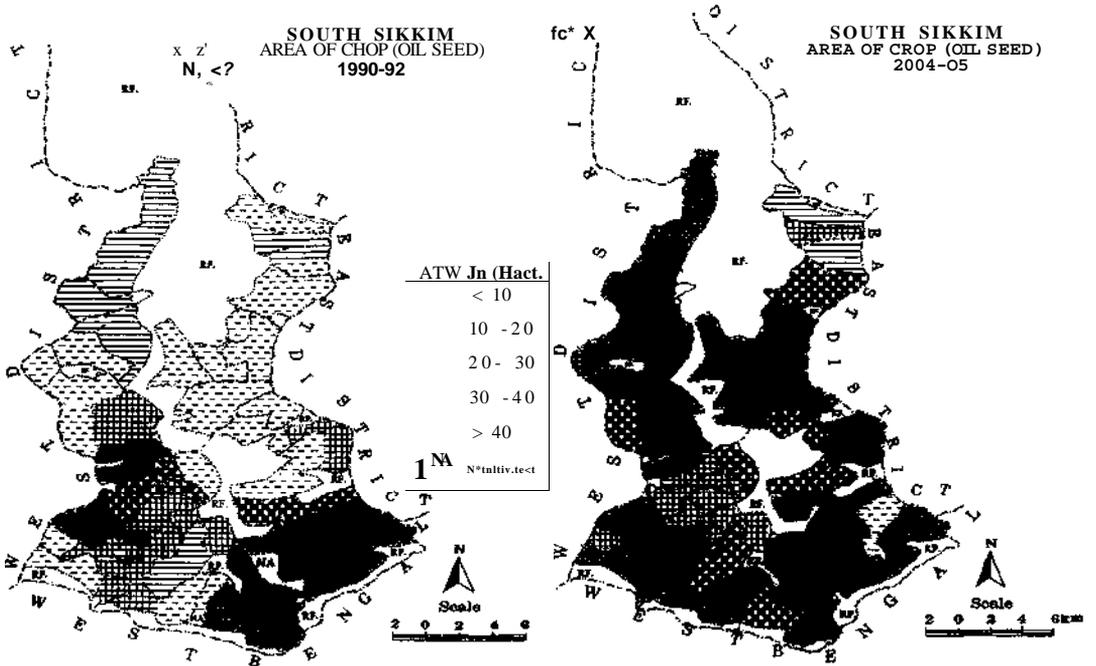
Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<10	Very low	20	44.44
10-20	Low	5	11.11
20-30	Medium	7	15.56
30-40	High	3	6.67
>40	Very High	9	20.00
NA		1	2.22
Total		45	100.00

*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.

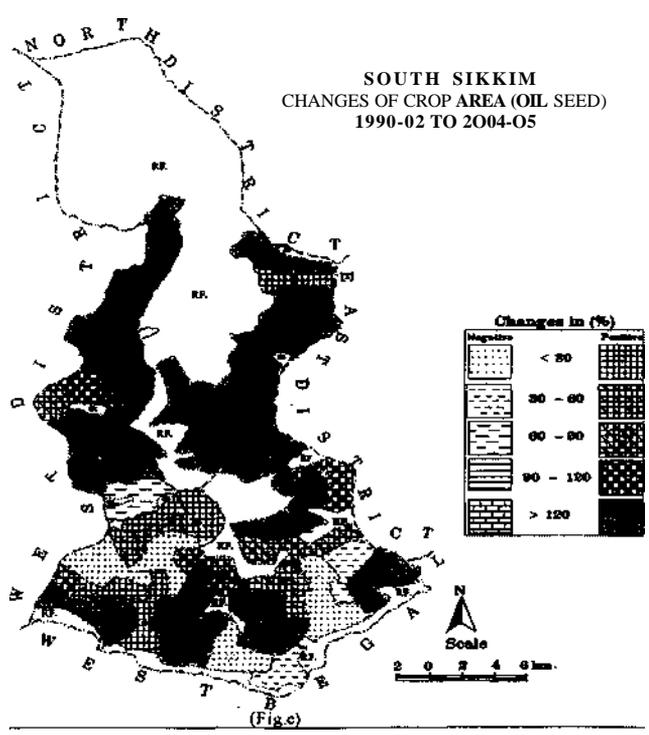


Photograph 4.3 Mustard cultivated field.



(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.

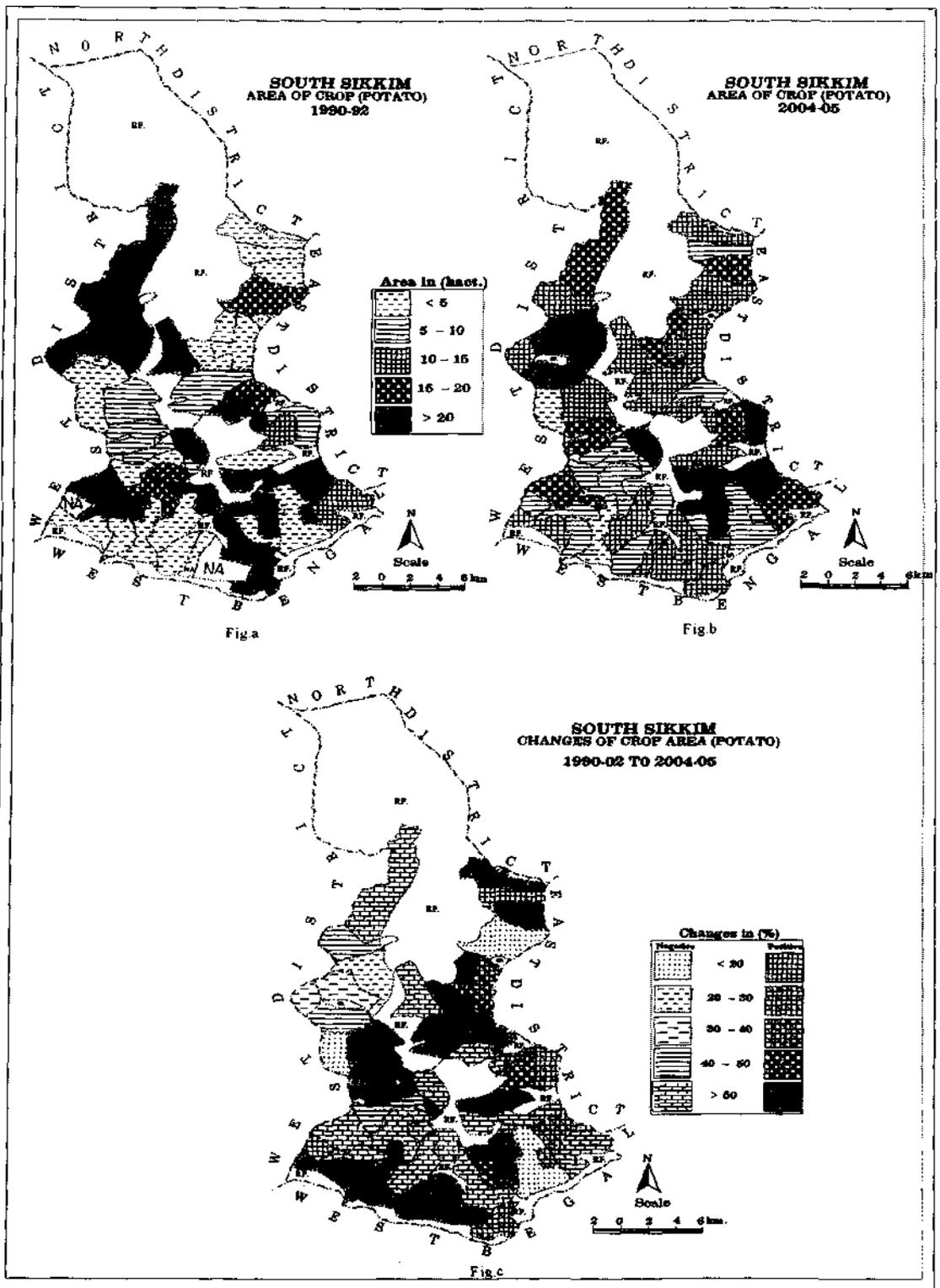
Most of these Gram Panchayat units are located in the southern and western parts of the district. The medium category (10-15hect) has the highest percentage amongst the categories having more than 35% of the total GPUs which is also more than the base year of 1990-92 and they are located in the western 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

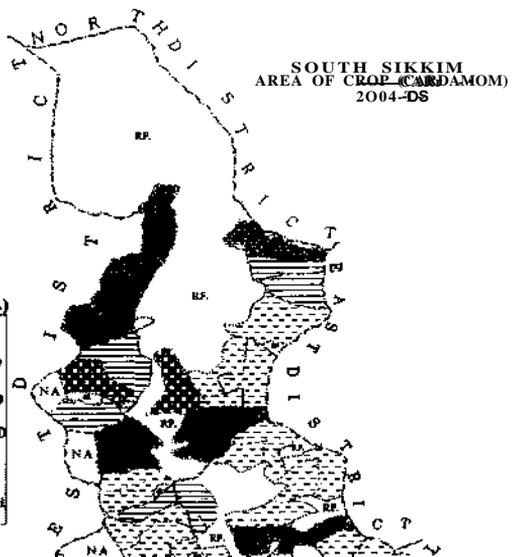
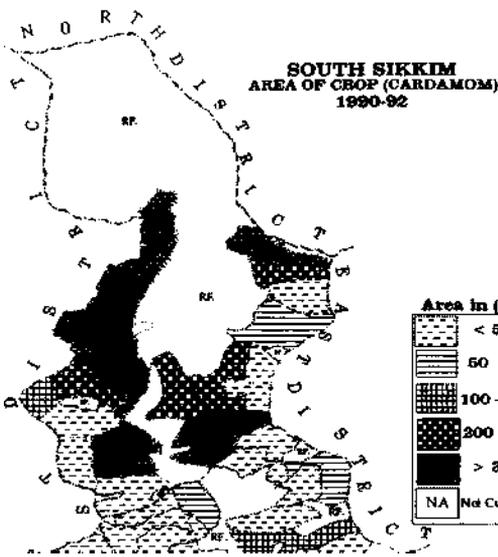
Area in Hectare	Category	No of Gram Panchayat unit	Total Gram Panchayat units %
<50	Very low	17	37.78
50-100	Low	6	13.33
100-200	Medium	Nil	0.00
200 - 300	High	2	4.44
>300	Very high	6	13.33
Not Cultivated		14	31.12
Total		45	100.00

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)

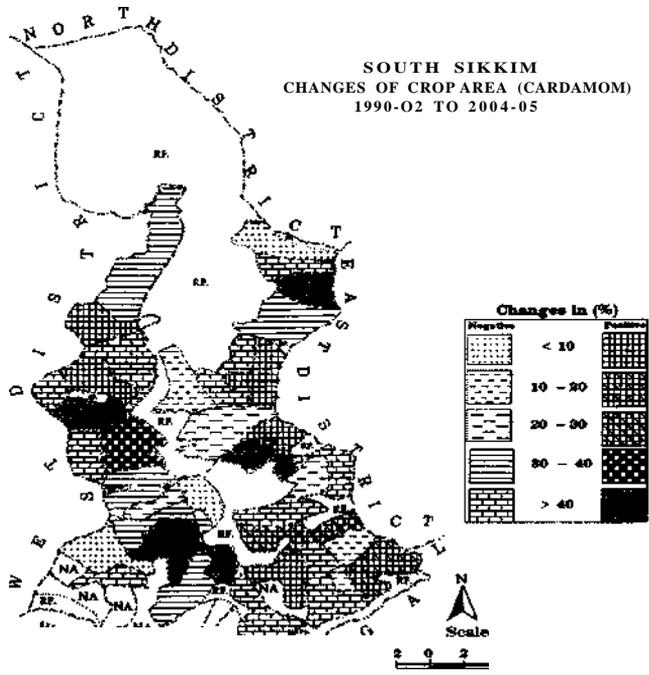


Photograph 4.4 Large Cardamom Cultivation



W -%<-t⁸T^Nj I ^z-ci?/NA^ Scale
T 3 --
Fig.a

W V <^NAHJ><Y j---T-'^r^
£-|'-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.

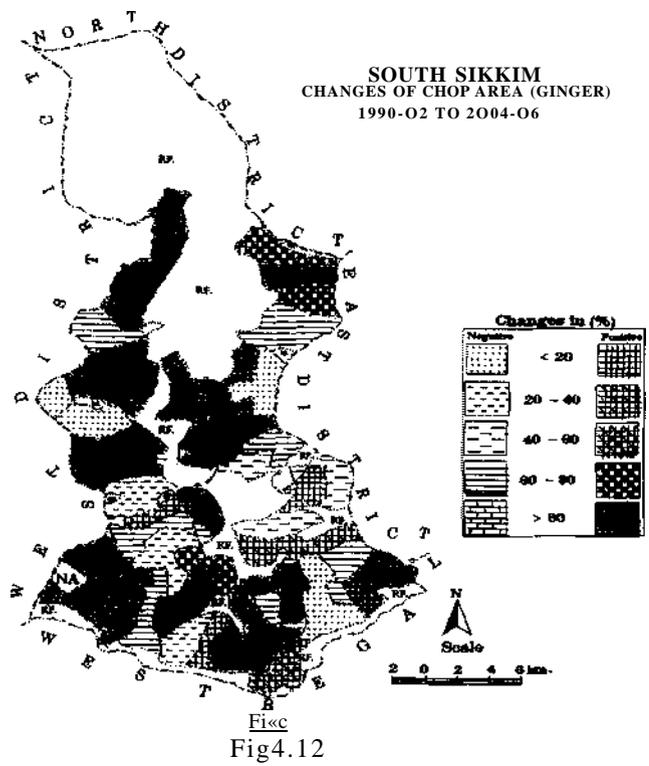
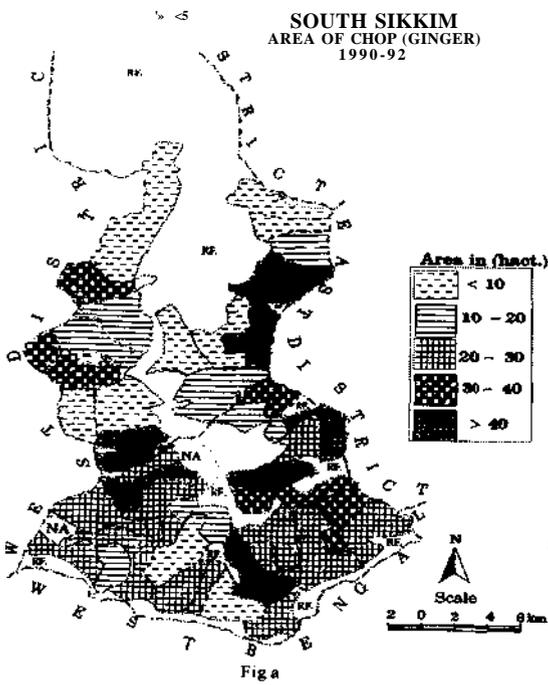
4.2.8a Ginger Cropped Area 1990-'92.

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

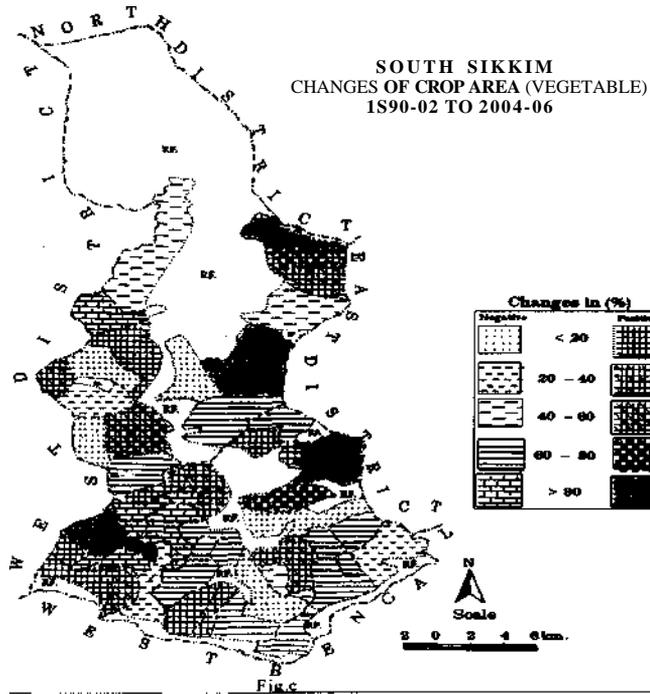
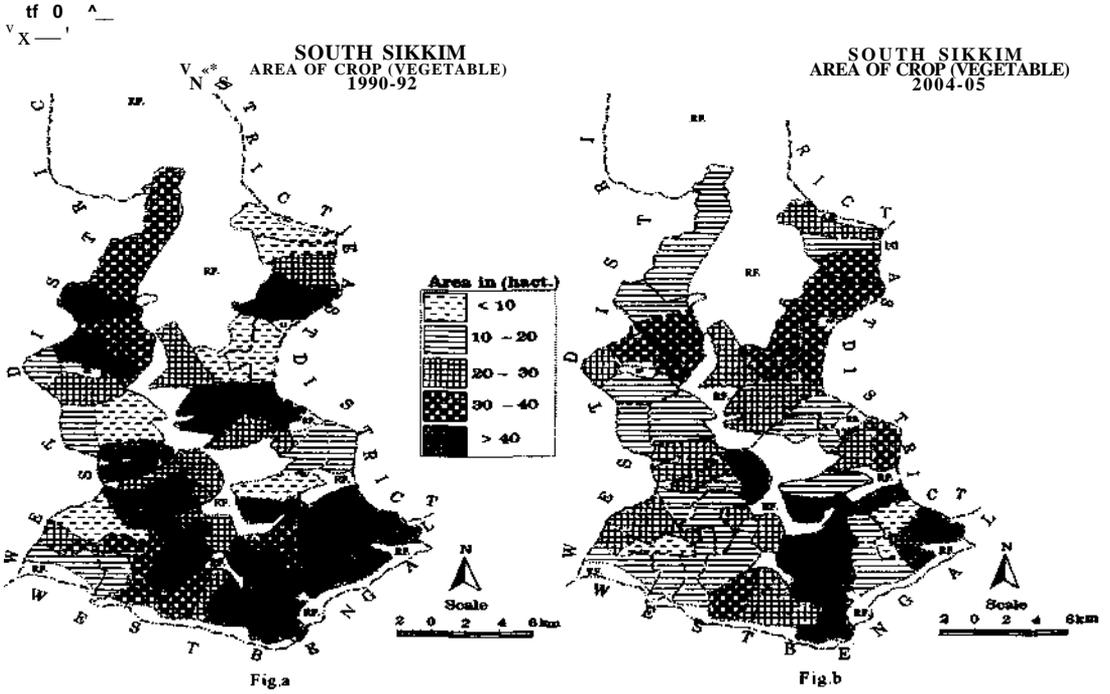


Fig4.13

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.

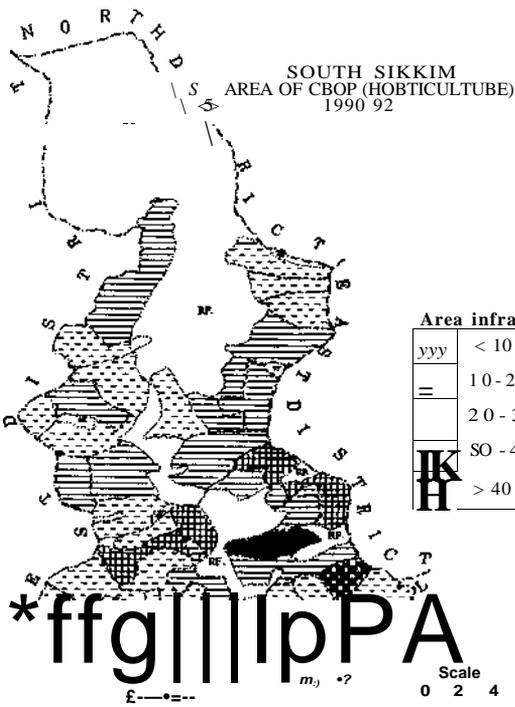


Fig.a

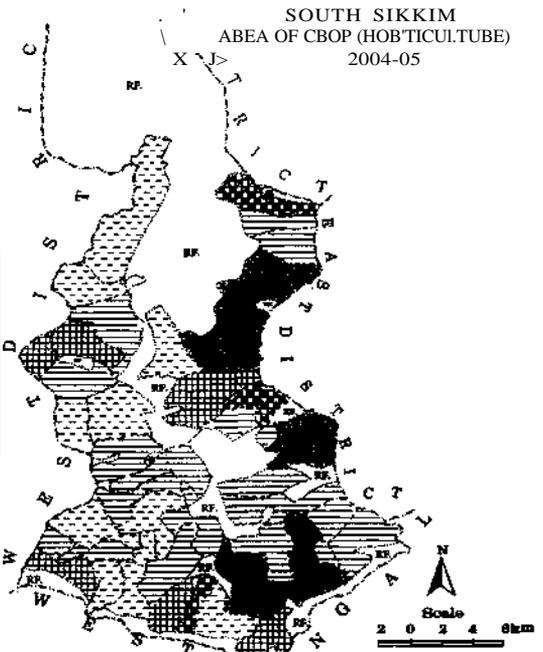


Fig.b

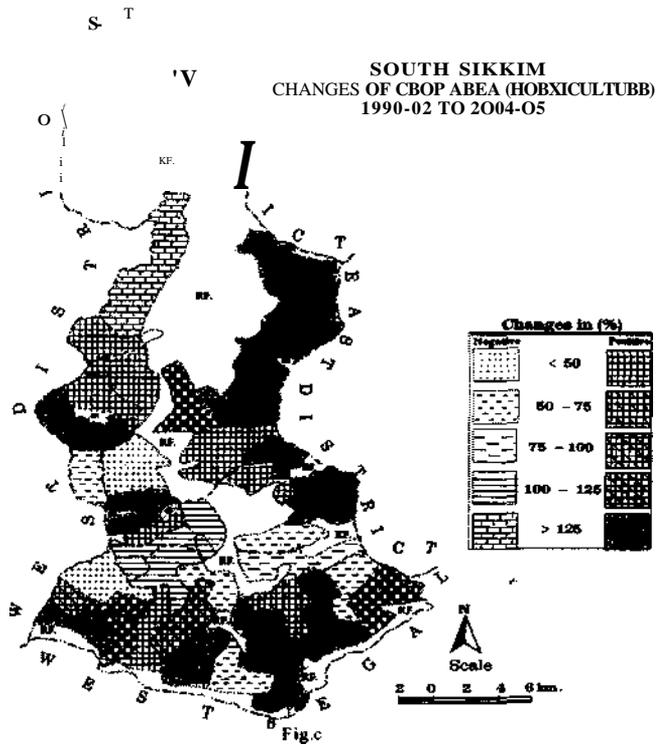


Fig4.14

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.

CHAPTER-V

CROP PRODUCTION, CONCENTRATION, COMBINATION AND DIVERSIFICATION

INTRODUCTION

The agricultural development and problems of any area can be studied by various methods, some of the important methods for studying the agricultural development are study of variation in production level of various crops in regional structure i.e. village level, block level, district and state level which reveals the regional variation pattern. The crop concentration, combination and diversification are also applied for studying the problems, development and for further suggestion and future planning. These methods are usually applied for finding out the selection, dominance and future choice of crop in an area. These studies also reveal the underlying physiographic, socio-economic and cultural influence. Besides these studies have direct bearing on the changing land use pattern of any area.

5.1 CROP PRODUCTION

Productivity level of any crop is one of the important indicators of agricultural development. The sedentary nature of agriculture in South District does not indicate higher productivity of the crops. For the district ten selected crops productivity level is studied for 2004-05 for Gram Panchayat units as the data for block level is not available. The productivity of any crop depends on the various parameters, like suitable agro-climatic conditions, farmer's interest for cultivation of a particular crop, demand in the local markets, traditional practice of cropping, adaptability to the changing scientific agricultural methods of cultivation etc. The productivity levels amongst the crops are also very different. The production of crops has been measured in thousand kg.

5.1.1 Production of Maize: 2004-'05

Maize is the most important first ranking crop in the South District. Out of the total Gram Panchayat units, only two Gram Panchayat units (4.45%) are under the category of very low (<100'000 kg/ hectare).(Table5.1a) These Gram Panchayat are Rateypani and Sadam -Suntaley. Another two GPUs (4.45%) are in the category of

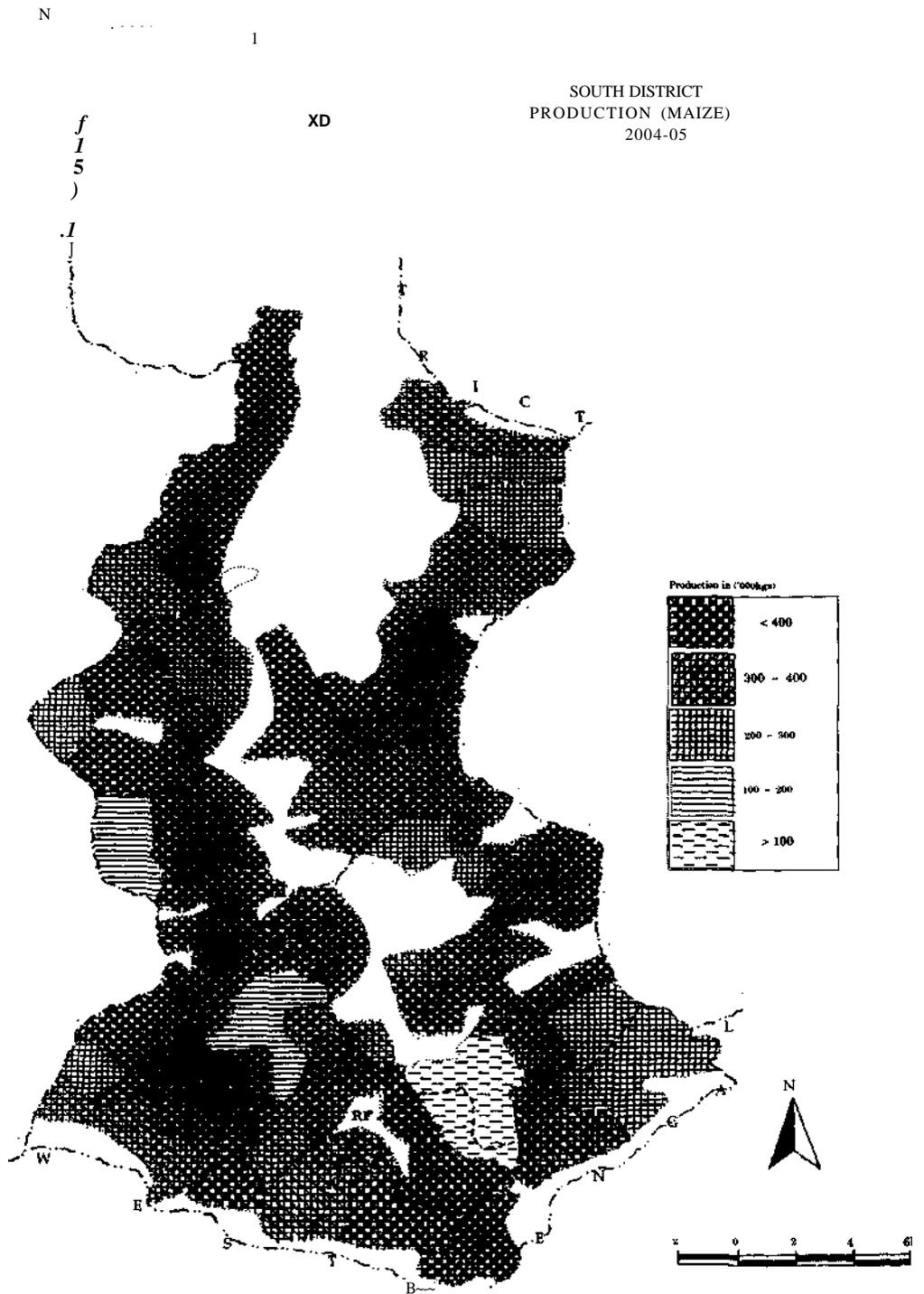


Fig 5.1

low (100 - 200)'000kg/hectare. They are Singithang-Boomtar and Sanganath GPUs. But the medium category (200-300'000kg/hectare) has been recorded in seven GPUs, occupying 16% of the total GPUs. These Gram Panchayat units are located in north-eastern and south-eastern parts of the district.

Table 5.1a Production of Maize,(South District.2004-05)

Production in('000)kg	Category	No of Gram Panchayat unit	Total Gram Panchayat unit %
<100	Very low	2	4.45
100-200	Low	2	4.45
200 - 300	Medium	7	15.56
300-400	High	17	37.77
>400	Very high	17	37.77
Total		45	100.00

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

The high (300-400'000 kg/hectare) maize production is observed in more than 37% of the total GPUs. Most of these GPUs are located in south-western part of the district. About 37% of GPUs are under very high (>400'000 kg/hectare) production category. These GPUs are scattered throughout the district, (fig 5.1). The production of maize in the South District can be concluded as high in comparison to the other districts of the State, as the percentage of high and very high category together constitutes more than 66% of GPUs of the South District.

5.1.2 Production of Rice: 2004-'05

Rice is the second ranking crop next to maize as the sizable area is under the rice cultivation, even though it is the main staple food crop of the district. Most of the rice cultivated tracts are located in the fertile river valleys, where the slope is gentle. Besides, it is also cultivated in the upper parts of hills by means of terrace farming.

Table 5.1b Production of Rice (South District. 2004-05)

Production in ('000)kg/hect.	Category	No of GPU	Total GPUs %
<25	Very low	10	22.23
25 - 50	Low	9	20.00
50 - 75	Medium	9	20.00
75 - 100	High	5	11.11
>100	Very high	6	13.33
NA		6	13.33
Total		45	100.00

* Source: Crop Production Statistics, Department of Agri Govt, of Sikkim. 2004-05

In comparison to maize, the production of rice in the South District is very low. The production ranges in between 0 and 100 kg. The very low (<25'000kg/hectare) rice category is recorded in ten Gram Panchayat units which occupy 22% of the total Gram Panchayat units and these are mostly found in the western and central parts of

the district. Exactly 20% of GPUs are in the next category of low (25,000 - 50,000 kg/hectare). (Table5.1b).

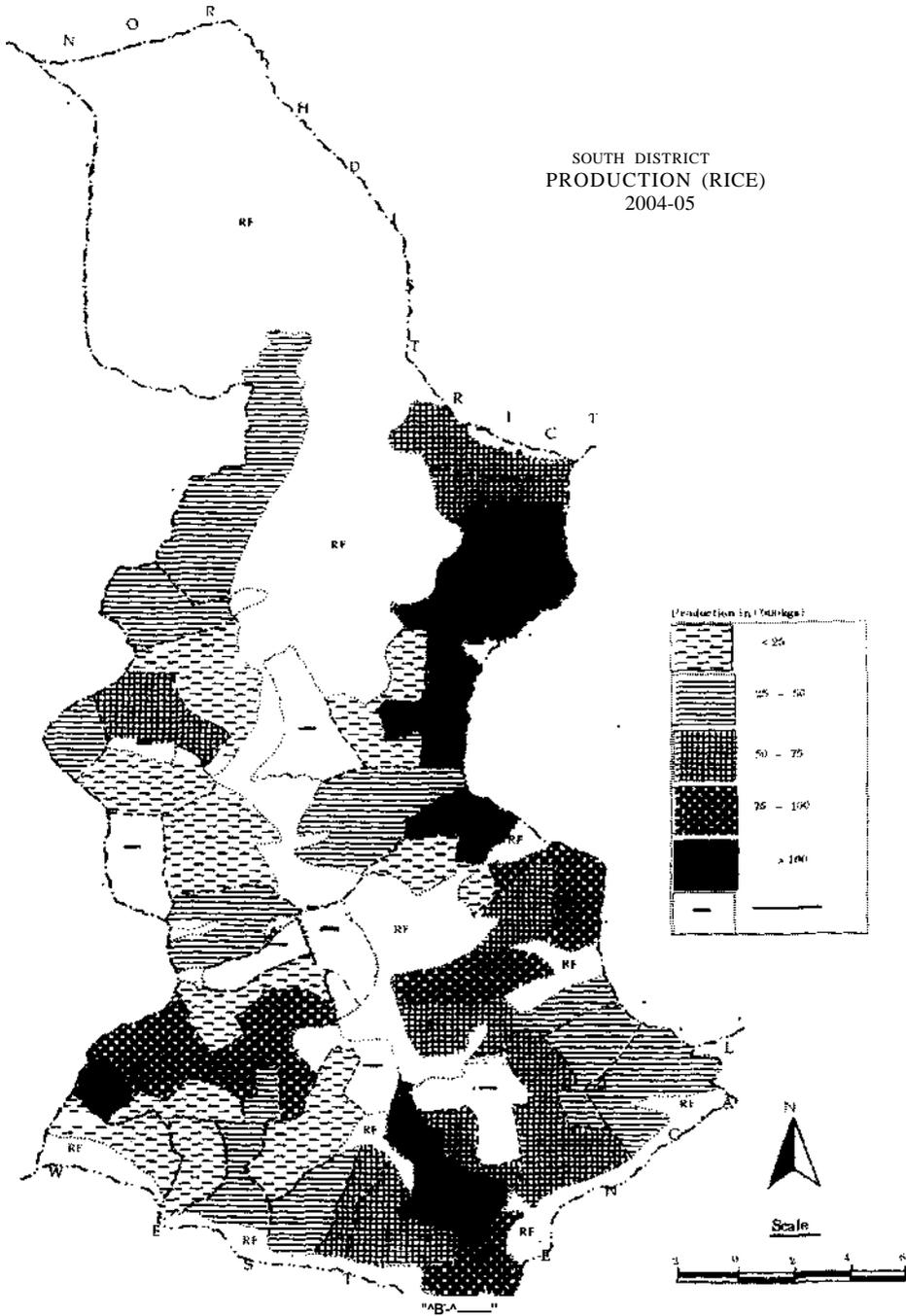


Fig 5.2

These Gram Panchayat Units are located in the eastern part of the district. About 20% of GPUs are also under the medium (50,000 - 75,000kg/hectare) production category. There are nine Gram Panchayat units in this category. But in the high (75,000 -

100,000 kg/hectare) rice production category, the percentage is less having only 11% GPUs and They are Namphok, Ramaeng-Nijameng, Melli-Mellidara, Poklok-Denchung and Singithang-Boomtar. In the category of high (>100'000kg/hectare), there are only 13% of the total Gram Panchayat units. Six Gram Panchayat units do not cultivate rice at all which occupy more than 13% of the total Gram Panchayat units, (fig 5.2)

Rice production in South District has the characteristics like other hilly areas having low production. As the hilly terrain do not suitable for rice cultivation. The percentage of very low, low and medium together constitutes more than 50% of the total Gram Panchayat units.

5.2.3 Production of Pulses: 2004-'05

The pulse is the third important crop next to the maize and rice in the South District. The favorable agro-climatic conditions support the large scale production of pulses in the district especially in the southern part of the district. (Table5.1c). In the very low (<20'000kg/hectare) production category , there are twelve Gram Panchayat units which accounts around 27% of the total Gram Panchayat units and these are located in the central parts of the district. The low (20-30'000kg/hectare) production category has more than 24% of the total Gram Panchayat units

Table 5.1c Production of Pulse (South District: 2004-05)

Production in ('000 kg/hect.	Category	No of GPU	Total GPUs %
<20	Very low	12	26.67
20-30	Low	11	24
30-40	Medium	4	8.89
40-50	High	3	6.67
>50	Very high	15	33.32
Total		45	100.00

* Source: Crop Production Statistics. Department of Agriculture & Food Security .2004-05

Most of the Gram Panchayat units which are under this category are found in the western part of the district. Around 9% of the total Gram Panchayat units are under the category of medium (30-40'000kg/hectare). These GPUs are mostly found near the peripheral areas of the high category. The high (40-50'000kg/hectare) pulse production category has occupied only 7% of the total Gram Panchayat units and they are Rameng-Nijameng, Tingrithang, and Rong-Bul. But in the high (>50,000kg.hectare) category pulse production, the percentage of GPUs is more than

33% and mostly found in the southern part the district. The production of pulses in this particular year is medium as the percentage of high and very high together constitutes more than half of the total GPUs. The higher concentration of pulse production is in the higher altitudes of southern parts, where the dry and warm climatic condition prevails, (fig 5.3).

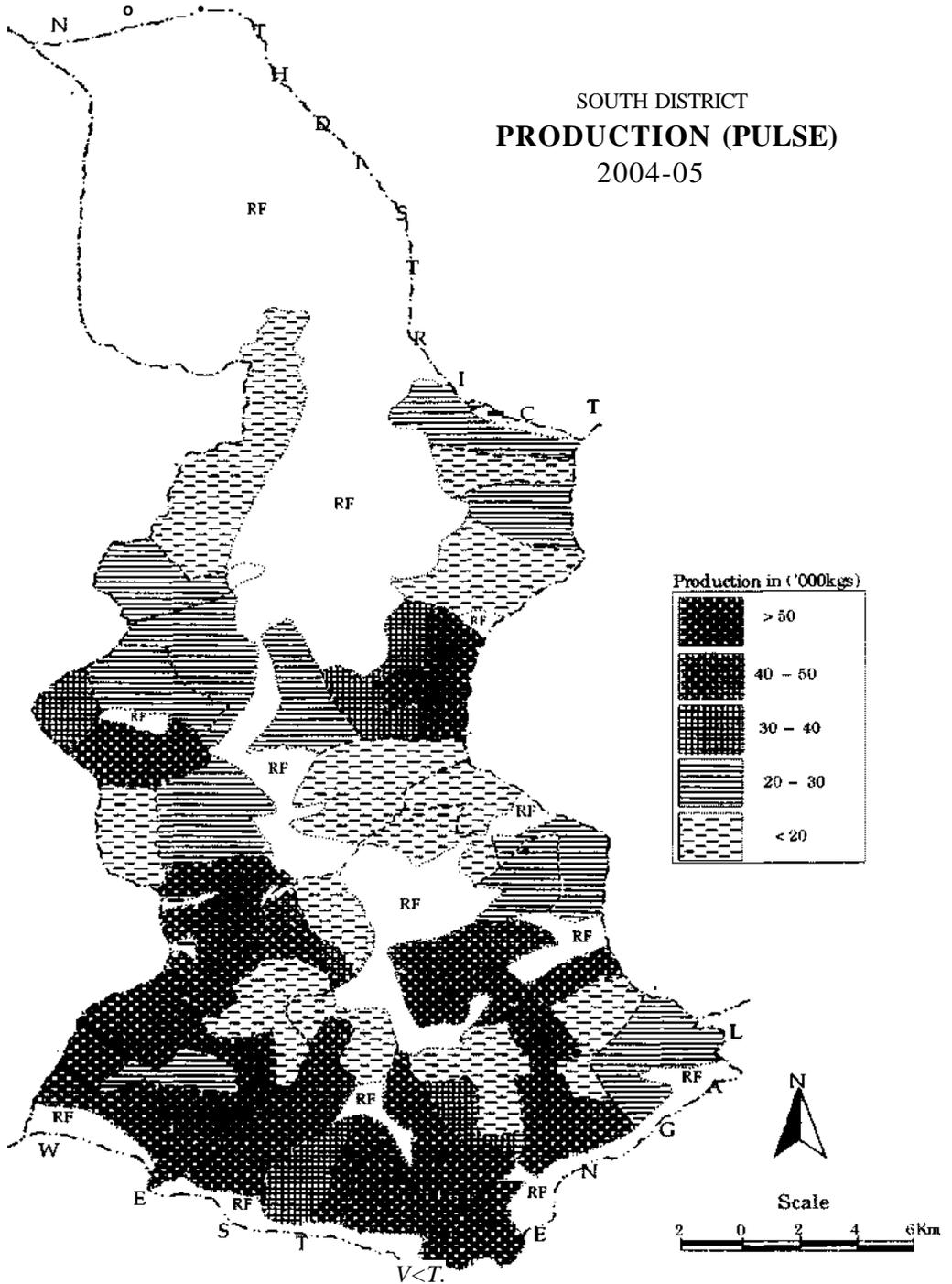


Fig 5.3

5.1.4 Production of Wheat: 2004-'05

Wheat is the third important cereal crops of the South District. The production pattern and distribution of wheat is different from pulse crop. The fig 5.4 depicts the production of wheat in the South District. The northern part of the district has the higher tendency of wheat production than the southern part of the district. The picture is vice-versa from the case of pulse production.

Table 5. Id Production of Wheat (South Dsitriect.2004-05)

Production in ('000 kg/hect.	Category	No of GPU	Total GPUs%
<20	Very Low	20	44.45
20-30	Low	10	22.22
30-40	Medium	5	11.11
40-50	High	5	11.11
>50	Very high	5	11.11
Total		45	100.00

* Source: Crop Production Statistics, Department of Agriculture & Food Security.2004-05.

In the very low (<20'000kg/hectare) category there are more than 44% of the total Gram Panchayat units. Most of these Gram Panchayat units are found in the south western part of the district. This due to the fact that, the southern part is drier and the farmers give emphasis to the cultivation of maize and rice. The low (20,000-30,000kg/hectare) category has occupied around 22% of the total Gram Panchayat and these are found in the southern part of the district. The three category viz, medium (30,000-40'000kg/hectare) high (40,000-50'000kg/hectare) and very high (>50'000kg/hectare) occupy same percentage of more than 11% GPUs each.The Gram Panchayat units which are under the medium category are; Paiyong, Naya-Mangzing, Narnyak, Tangji-Bikmat and Poklok-Dhenchung, and the Gram Panchayat uits which are registered in high category are Lingi, Lamting- Tingmo,Barfung, etc. The gram Panchayat units of Tokday, Tarku, Sadam etc. are in the very high category. (Table5.1d)

The production of wheat in the South District is very low as the percentage of very low and low together occupies more than 50% of the total Gram Panchayat units. As the food habit of the people in the district is changing due to the various factors. Again demand for the wheat in the market is decreasing, these factors leads to the decreasing wheat crop area in the district.

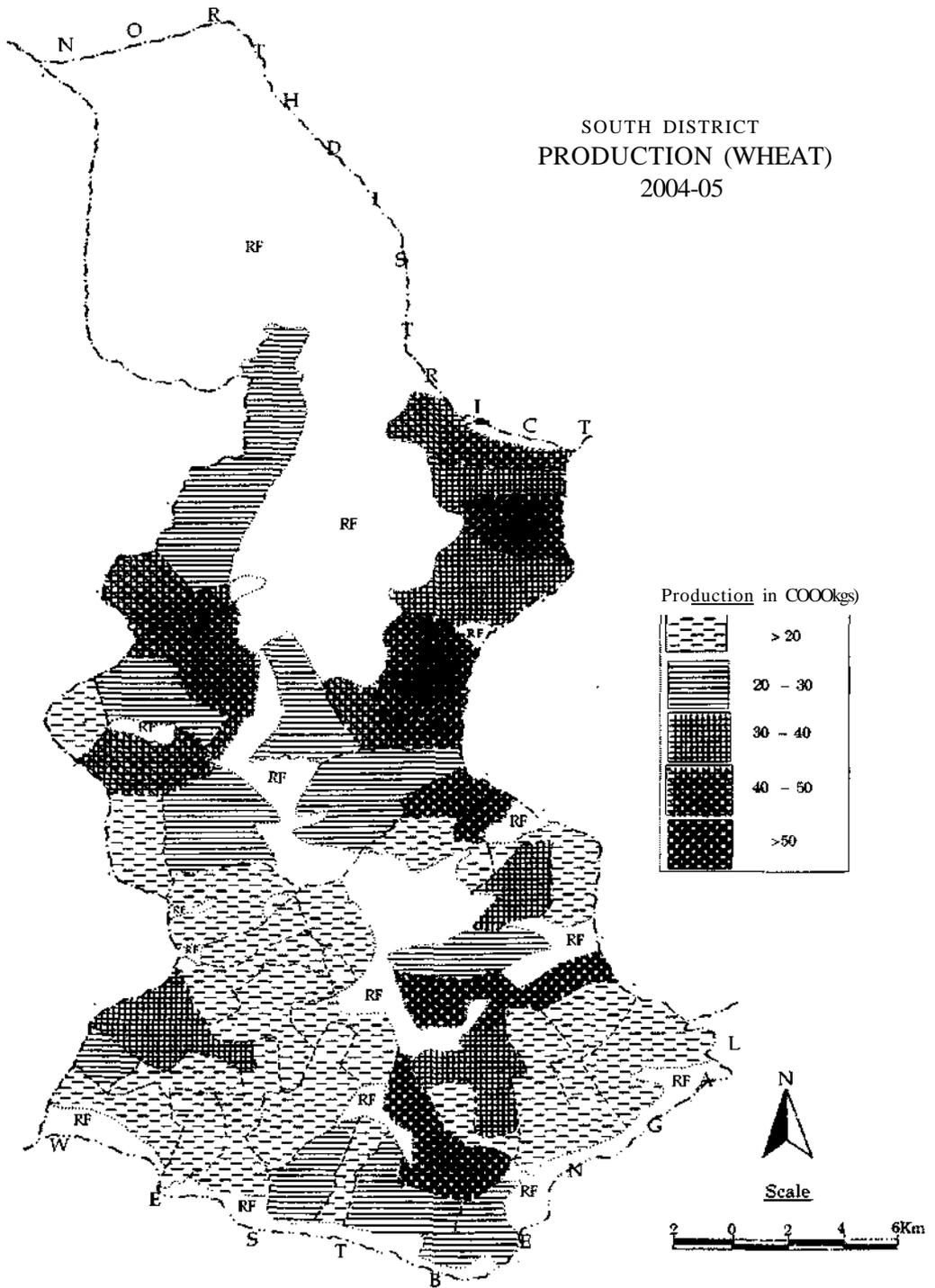


Fig 5.4

5.1.5 Production of Oilseed: 2004-'05

Oilseed is the most important rabi crop of the South District. The main crop cultivated fields are engaged by cultivating oilseed as a crop rotation. The general characteristic of oilseed productions in the district is that. The western and south-

western parts of the district have higher production than the northern and eastern parts of the district.

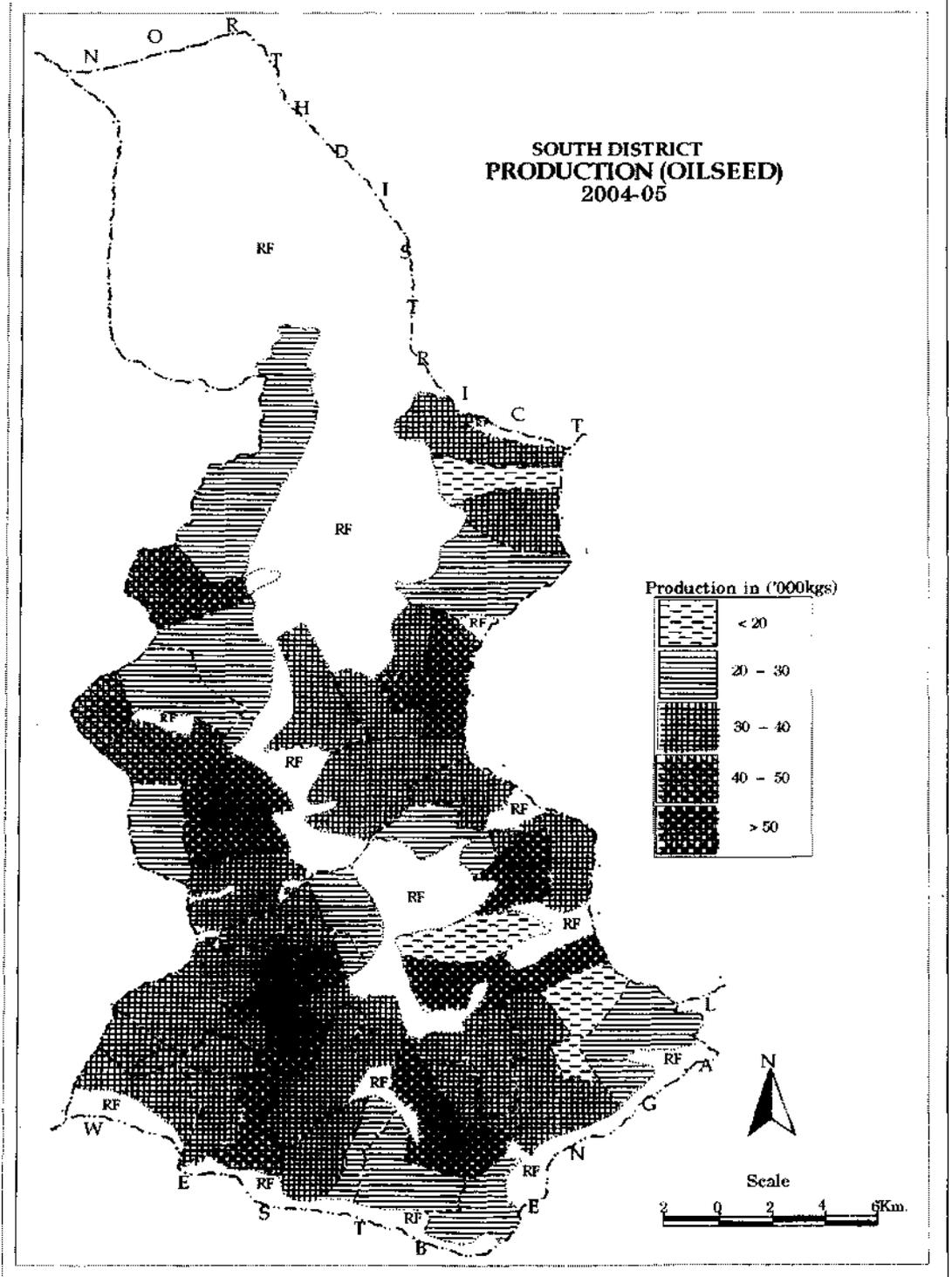


Fig 5.5

Table 5.1e Production of Oilseed (South district.2004-05)

Production in ('000kg/hect)	Category	No of GPU	Total GPUs %
<20	Very low	3	6.67
20-30	Low	11	24.45
30-40	Medium	21	46.67
40-50	High	5	11.11
>50	Very High	5	11.11
Total		45	100.00

* Source: Crop Production Statistics. Department of Agriculture & Food Security .2004-05.

The production pattern of oilseed in South District has unique characteristics. Table 5.1e shows that, in the very low (<20'000kg/hectare) category there are only 7% of the total Gram Panchayat units. The Gram Panchayat units which are under this category are namely Paiyong, Rameng-Nijameng and Maneydara. About 24% are in the category of low (20,000-30,000kg/hectare). These Gram Panchayat are found in the north in the north-western part of the district. The medium (30,000-40,000kg/hectare) has the highest percentage of oilseed production having around 47% of the total Gram Panchayat units. Most of these Gram Panchayat units are located in south-western and eastern parts of the district. But, the high (40,000-50,000kg/hectare) and very high (>50'000kg/hectare) have the same percentage having 11% GPUs each.

Within the district, the south western part has higher and medium production of oilseed. The area coincides with rice cultivation, where oilseed is cultivated during winter season, (fig 5.5).

5.1.6 Production of Ginger: 2004-'05

Ginger is the second most important cash crop of the district next to cardamom in terms of market price. The production of ginger crop in the South district is one of the highest amongst the four districts of Sikkim. Ginger is especially cultivated with maize as mix cropping as well as in the fallow land of steep slopes, where the cultivation of rice and other crops is impossible.

Table 5.1f Production of Ginger (South District.2004-05)

Production in ('000kg/hect)	Category	No of GPU	Total GPUs %
<50	Very low	6	13.33
50-100	Low	5	11.11
100-200	Medium	11	24.45
200 - 300	High	8	17.78
>300	Very high	15	33.33
Total		45	100.00

* Source: Crop Production Statistics, Department of Agriculture and Food Security.2004-05

The production of ginger is higher and as the crop has registered higher production amongst the important crops of the district.

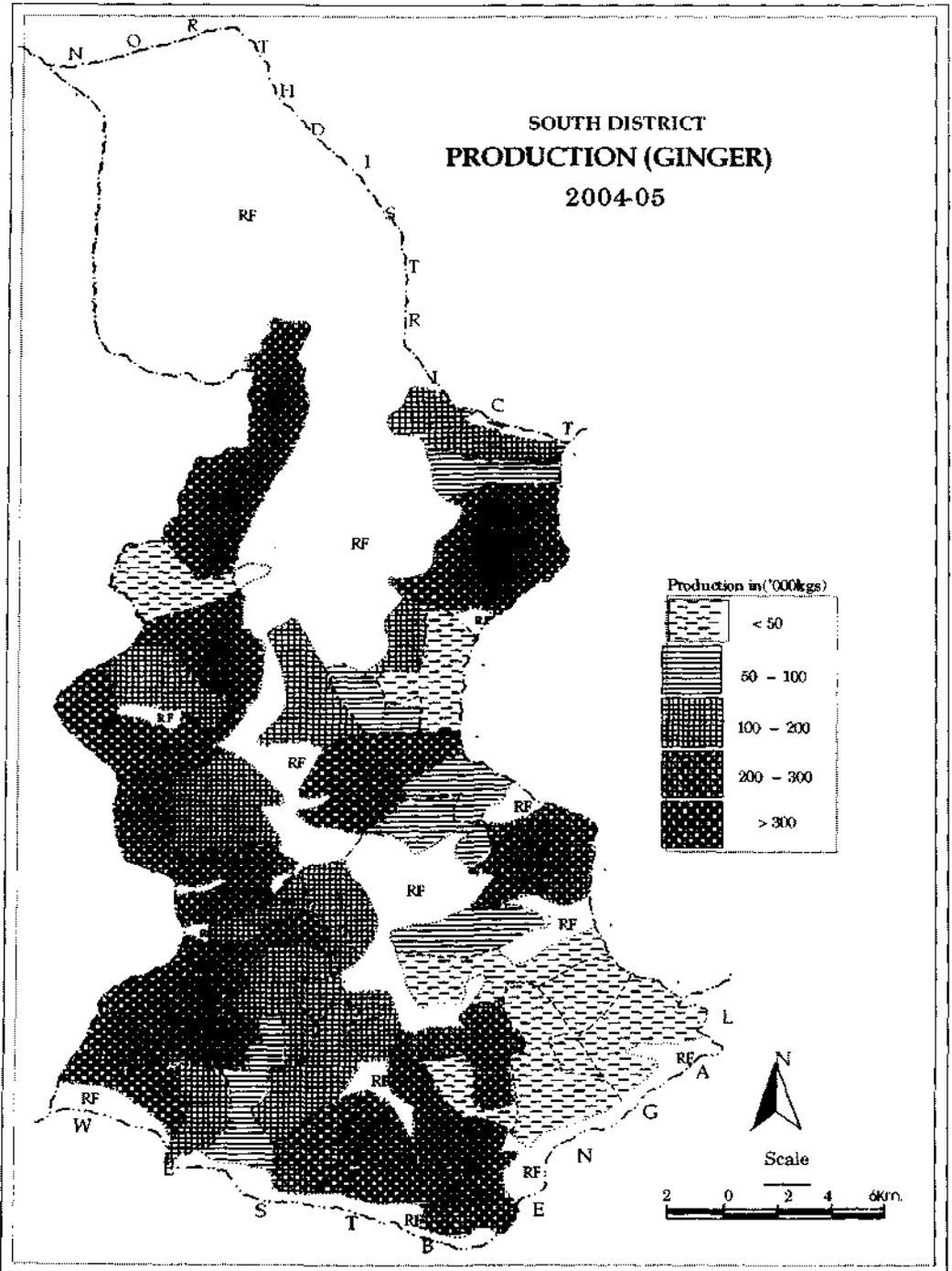


Fig 5.6

5.1.7 Production of Cardamom: 2004-'05

Cardamom is the most important cash crop of The South District in terms of price cardamom fetches higher income than the other crops cultivated in the district. The production of cardamom is not well distributed as the cultivation of cardamom

requires specific agro-climatic conditions. Some of the Gram Panchayat units where conducive climatic condition prevails, its production is high especially in the northern part of the district and low in the drier part especially in the southern part of the district.(fig 5.7)

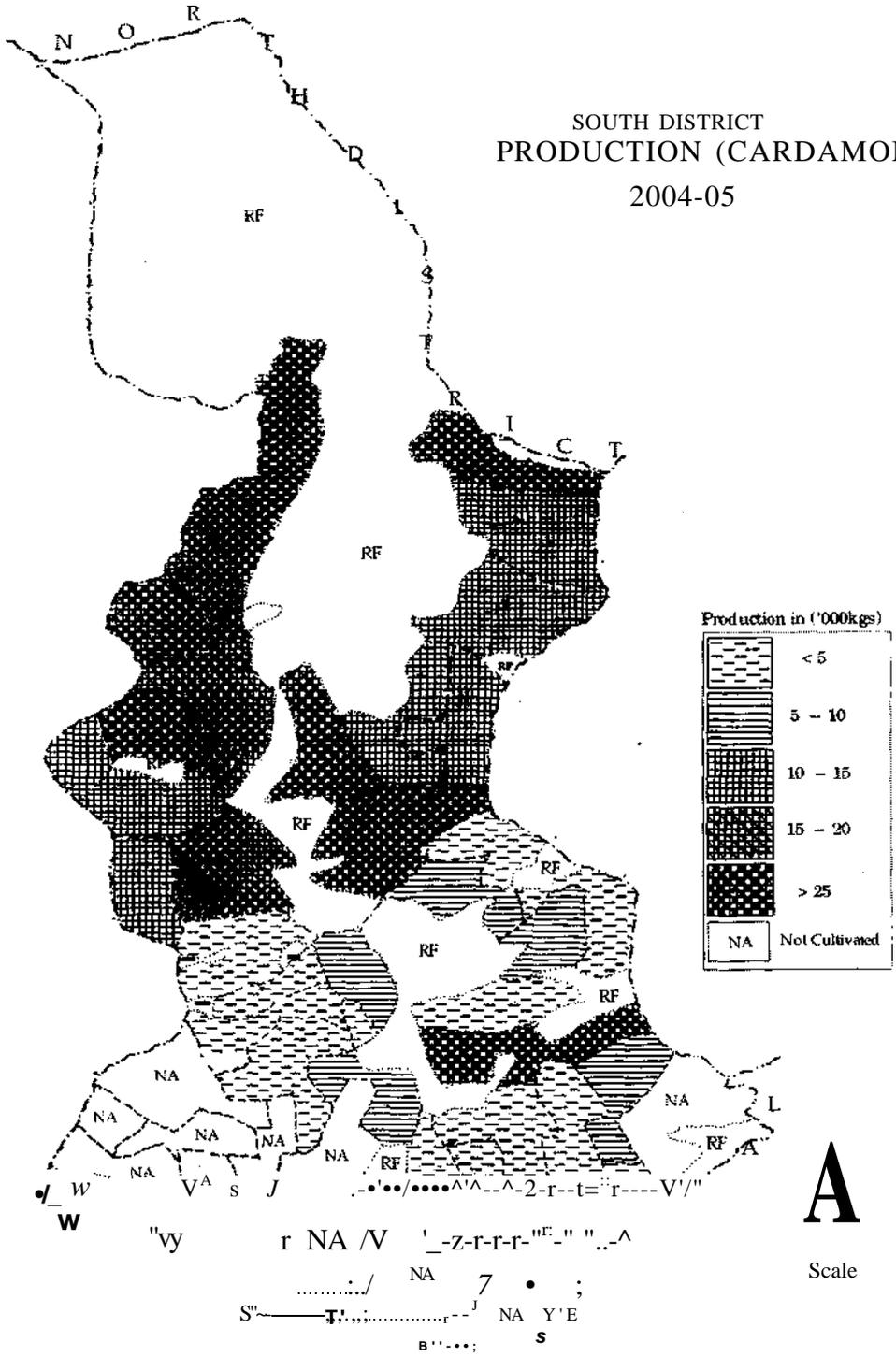


Fig 5.7

Table 5.1g. Production of Cardamom (South District, 2004-05)

Production in ('000kg/hectare)	Category	No of GPU	Total GPUs %
<5	Very low	11	24.45
5-10	Low	5	11.11
10-15	Medium	8	17.78
15-20	High	1	2.22
>20	Very high	8	17.78
Not Cultivated		12	26.66
Total		45	100.00

*• Source: Crop Production Statistics, Department of Agriculture and Food Security, 2004-05

Out of the total 45 Gram Panchayat units in South District, in 33 Gram Panchayat units or 73% is cardamom cultivated, due to the agro-climatic constraints. The remaining 12 Gram Panchayats units are located in low altitudes and warm climate which is not suitable for cultivation of cardamom. (Table 5.1g). In the very low (<5'000kg/hectare) cardamom production category, there are 11 Gram Panchayat units accounting more than 24% of the total GPUs. These GPUs are located in the southern parts of the district. Another 11% GPUs are under the category of low (5,000 -10,000kg/hectare) cardamom production and they are Damthang, Maniram-Phalidara, Temi, Barnyak, and Manetdara. Almost 18% of the Gram Panchayat units are found in the category of medium (10,000 - 15,000kg/hectare) and these GPUs are mostly located in the eastern part of the district. There is one Gram Panchayat i.e. Barfung in the category of high (15,000-20,000kg/hectare) cardamom production. Around 18% of GPUs are under the category of very high (20'000kg/hectare) cardamom production. These GPUs are located in western part of the district. The unique characteristic of cardamom production in the South District is that most of the Gram Panchayat units which fall in the category of medium, high and very high are found in the Ravongla sub-division.

5.1.8 Production of Potato: 2004-'05

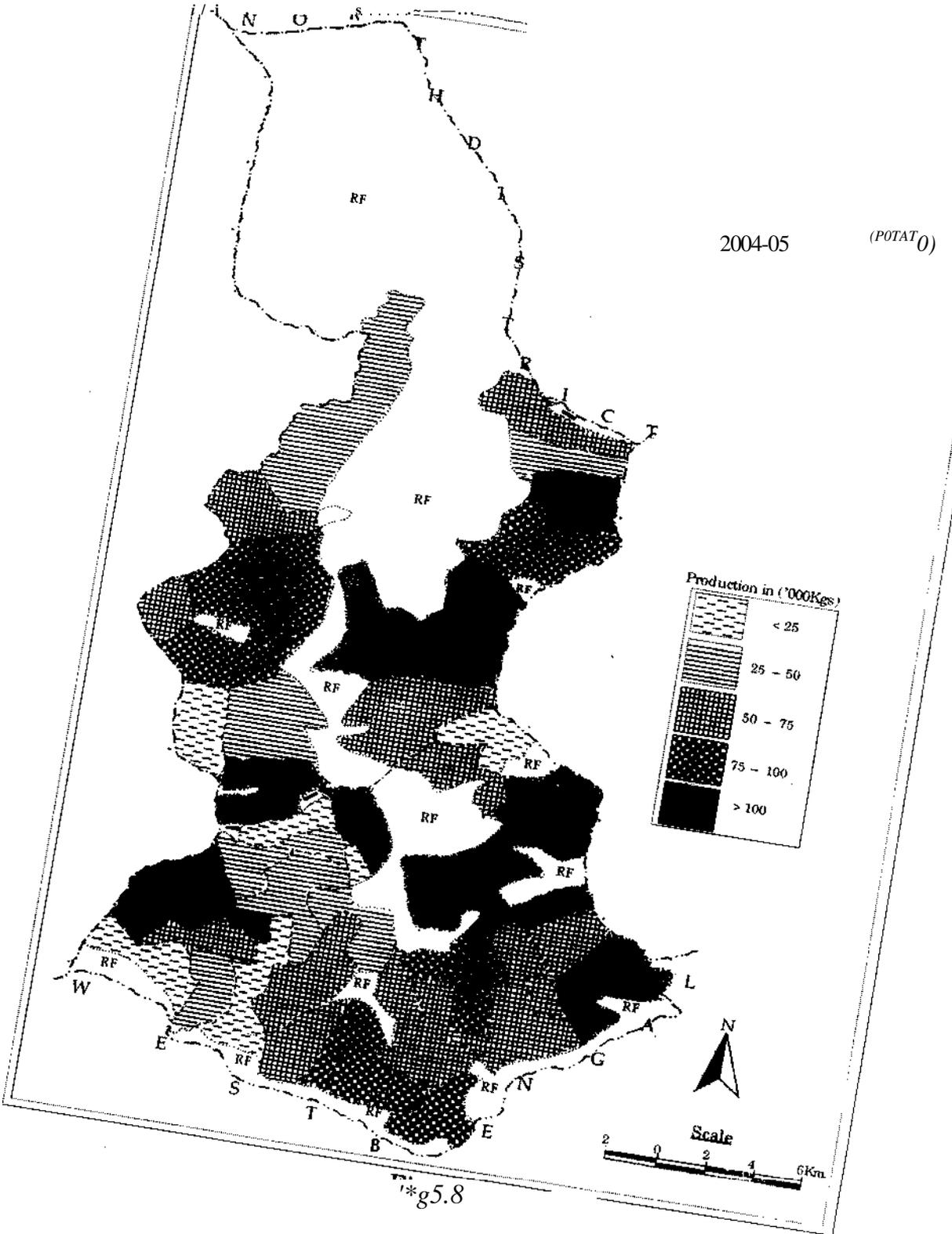
Potato is one of the important semi-cash crops, as it has been cultivated for household consumption as well as cash crop. The entire gram Panchayat units cultivated potato.

Table 5.1h represents the production of potato in South district. There are more than 11% of GPUs in the very low (<25'000kg/hectare) potato production category. These Gram Panchayat units are located in the south-western and western parts of the district. Another 15% GPUs are under the category of low (25,000-

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category (75,000-100,000kg/hectare) production is observed in 17% of the total GPUs and these GPUs are found in the eastern and southern parts of the district. But the very high (>100'000kg/hectare) production category has almost 29%. Of the total GPUs and these are Tuning, Mamring, Chuba-Perbing, Rameng-Nijameng, Damthang, Poklok-Denchung etc. (fig 5.8)

Table 5.1h. Production of Potato (South District.2004-05)

Production in ('000kg/hect.)	Category	No of GPU	Total GPUs %
<25	Very low	5	11.11
25 - 50	Low	7	15.56
50 - 75	Medium	12	26.67
75 - 100	High	8	17.78
>100	Very high	13	28.88
Total		45	100.00

* Source: Crop Production Statistics, Department of Agriculture and Food Security.2004-05

The potato production pattern in South District has high nature as the category of medium, high and very high constitutes around 70% of the total Gram Panchayat units. This is due to the fact that, the potato is one of the important food items of vegetables in hilly area. It is simply boiled or taken as main meal by villagers. The cultivation of potato does not require specific climatic condition like cardamom. In hilly area potato can be cultivated in any available piece of land easily.

5.1.9 Production of Olericulture (Vegetable): 2004-'05.

The study of production pattern of vegetable in South District has a direct bearing to the understanding of economic condition of the people. More than 80% of the vegetables in the district are imported from outside the state. Another important aspect of study of vegetables production is that, the locally produced vegetable is totally depends on the bio-fertilizer or organic farming. So the demand of locally cultivated vegetables is very high in local market. This is another branch of agriculture which has further development prospects.

Table 5.1i Production of Vegetables. (South District 2004-05)

Production in ('000kg/hectare)	Category	No of GPU	Total GPUs %
<50	Very low	1	2.22
50 - 75	Low	9	20.00
75 - 100	Medium	11	24.45
100 - 125	High	24	44.45
> 125	Very high	4	8.83
Total		45	100.00

* Source; Crop Production Statistics. Department of Agriculture & Food Security:2004-05

Table 5.1 i shows the vegetable production pattern of South District. Only a single GPU i.e. Assangthang is in the very low (<50'000 kg/hectare) category which is the driest GPU in the South District. The low production of vegetable (50,000 -75,000kg/hectare) category has 20% of the GPUs. These are mostly located in the western part of the district. Another 24% GPUs are in the medium (75,000 -100,000kg/hectare) production category. These GPUs are scattered in north-western and south-western parts of the district. The high (100,000-125,000kg/hectare) production has the highest percentage amongst the categories, having more than 44% of the total GPUs. More than 8% of the total GPUs are under the category of very high (>125'000kg/hectare) vegetable production. The high and very high categories of vegetables production are found in the south and western parts of the district, where the warmer climate prevails. (fig5.9)



Photograph 5.6 Oreliculture(Sustainable Agricultural Practice)

In general, the production of vegetables in the South District of Sikkim can be considered as medium. Further policy and planning is required for its increase production. The use of organic fertilizer has fetched higher price, but most of the farmers are still not willing to shift from the traditionally used inorganic ones. Besides, large scale cultivation of vegetables is limited except some selected farmers. This is due to the sedentary nature of the agriculture. Lack of knowledge about the profitable markets of vegetables is some of the problems for large scale production of vegetables in the district.

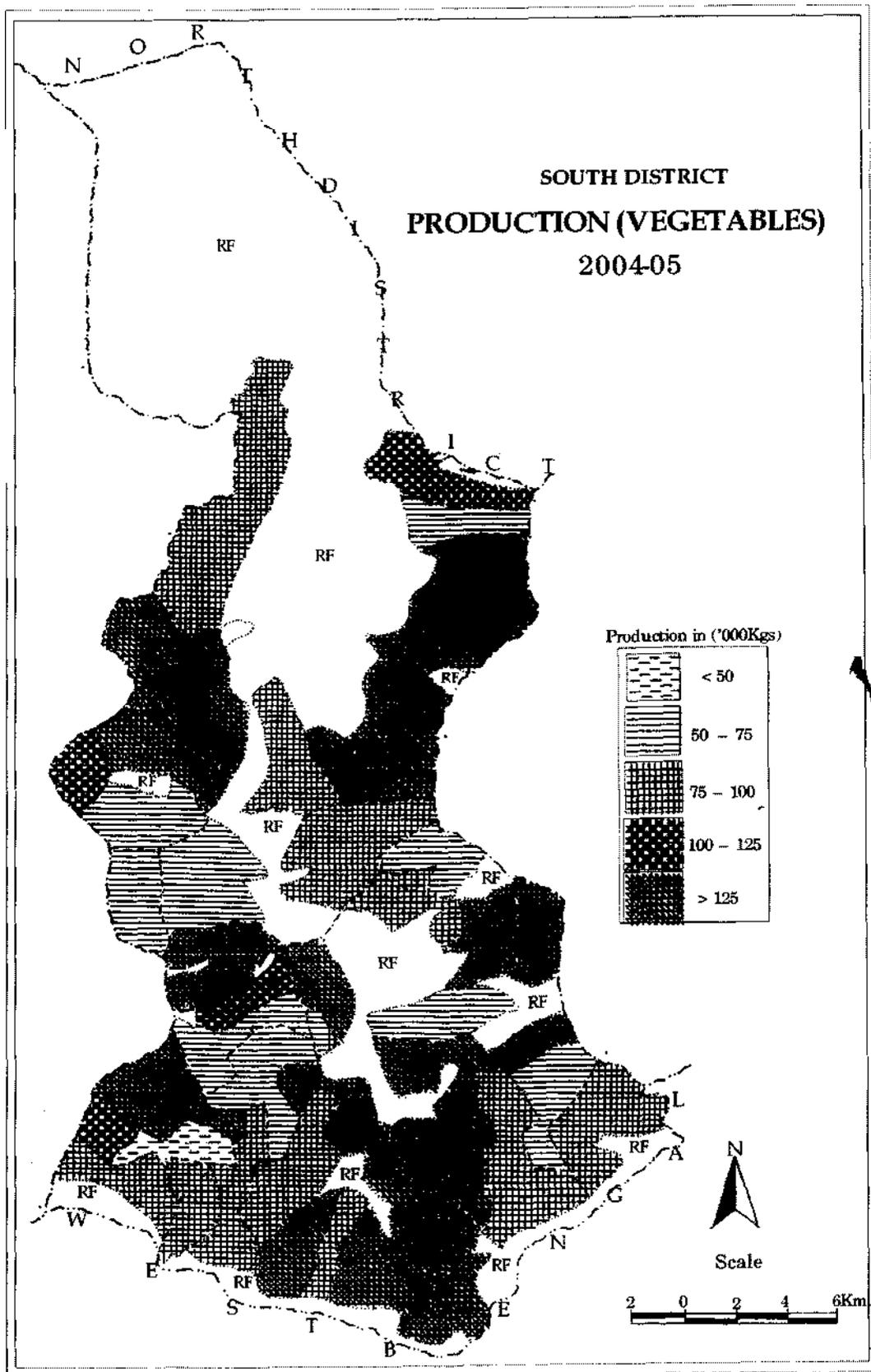


Fig 5.9

The Crop Production in the South District has the following characteristics:

- i). Out of the important selected crops viz, maize, rice, wheat, pulses, oilseed, cardamom, ginger, potato, and vegetables. The crops like maize, pulse, ginger, potato, and vegetables have well distribution of production and similar pattern of intensity of production.
- ii). The crops like rice, cardamom and wheat have regional pattern of production as they have been concentrated in only some selected specific Gram Panchayat units as the cultivation of these crops is more or less controlled by the availability of fertile and well drained soil as well as specific-agro-climatic conditions.
- iii). The production of ginger, potato and vegetables can be increased if the intensity of cropping area is increased e.g. vegetables cultivation has been practiced as hobby in the small kitchen garden areas. If the farmers are pursued to use the land for the cultivation of vegetables instead of less productivity and low market demand crops, will automatically benefit the farmers and indirectly increase the income level of farmers.
- iv). Amongst selected the crops, highest level of productivity is found in three crops i.e. ginger, potato, and vegetables. The average yields of these three crops are 7000kg/hectare, 4500kg/hectare and 2500kg/hectare respectively in 2004-05. And rice has the lowest yield amongst the crops having only 800kg/hectare.
- v). The farmers are still clinging to traditionally cultivate low production crops like rice, cardamom, and maize even though their productivity is low due to certain socio-economic constrains, e.g. farmers can not instantly changes from these low production crops to higher market price crops due to the lack of knowledge and unfavorable agro-climatic conditions. And on the other hand, they can not dump due to the lack of ideas and knowledge for new crops and higher capital inputs requirement do not allowed them to change. This leads to low productivity of some of the crops.
- vi). The low productivity of most of the crops indicates proper policy and planning is required for agricultural development in the South District.
- vii). The policy and planning should be locally suitable methods, many a time the modern scientific methods are experimented in the plain area where they are suitable

these technologies are pushed into the hill without necessary and appropriate modification for suitable in hilly areas the name of modernization of agriculture.

5.2 CROP CONCENTRATION

Crop concentration means the variation in the density of any crop in an area/region at a given point of time. The concentration of crop in an area is largely depends on its terrain, temperature, moisture, and pedological conditions. As each crop requires a maximum and minimum and optimum of temperature, soil moisture, duration of sunshine etc, and the tendency to have high concentration in the area of ideal agro-climatic conditions prevail and the density of concentration is declined as the geographical condition become less conducive.

South District has its own agro-climatic conditions which lead to the development of own unique feature of crop concentration. The crop concentration in the district has been studied by applying Bhatia's (1968) relative concentration methods. The study is for selected crops which have direct bearing to generation of gross domestic product in the district. They are as cereals, pulses, potato, cardamom, oilseed and horticultural crops.

5.2.1 Crop Concentration Cereal. 2004-'05

The cereal includes maize, rice, wheat, and oat. These are mainly cultivated in the South District. Out of these, cereal crops cultivation of oat is very negligible and maize occupies the first rank amongst the cereal in terms of coverage which is cultivated in slopes of available field. Rice is in the second position and traditionally concentrated in the lower river valleys and wheat concentrated in middle and higher altitude.

The mean(X) value has been calculated as 1.11 and SD 1.13 and three categories has been found out viz. low category(X-1SD to X), medium category(X+1SD) and high category(X+2SD)

Table 5.2a Crop Concentration, Cereal (South District, 2004-05)

Concentration Index	Category	No of Gram Panchayat Unit	Total Gram Panchayat Unit %
0.02-1.11	Low	18	40.00
1.11-2.24	Medium	25	55.56
2.24-3.37	High		4.44
Total		45	100.00

* Source: Crop Area Statistics, Department of Food Security, Govt, of Sikkim. 2004-05

Table.5.2a represents the cereal concentration picture in The South District. The low (0.02 -1.11) category has occupied 40% of the total Gram Panchayat units. Most of these Gram Panchayat

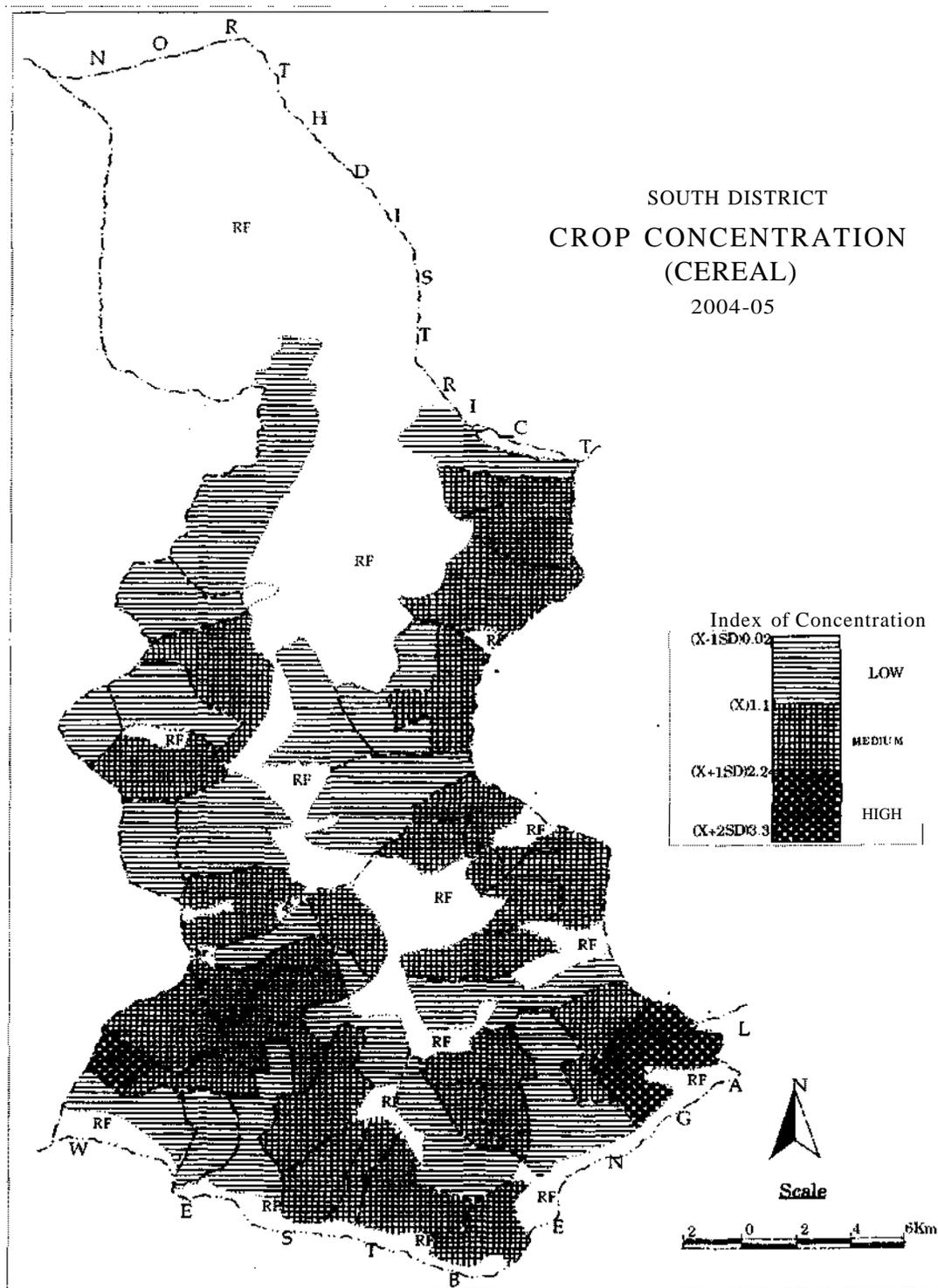


Fig 5.10

units are found in western, central and south-western parts of the district. Amongst the Gram Panchayat units which falls in this category, Ben-Namphok has the lowest having 0.39 and Kewzing -Bhakhim has the highest 0.98. The medium (1.11-2.24) category constitutes around 54% of the total Gram Panchayat units. Out of the Gram Panchayats units which are under this category Sumbuk-Kartikey has the lowest value. These Gram Panchayats units are located in eastern and south-western parts of the district. Another 4.44% are under the category of high (2.24-3.37) having only two GPUs namely Tinik - Chisopani and Tuning -Mamring (fig 5.10). The picture of cereal concentration in South District is medium because half of the total Gram Panchayat units come under the medium category.

5.2.2 Crop Concentration, Pulse: 2004-'05

Pulse is one of the important crops which supplement the economy as well as the protein intake of the native of South District. The important types of pulse cultivated in the district are urad, rice bean, raj amah, fields' pea, cow pea, arhar and black gram. The cultivation of pulse crop is increasing, but the concentration of pulse is low in South District.

Table 5.2bCrop Concentration Pulse (South District. 2004-05)

Concentration Index	Category	No of Gram Panvhayat uni	Total Gram Panchayat units %
0.25—0.97	Low	32	71.11
0.97—1.68	Medium	7	15.56
1.68—2.39	High	6	13.33
Total		45	100.00

* Source: Crop Area Statistics. Department of Food Security. Govt, of Sikkim. 2004-05

The concentration of pulses is represented by table 5.2b in the South District. The mean value for all forty five Gram Panchayats units is 0.97 and Standard deviation is 0.72, three categories have been found out as low, medium, and high. In the low (0.25-0.97) category of crop concentration, there are 32 Gram Panchayat units, which account more than 71% of the total Gran Panchayat units. These GPUs are found western, northern and south-western parts of the district. Out of the GPUs which fall in this category, Lingi has the lowest value (0.09) and Rateypani has the highest value (0.88). Another 16% are in the medium category (0.97-1.68). The GPUs which are in this category are mostly concentrated in south-eastern and eastern parts of the district. Some of the important Gram Panchayat units which are under this category are Sumbuk-Kartikey, Sorok-Shayampani and Wak-Omchu etc.(fig5.2) But

the high category gas only 13% of the total Gram Panchayat units and these are found in GPUs of Likship-Linzo, Sanganath, Temi, Tarkua and Nagi- Pamphok etc. In comparison to cereal crops, pulses concentration is more as the number of Gram Panchayat units which fall in high category is more.

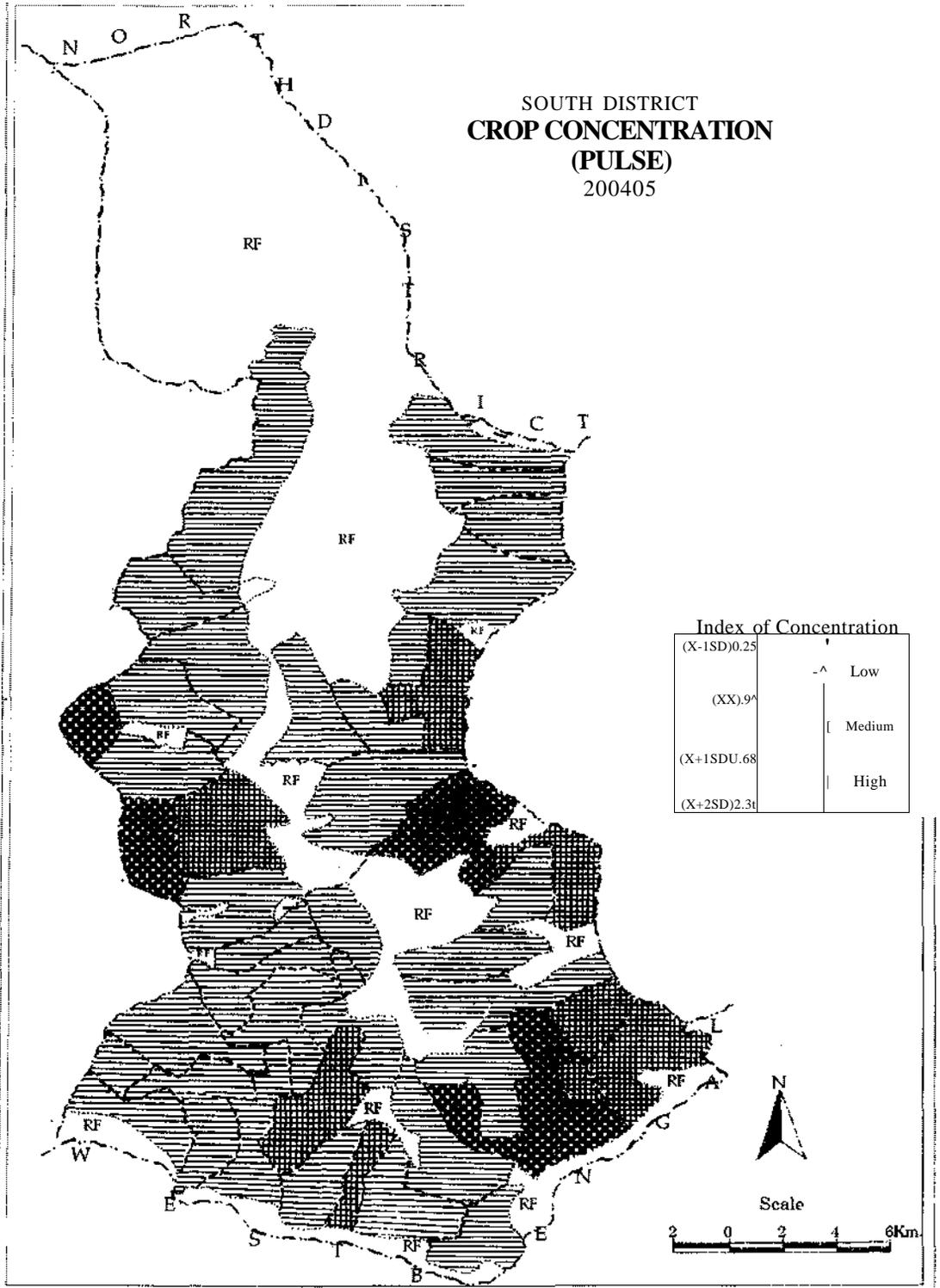


Fig 5.11

5.2.3 Crop Concentration Large Cardamom: 2004-'05

Large cardamom is the most important cash crop of South District. Unlike other crops cardamom require specific climatic agro-climatic conditions. The natural habitat of cardamom is sub-tropical semi-evergreen forest of mountainous sub-Himalayan region. Cardamom is shade loving plant..

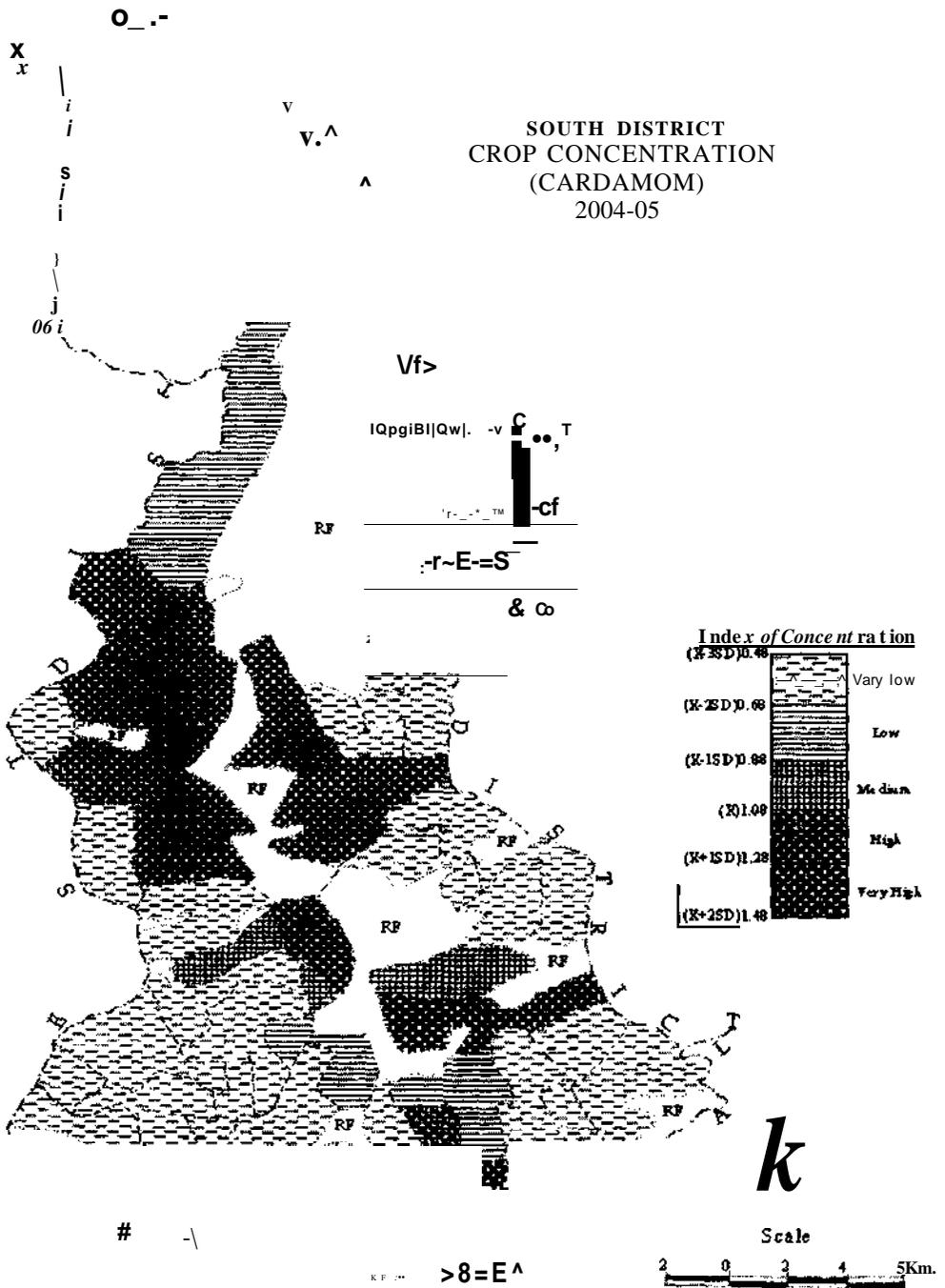


Fig. 5.12

Table 5.2c Crop Concentration Large Cardamom (South District.2004-05)

Concentration index	Category	No of GPU	Total Gram Panchayat unit %
0.48 - 0.68	Very low	27	60.00
0.68 - 0.88	Low	3	6.67
0.88-1.08	Medium	2	4.44
1.08-1.28	High	2	4.44
1.28-1.48	Very High	11	24.45
Total		45	100.00

* Source: Crop Area Statistics, Department of Food Security, Govt, of Sikkim.2004-05.

The table 5.2c shows the picture of cardamom concentration in the South District. Very low concentration of cardamom (0.48-0.68) is found in 27 Gram Panchayat Units constituting 60% of the total Gram Panchayat units. These GPUs are mostly located in Namchi Sub-division. This is due to the fact that the climatic condition of Namchi is drier which is not suitable for cardamom cultivation. The low (0.68-0.88) category has occupied only around 7% of the total GPUs. They are namely Pamthang, Mainram -Phalidara, and Tangi-Bikmat. The categories of medium (0.88-1.08) and high (1.08-1.28) have 4.44% each. The earlier one is recorded in the GPU of Rameng-Nijameng and tingrithang. And the later one is found in the GPUs of Rateypani and Lamting- Tingmo. But the very high (1.28-1.48) category of cardamom concentration has higher percentage having more than 24% of the total GPUs. The GPUs which fall in this category are mostly found in the Ravongla sub-division. (fig5.12). The cardamom has higher concentration in the Ravongla Sub-division than the Namchi Sub-division.

5.2.4 Crop Concentration Potato: 2004-'05

Potato is important cash cum vegetable crop of South District, which is cultivated through out the year. The cultivation of potato does not require specific climatic conditions like cardamom. Its cultivation in recent years has shown significant increase due to the huge market demand. The cultivation of potato does not require intensive labours this is another factor which support the increase in potato cultivation.

Table 5.2d Crop Concentration, Potato (South Sikkim.2004-05)

Concentration Index	Category	No of Gram Panchayat Unit	Total GPUst %
0.12-0.97	Low	29	64.45
0.97-1.87	Medium	8	17.78
1.87-2.97	High	8	17.78
Total		45	100.00

* Source: Crop Area Statistics, Department of Food Security, Govt, of Sikkim.2004-05.

Table 5.2d, represents the concentration of potato in South District. The low (0.12-0.97) category concentration has occupied more than 64% of the total GPUs. Most of these GPUs are located in north-eastern and south-western parts of the district.



Photograph 5.1 Cultivation of Potato (Rabi)

The medium (0.97-1,87) category concentration has occupy 8 GPUs constituting around 18% of the total Gram Panchayat units and are mostly found in the western part of the district. The high (1.87-2.97) category potato concentration has also the same percentage like medium having around 18% GPUs. The gram Panchayat units which are under this category are namely, barong-Pamthang, Ralong-Namlung, Barfung, Damthang, Tringrithang, Chuba-Perbing, Maneydara and Melli etc (fig 5.13).

SOUTH DISTRICT
CROP CONCENTRATION
(POTATO)
2004-05

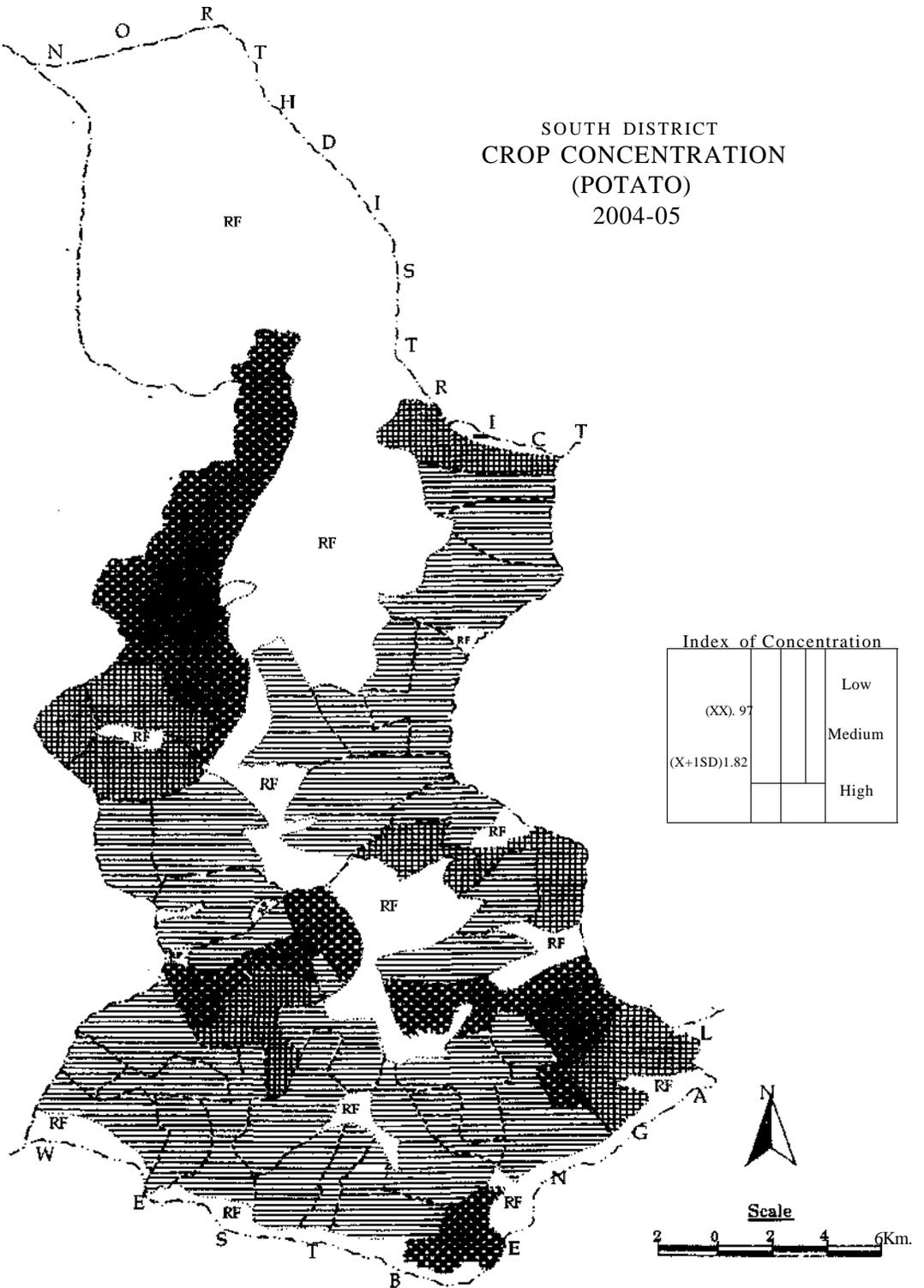


Fig 5.13

5.2.5 Crop Concentration, Oilseed: 2004-'05

Table 5.2e Crop Concentration, Oilseed (South District, 2004-05)

Concentration Index	Category	No of GPU	Total Gram Panchayat unit %
0.37-0.95	Low	27	60.00
0.95-1.08	Medium	5	11.11
1.08- 1.66	High	13	28.89
Total		45	100.00

* Source: Crop Area Statistics, Department of Food Security, Govt, of Sikkim 2004-05

Oilseed is another crop which registers in crop area in South District in 2004-05. The low category (0.37-0.95) has the highest percentage having 60% GPUs Table 5.2e. All the entire Gram Panchayats which are under this category have been equally distributed in all parts of the district. But medium (0.95-1.08) concentration category has only 11 % of the total Gram Panchayat units. The GPUs which are under this category are Sripatam-Gangchung, Namphing, Maneydara, Mikhola-Kitam, and Mainram-Phalidara. The high (1.08-1.66) category accounts more than 28% of the total GPUs. Some of the the important Gram Panchayat units which fall in this are; Sanganath, Raiyong-Tinkitam, Turung-Mamring etc. The concentration of oilseed in South District of Sikkim during 2004-05 is generally medium (fig 5.14)



Photograph 5.2 Oilseed Cultivation(mustard)

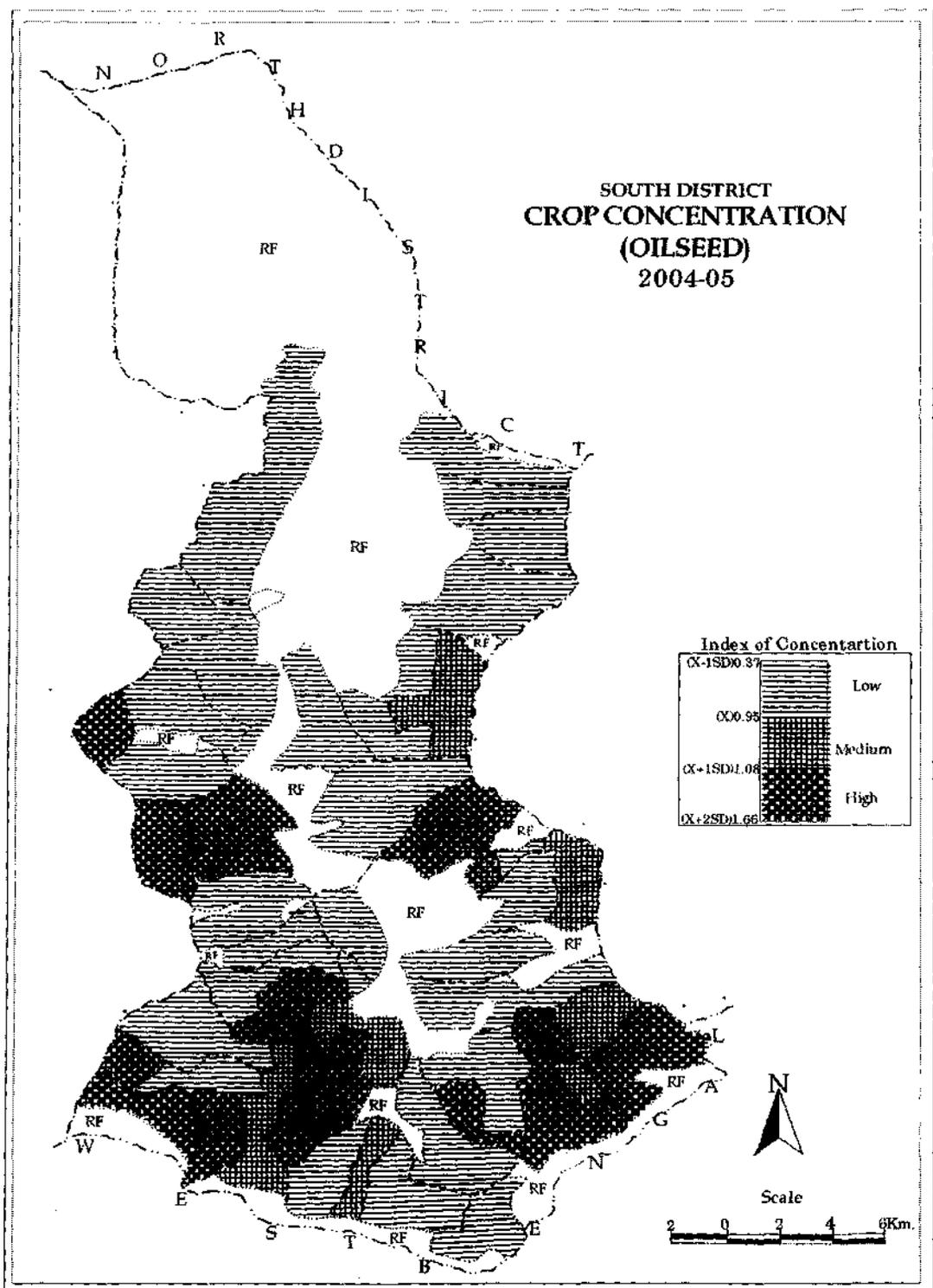


Fig 5.14

5.5.2.6 Crop Concentration, Horticulture: 2004-'05

Horticulture is one of the important fields of economy which can be further increase, because this practice can be of multipurpose benefit for agro-forestry purpose. The fragile environment conditions of South District require the protection of environment as well as the land should get economically benefited. The important

fruits cultivated are mandarin orange, guava, litchi, papaya, banana, passion fruits, peach, avocado, plum, and walnut.

Table 5.2f Crop Concentration, Horticulture (South District.2004-05)

Concentration Index	Category	No of GPU	Total Gram Panchayat unit %
0.34-1.03	Low	28	62.22
1.03-1.73	Medium	10	22.22
1.27-2.40	High	7	15.56
Total		45	100.00

* Source; Crop Area Statistics, Department of Food Security, Govt of Sikkim. 2004-05

Horticulture crop concentration in South District for 2004-05 is represented by table 5.2f. The low concentration (0.34-1.03) has more than 62% of the total Gram Panchayat units. These GPUs are mostly located in north-western, western and south-western parts of the district. Another 22% of GPUs are in the category of medium (1.03-1.73) and they are mostly found in southern and eastern parts of the district. But high category (1.27-2.40) has low percentage; having only around 16% of total Gram Panchayat units. These GPUs are located in south-eastern parts of the Districts. In spite of tremendous increase in crop area in horticulture, total area under this crop is less because the concentration trend shows that there is maximum percentage in low category of concentration (fig 5.15)



Photograph 5.3 Passion Fruits (An Important Horticultural Crop)

SOUTH DISTRICT
CROP CONCENTRATION
(HORTICULTURE)
2004-05

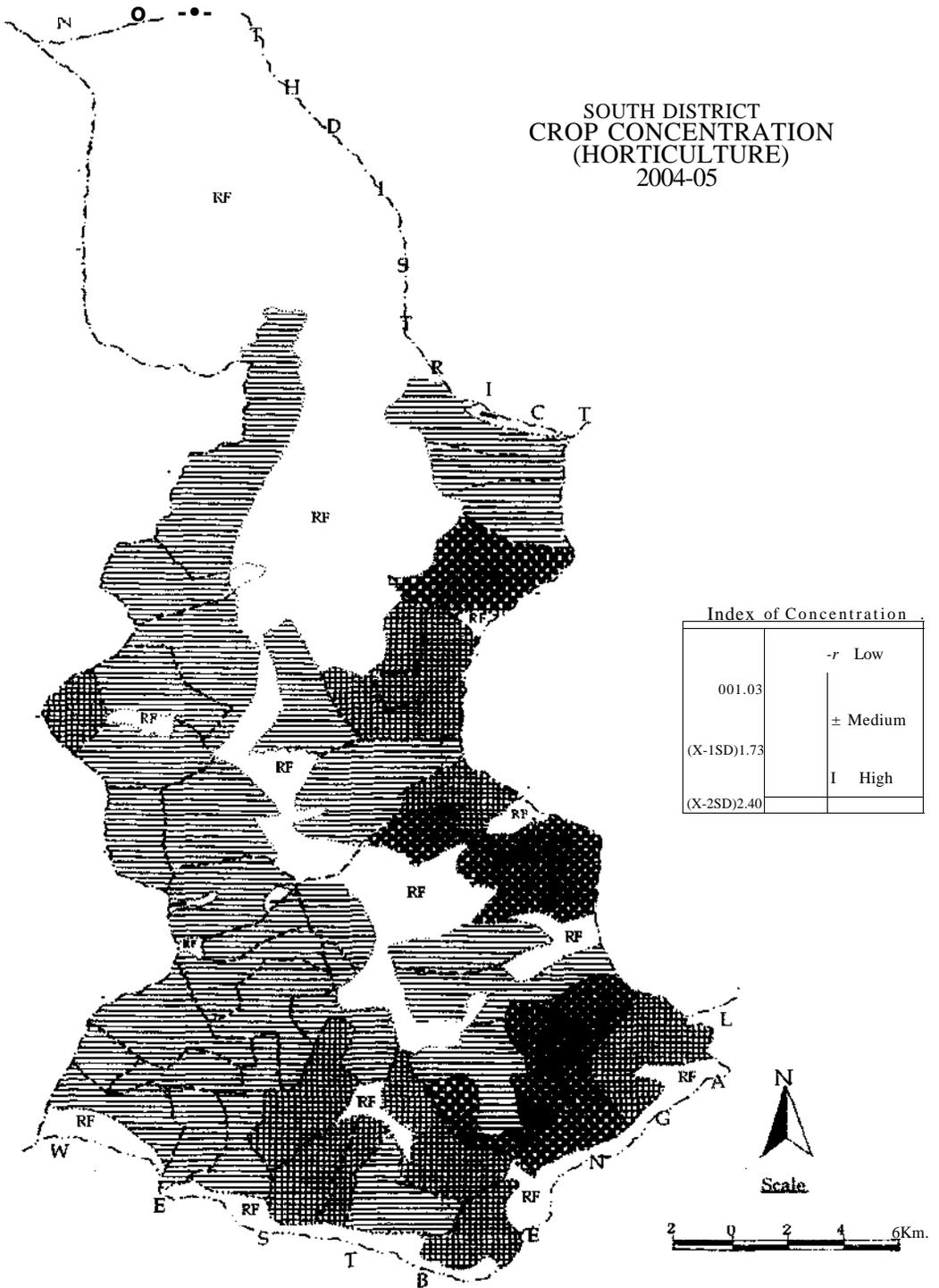


Fig. 5.15

The Crop Concentration in South District has the following characteristics.

- i). Cereal has the characteristics of uniform concentration pattern amongst the Gram Panchayat Units as still cultivation and production of staple food crop is the main sources of income in the district
- ii). The concentration of pulses has similar characteristics with cereal, because pulse is cultivated along with cereal crops as mix crops. Next to cereal, pulse has been given importance for cultivation while choosing by the farmers.
- iii). The oilseed also has the same pattern as cereals and pulses as the oilseed crops are cultivated in that area during lean season or inter cropping, especially mustard and soybean. The farmers give oilseed as second choice after cereals and pulses.
- iv). The concentration of cardamom has the tendency to concentrate in some pockets only, as the cultivation of cardamom is entirely controlled by the climatic conditions, which is prevail in northern part of the district.
- v). The high potato cultivation also has the tendency to concentrate in some pockets areas. Even the area of potato cultivated area is increasing, because most of the farmers cultivate potato for subsistence crop not for commercial purpose.

The facts and figure shows that agricultural development in the district can be further developed by increasing intensity of cropped area by means of practicing double and multiple cropping by providing proper policy and planning. The policy and planning should be in accordance with the local specification means and methods like, terrace farming which control the soil moisture especially in hilly topography of the district. The plantation of broom plant will support the water retaining for the crops for the crops like rice, and as a farm fodder as well as cash crop along the contour banding, which will supplement the economy of the farmers. Above all, provision for the irrigation practicing like rain water harvesting should be encouraging and encouragement of farmers to participate in the development and management of watershed should be done, because lack of irrigation facility is the most important problem for agricultural practice in the hilly areas like the district. Besides, proper advice to the farmers is necessarily, while selecting the crop in accordance with the suitable local agro-climatic conditions. The development of proper mechanism of local market facilities will increase the crop concentration.

5.3 CROP COMBINATION

The concept of crop combination is scientific methods of study about the existing spatial relationship of crops in association with each other in land utilization study. Such study is necessary in order to have a more composite structure of agricultural region. By employing the method, one can find out the dominant crop of a particular area and proper planning can be formulated for the future agricultural development of the area. The idea of crop combination could be best utilized in understanding the existing agricultural situation, the land use pattern of a region and planning of crops keeping with the local nature of socio-economic and physical conditions for the future.

The crop combination in South District has been studied by using Weaver's (1954) methods. By employing the methods, up to seven crop combination picture of Gram Panchayat units has been found out for 2004-05.

Table 5.3. Crop Combination. (South District, 2004-05)

Crop Combination Index	No of Gram Panchayat units	Total GPUs(%)
Three crops	3	6.67
Four crops	10	22.22
Five crops	16	35.56
Six crops	11	24.11
Seven crops	5	11.11
Total	45	100.00

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

Table 5.3 shows that there is no single Gram Panchayat units where there is mono crop and 2 crop dominances in the district. The three crop combinations also have only in 7% of the GPUs and they are found in the Gram Panchayat units of Tingithang, Kamrang-Mamley and Chuba -Perbing. Another 22% of the GPUs have four combinations. These Gram Panchayats are mostly located in the southern parts of the district; where the conducive conditions like warm climate, low and middle altitude with gentle slope and well distribution of rainfall are prevail. The highest percentage having 36% of GPUs is occupied by the five crop combination. The Gram Panchayat units which have five crop combinations are located in the south-eastern and western parts of the district. The six crop combination has more than 24% of the total GPUs. Most of these GPUs which fall in this category are found in the southern part of the district. And the seven crop combinations have found more than 11% of the total Gram Panchayat units. (fig5.16)

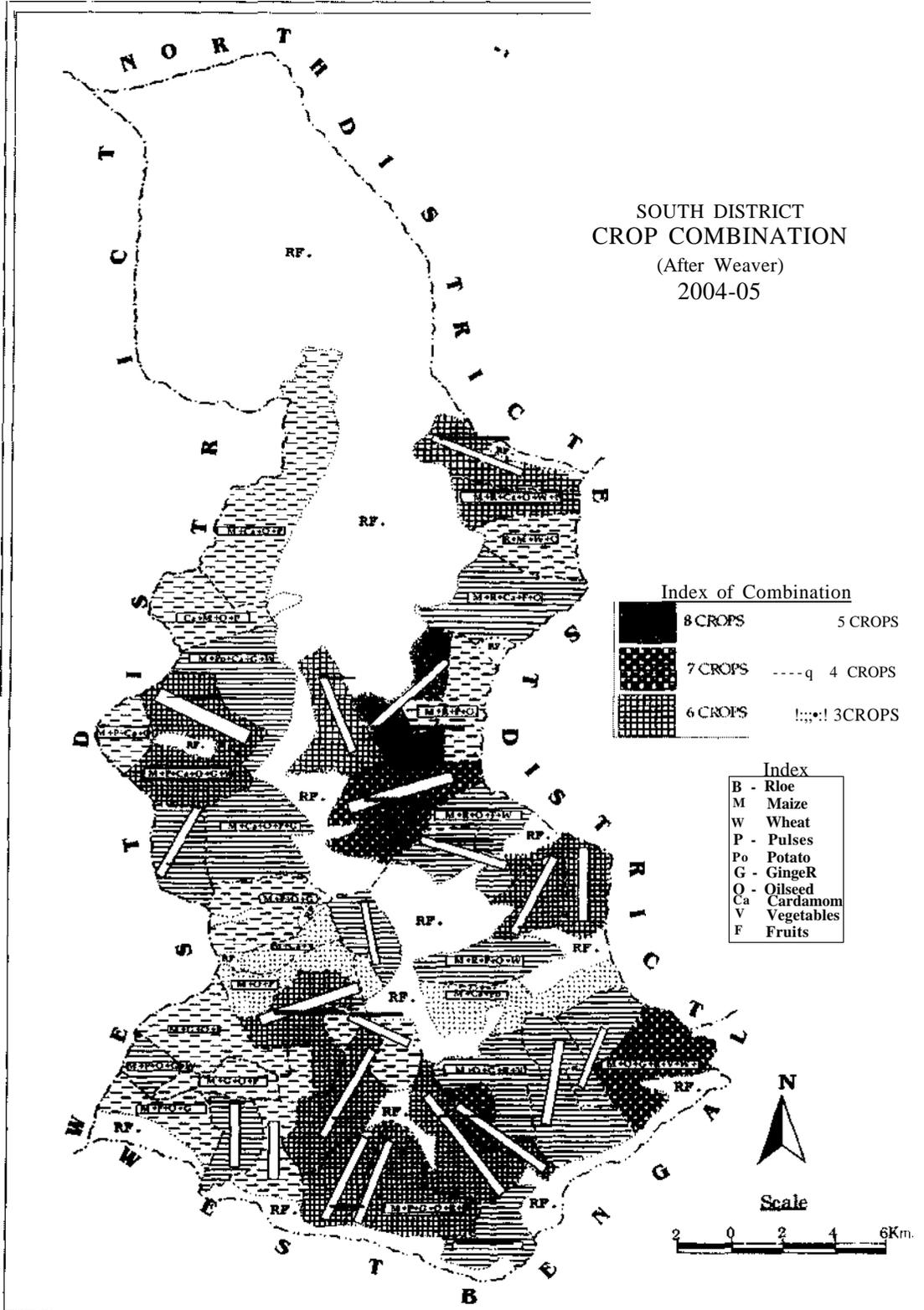


Fig 5.16

The Crop Combination in the South District has the following characteristics:

i). Out of the total Gram Panchayat units, 41 Gram Panchayat units have maize (91%) as the first ranking crop and the 5 Gram Panchayats (9%) have the cardamom is the first ranking crop. Sixteen Gram Panchayats have recorded pulse as the second ranking crop. Nineteen Gram Panchayat units have rice as second ranking crop. There is only a single Gram Panchayat unit which has recorded potato as the second ranking crop. Three Gram Panchayat units have oilseed is the second ranking crop. Two Gram Panchayat units have fruits are second preference crop.

ii). The over all characteristics of crop combination pattern in the South District shows the micro crop region in the district as the maize and pulses in western part of the district. The second micro crop region is that of maize-rice in the western part of the district and third maize cardamom in the central and northern part of the district.

iii).The crop combination pattern shows that the traditional combination pattern still prevail in the South District in spite of low production. The farmers of the district are still clinging to the old practice of crop combination. The farmers do not know about the scientific practice of cultivation which may give more productivity.

iv). All the above facts and figure indicate that the framers of South District are lack in scientific knowledge of cropping

v).The character of maize dominance in crop combination pattern reveals that still climatic condition especially soil moisture condition is the most dominant factor pf cultivation of crops in hilly region.

vi).Encouragement to farmers for using HYV seed of maize, pulses, oilseed and potato will change the crop combination as well as increase the agricultural productivity in the district.

vii).The system of mono and bi-cropping pattern should be encourage; the higher percentage of 5 and 6 crop combination pattern show low agricultural development in the district.



Photograph 5.4 Mix Cropping (Pea & Potato)

5.4 CROPDIVERSIFICATION

Crop diversification is another method by which the level of agricultural development is determined as it explains why it is possible or necessary to raise various forms of agricultural activities. Essentially, it is an indicator of multiplication of agricultural activities which obviously involve intense competition among various activities for space. The keener the competition, the higher the magnitude of diversification, and lesser the competition greater will be the trend towards specialization or mono-cultural farming where emphasis is on one or two crops.

Table 5.4 Crop Diversification (South District.2004-05)

Diversification Index	Category	No of Gram Panchayat unit	Total Gram Panchayat unit %
<50	High	2	4.44
50-60	Medium	1	2.22
60-70	Low	17	37.79
>70	Very low	25	55.56
		45	100.00

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

Table 5.4 represents the crop diversification of South District. There are various methods which can determine the crop diversification. The crop diversification study for South District is based on Bhatia's (1965) methods, in which crop area is considered as objective measurement of crop diversification. Out of the

total Gram Panchayat units, only two GPUs are in the category of high (<50) crop diversification accounting 4.44% of total GPUs. The two Gram Panchayat units which fall in this category are namely, Nagi-Pamphok and Mainram-Phalidara. One Gram Panchayat unit is under the medium category (50-60) crop diversification, having only 2.22% of GPUs and it is found in the Gram Panchayat unit of Tinik-Chisopani. Around 38% of the total Gram Panchayat units are under the category of low (60-70) crop diversification. More than 55% of the total gram Panchayat units are in the category of very low (>70) cop diversification. Most of these Gram Panchayat units are located in southern, eastern and western part of the district, (fig 5.17)



Photograph 5.5 Floriculture(An Alternative Agriculture)

The crop diversification in the South District has strong characteristics of mono-crop culture specially rice in river valley, maize in middle altitude and cardamom in higher altitude. This mono-crop culture is not by the agriculture development and advance farm management, but due to constraints laid by the physio-climatic conditions. The steep slope is not suitable for rice cultivation. The farmers are compelled to cultivate maize or cardamom as found in the western part of the district. The case is the same in eastern and southern parts where rice and pulses have dominant characteristics. Rice is cultivated in the fertile river valleys and pulses in the higher slopes. Maize is cultivated in the southern part where the cultivation of rice is not possible.

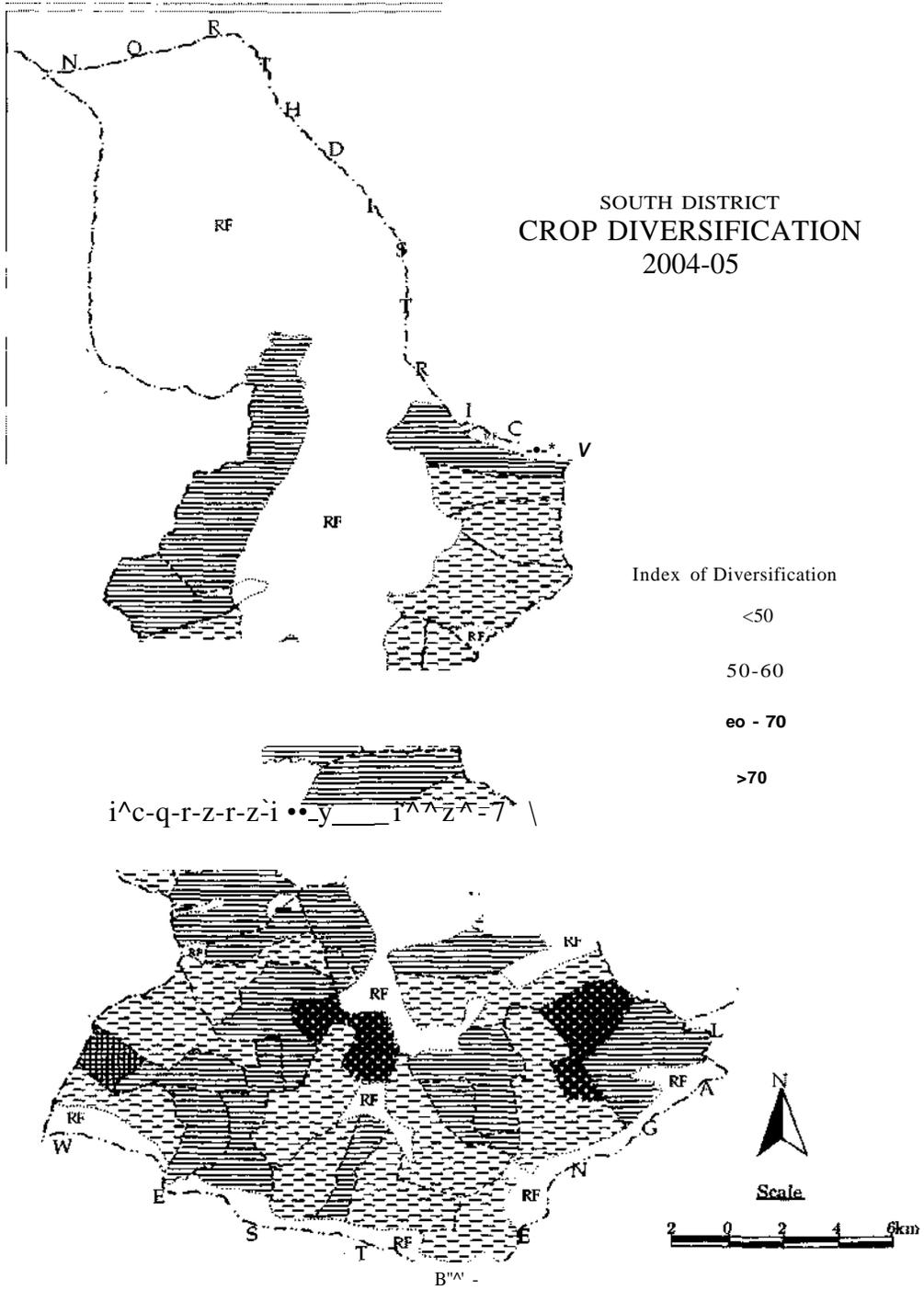


Fig5.17

The overall character of agricultural land use in the district is low as the percentage of low crop diversification in more than 50% of GPUs. More planning and policy based on the local specific problems and condition should be implemented, for the further development of agricultural production. The attitude of sedentary nature of

the farmers should be changed. The higher agricultural production is needed for the ever increasing population in the district. The mon-crop culture only supports the sedentary agriculture. The farmers of the district should be encouraged for more diversification of different crops or system at different time of the year. This will be possible only after addressing the existing the local problem of agro-climatic zones. Diversification is also an effective way of optimizing the use of socio-capital (e.g. rural labour) in rural areas where unemployment and under employment are high, this will increase and ensure the agricultural productivity and food security

5.5 CROP EFFICIENCY

Crop efficiency is an important concept of determining the level of agricultural productivity and its help to formulate policies and planning for further agricultural development. Crop efficiency for South District is calculated by using Kendall's (1939) ranking co-efficient method and (mean value is found as 22.79 and standard deviation as 7.2)

Table 5.5 Crop Efficiency (South District.2004-05)

Efficiency	Category	No of GPU	Total Gram Panchayat unit %
1.19-8.39	Very high	1	2.22
8.39-15.59	High	5	11.11
15.49-22.79	Moderate	14	31.11
22.79 - 29.90	Low	16	35.56
29.90-32.10	Very low	9	20.00
Total		45	100.00

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

The category of very high crop efficiency (1.19-8.39) has only a single Gram Panchayat units accounting only 2.22% and found in the GPU of Nagi-Pamphok. Another 11% are under the high crop efficiency (8.39-15.59) category and are registered in the Gram Panchayat of Lingmo-Tokday., Lamting-Tingmo, Poklok-Denchung, Sripatam-Namphok and Chuba-Perbing. The moderate (15.59- 22.79) category have 31% of GPUs. These Gram Panchayat units are mostly located in southern and south-eastern parts of the district. The low category (22.79—29.90) have around 36% of the total GPUs and are located in the western parts of the district. The very low (29.90 - 32.10) category occupied 20% of the total Gram Panchayat units and most of them are located in the south-western parts of the district, (fig 5.18).

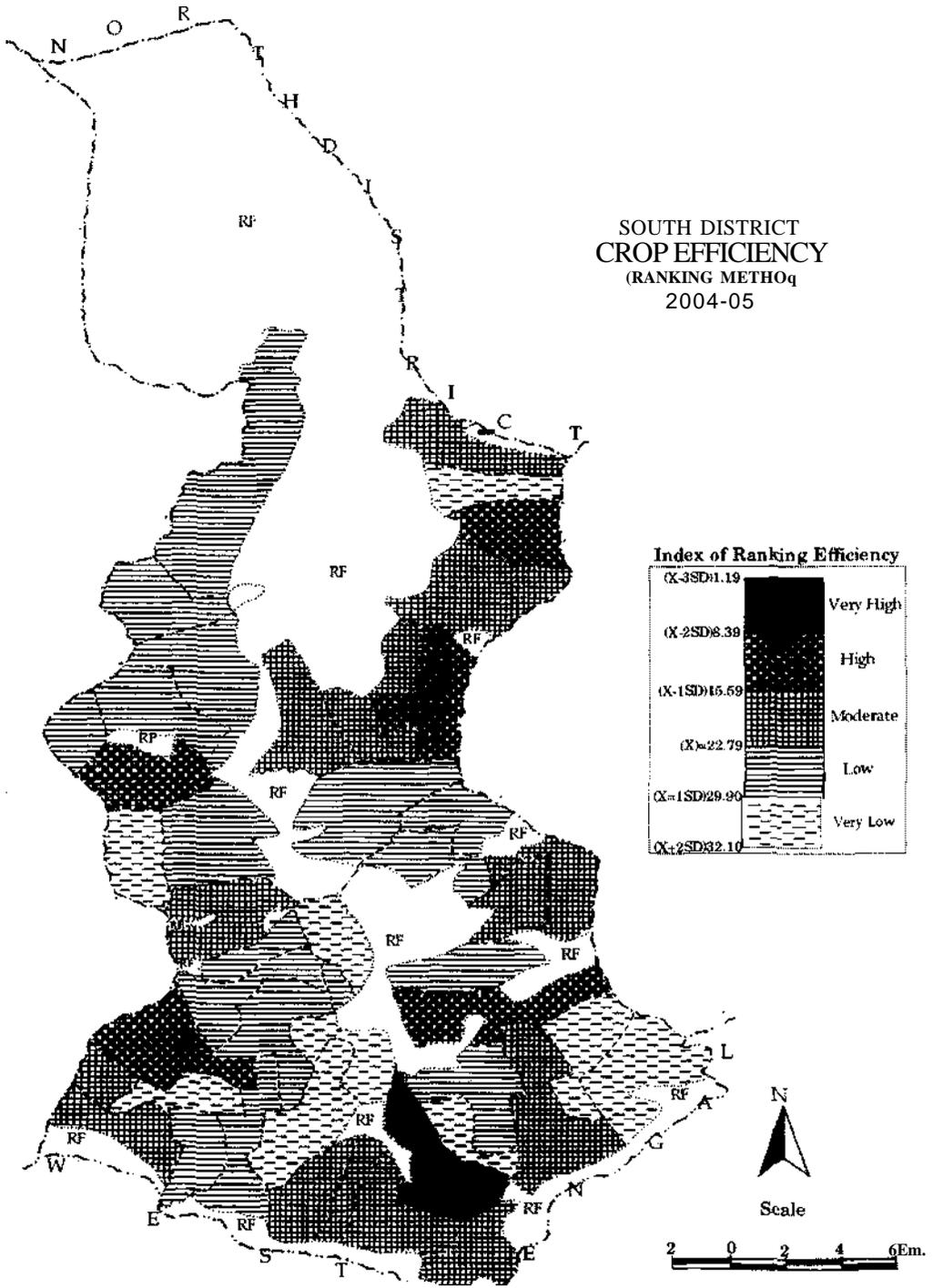


Fig 5.18

The crop efficiency or the productivity is very low as the percentage of low and very low categories constitutes more than 55% of the total Gram Panchayat units. The sedentary nature of cultivation and the lack of irrigational facility in the district are the main problems of low productivity.

5.6 ANIMAL HUSBANDARY

Animal husbandry and agriculture can not be separated especially in hilly or upland agricultural practice because of the higher dependency of animal labour for agricultural purpose as well as manures and income supplements for the farmers in the forms of dairying, poultry, piggery and rabbit rearing, which help the diversification of occupation in the rural areas.

Table 5.6 Live Stock Population (South District. 1997-2007)

Live Stock	1997	Total %	2003	Total %	Decadal Changes 1997-2007
Cattle	12080	23.59	43892	22.16	263.34
Sheep	2325	4.55	2700	1.36	16
Buffalo	61	0.12	1487	0.75	2337
Pig	3135	6.13	9791	4.75	212.31
Goat	8375	16.35	34678	17.52	314.06
Horse	1322	2.58	13	0.006	-99
Yak	2167	4.24	0	0	-0
Rabbit	54	0.10	41	0.02	-24
Poultry	21680	42.34	1.5409	53.23	386
Total	51199	100.00	198011	100.00	

*Source: Live Stock Census 2003:

Table 5.6 shows the live stock population in the South District. In 1997 out of the total population of live stocks poultry has occupied 42.34 %, because in most of the households rearing of fowls and duckling is common practice for food supplements. The cattle occupied second largest share of live stock population, having 23.59%, goat 16.35%, pig 4.55%, Yak4.24%, horse2.58%, buffalos 0.12% rabbit0.10 respectively.

The picture of live stock population in the district in2003 has another picture. Still poultry constitutes the highest percentage having 53.23% of the total live stock population. And cattle 22.16%, goat17.52%, pig 4.04%, sheepl.36% Buffaloes 0.75%, horse0.006% and rabbit 0.02%.

During the period changes of the live stock population has promising picture. Positive increase is observed in cattle, buffaloes, pig, goat, and poultry. These changes indicate some underlying fact of diversification of occupation from the traditional practice of agriculture. Another factor of these positive changes is due to the increase demand of meat and milk by product in the district. This also shows a promising trend for the development of agricultural and allied sector. But in the same period the number of horse, rabbit, and yak population show negative growth. The

decreased in the rabbit population shows that the policy and planning is either not suitable to local problems or fully implemented in the district. The policy and planning in the rabbit rearing should be re-oriented and re-think. Where as decreased in the case of horse is due to the decreased use of horse as beast of burden and development in road network transportation in the district. Decreasing of Yak population has another different factor it due to the government's policy of environmental protection, as the transhumance practice which exists in the higher altitudes especially northern parts of the district is prohibit inside the National Sanctuary of Kanchanzungha.

The discussion shows that animal husbandry can be further develop in the district, especially in dairying, poultry, piggery and goatery, if adequate support and planning and policy is implemented. This will solved the problem of underemployment and unemployment in the rural areas of the district

5.7 PISCICULTURE

Even though the economy derived from pisciculture is negligible in the district, it can be further develop in the low lying river valleys of the district. The development in this sector will lessen the burden up on the agriculture and supplements the economy of the farmers.

Table 5.7 Number of Fishing Family (South District.2005)

Type of Family	Rural	Total % of Rural	Urban	Total % of Urban
Fishing Family	181	72.65	36	27.91
Fish Marketing	10	4.07	8	6.21
Repairing of fishing net	25	10.04	19	14.73
Fishing gear	11	4.42	22	17.05
No of Hooks	22	8.83	44	34.10
Total	249	100.00	129	100.00

* Source: Live Stock Census, Sikkim. 2003

Table 5.7 represents the pisciculture and related occupation in the district. Out of the total pisciculture households 72.65% are located in the rural areas and another 27.91 are in the urban area. The fish business or marketing family occupies 4.07% in rural and 6.21% in urban population. Another part of this economy i.e. repairing of fishing nets 10.07 % and 14.73% in rural and urban households. More than 4.42% and 17.05% of the total fishing community in the district are engages in the preparation of fishing gear in rural and urban area respectively. Off the total house 8.83% in rural

area and 34.10% in urban area has fishing hooks. But the pisciculture practice by urban household is for the leisure time only.

In order to lessen the pressure in the agricultural land use pisciculture can be develop in the district by proper planning and support in these areas, especially in and around the Rangit and the Tista river valleys as flesh water pisciculture and surrounding low land area can be develop in the forms of small fish ponds of locally suitable variety.

CONCLUSION

The agro-climatic conditions has influence the development of own unique feature of crop production, concentration, combination, and diversification. The production pattern of the ten selected crops shows variation. Out of these crops maize, ginger, potato vegetable has higher productivity level and they shows increasing trend and the crops like oilseed and rice have medium range of production, where as cardamom and wheat have general low production. The production pattern also shows that maize, pulse, ginger, potato, and vegetable have well distributed production pattern and similar pattern of production intensity. But the crops like rice, cardamom, wheat and horticulture has regional pattern of production, because these crops has been controlled by specific agro-climatic conditions^ The cereal concentration have shown that in the lower altitudes specially the rice. The character is same in the case of pulse, Potato, oilseed, and horticultural crops. But the cardamom has the tendency to concentrate in the higher altitudes. And the maize has uniform concentration pattern The crop combination has sown maize dominance as the 91% of the GPUs have maize as the first ranking crop and another 9% of the GPUs have cardamom as the first ranking crops. Besides these two crops other crops which farmers give importance for combination are rice, ginger, potato, pulse and oilseeds The diversification pattern also shows that the percentage of high diversification is very low and has mono-crop characteristics having the characteristics of rice in the lower valley, maize in the middle and cardamom in the higher altitude. These characters of mono-crop culture are not by the advancement of farm managements, but due to the constants laid by the physio-climatic conditions. This shows that farmers are still clinging to traditional methods of cultivation due to the limitations of climatic condition and lack of improved scientific method as well as lack of institutional facilities. The agricultural related economy like animal husbandry and pesiculture are

also shows that lack of development and due to the various factors. Even though the demand for milk and meat production is very high in the district due to the lack facilities and development policy and planning there is a huge gap between demand and supply of meat and milk. And the pisciculture is not fully exploited due to the lack of knowledge and scientific methods of rearing and practice in spite of having high demand for fish in the local market. These also indicate the need of proper policy and planning which will be suited to the existing condition of the district.

CHAPTER-VI

GENERAL INFRASTRUCTURAL FACILITIES

INTRODUCTION

The important link between infrastructure development and sustaining rapid growth and economic development can not be overstated. Economic opportunities are strongly shaped access to infrastructure. There is solid evidence that infrastructure investment broaden opportunities for people and communities by integrating them into regional and national system of production and commerce, and by improving their access to public service (World Bank, 2005). Infrastructure refers to the facilities, activities and services which support operation and development of other sector of the economy. These also support the daily life of society. There are two basic components of infrastructure viz., Physical infrastructures and social infrastructures. Physical infrastructures like roads, railways, port, air port, power, and telecommunication have strengthen the economy, boost investment, attracts prospective entrepreneurs and helps in alleviation of poverty and unemployment through numerous positive backward and forward linkage effects on primary, secondary, and tertiary sectors of the economy. Similarly, social infrastructures, like drinking water supply, sanitation, education health etc. help in improving quality of life of millions of rural inhabitant. But, the development of infrastructure must move ahead of the development of agriculture, industry, and other sectors for smooth and orderly development of the economy, without being caught in all manner of bottlenecks arising from inadequate development of the infrastructure.

As the district is located in hilly and mountainous region, the development of infrastructure is very slow and treacherous work. But for the last two decades, the infrastructural development in the district is steadily progress.

6.1 EDUCATION FACILITY

Education is the back bond of economic development in the present day today. Morden education in Sikkim begins in 1830s when the when the missionary school in Sikkim were established.(Rana1998).As the economic development stride the necessity of education is also increased Efforts are being made to improve the educational status in the South District by Government and Local Bodies. There are five major types of educational institutions in the district viz., primary schools, junior

high school or middle schools, high schools or secondary schools, senior secondary schools and colleges (Under graduate, ITI, CCTI) and Sanskrit Pathasala. Beside these, another important semi-religious schools found in the district is monastic schools, where not only Buddhist religious philosophy but also the general educational studies are also taught.

Table 6.1 Status of Educational Institutions in South District, 2001.

Category of Institution	No of Institutions		Command Area in (km ²)		Command Population	
	1991	2005	1991	2001	1991	2001
Primary School	217	141	185	282	368	146
Middle School	60	47	672	847.56	1333	441
Secondary School	14	28	2881	1422	5713	865
Senior Sec School	02	09	20167	4426	33392	2307
College/Bed college	00	02	—	39840	79984	10382
ITI	00	01	—	39840	79984	20764
Monastic School	04	12	10084	3320	19996	1730
Sanskrit Pathasala	00	02	—	19920	79984	10382
Private Institution	22	68	1833	585.88	3635	305
Total	317	308				

* Source: Census of Sikkim 1991, 2001 & A report on making human resource development by HRDD &SSA, South District.2005

Table 6.1 represent the educational facility in the South District. The availability of educational facility in the district is increasing specially in secondary level. The number of secondary schools has increasing enormously during 1991-2005 from 14 to 28 doubling, it self. In the case of senior secondary level the case is same from 2 in 1991 it becomes 9 in 2005. In South District, there were not a single under graduate college in 1 Bed College, and Industrial training institute and Sanskrit Pathasala in 1991. But in 2001, all these facility of educational institutes are established. Besides, the number of privately runs educational institution is increasing from 22 in 1991 to 68 in 2005. Most of the privately runs was primary and middle standard. After 2001, privately runs two secondary and one higher secondary school are also established. The command population and command area per educational institution are also increasing along with the educational infrastructure facilities. All the primary and middle schools have 4 to 6 rooms, RCC buildings with electrification,

toilet, drinking water, approach road and all season footpath facility. In the case of secondary education the command area as well as command population is decreasing, this means that the facility available to per head is increasing. The situation is same for under graduate college, BEd College, industrial training institute, Sanskrit pathasala and computer training institutes in the district.

SOUTH DISTRICT
(COMPOSITION OF EDUCATIONAL INSTITUTION)
2006

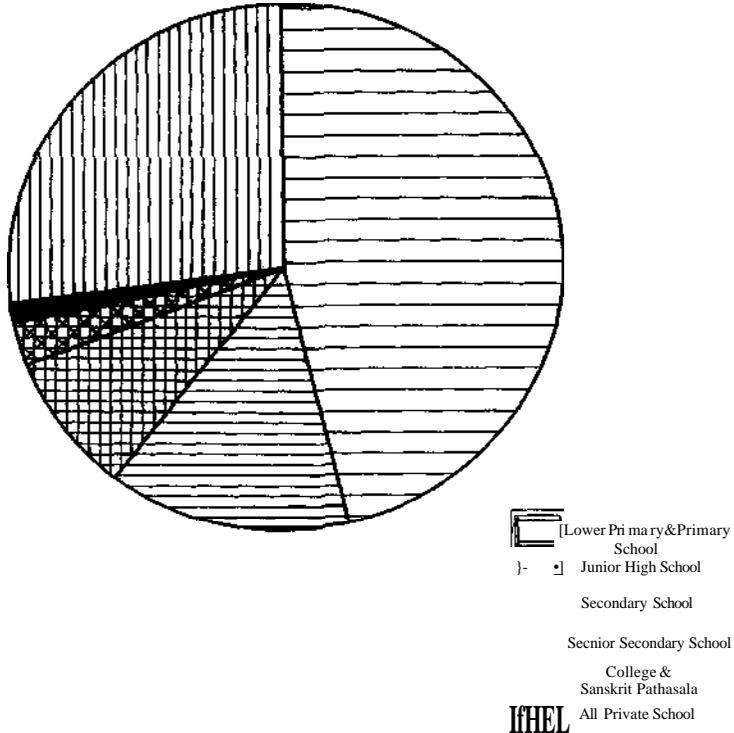


Fig6.a

Besides, augmentation from the Sarva Siksha Abiyan policies various sphere of elementary and primary education in the district like, identification of new habitation where children did not access to schooling facilities and establishing educational institution especially in far flung and remote areas and providing mid day meals, facility for compute education, free text book, rain coats and uniform up to class five will certainly boost the literacy level in the district.

SOUTH DISTRICT
DISTRIBUTION OF SCHOOL
2006

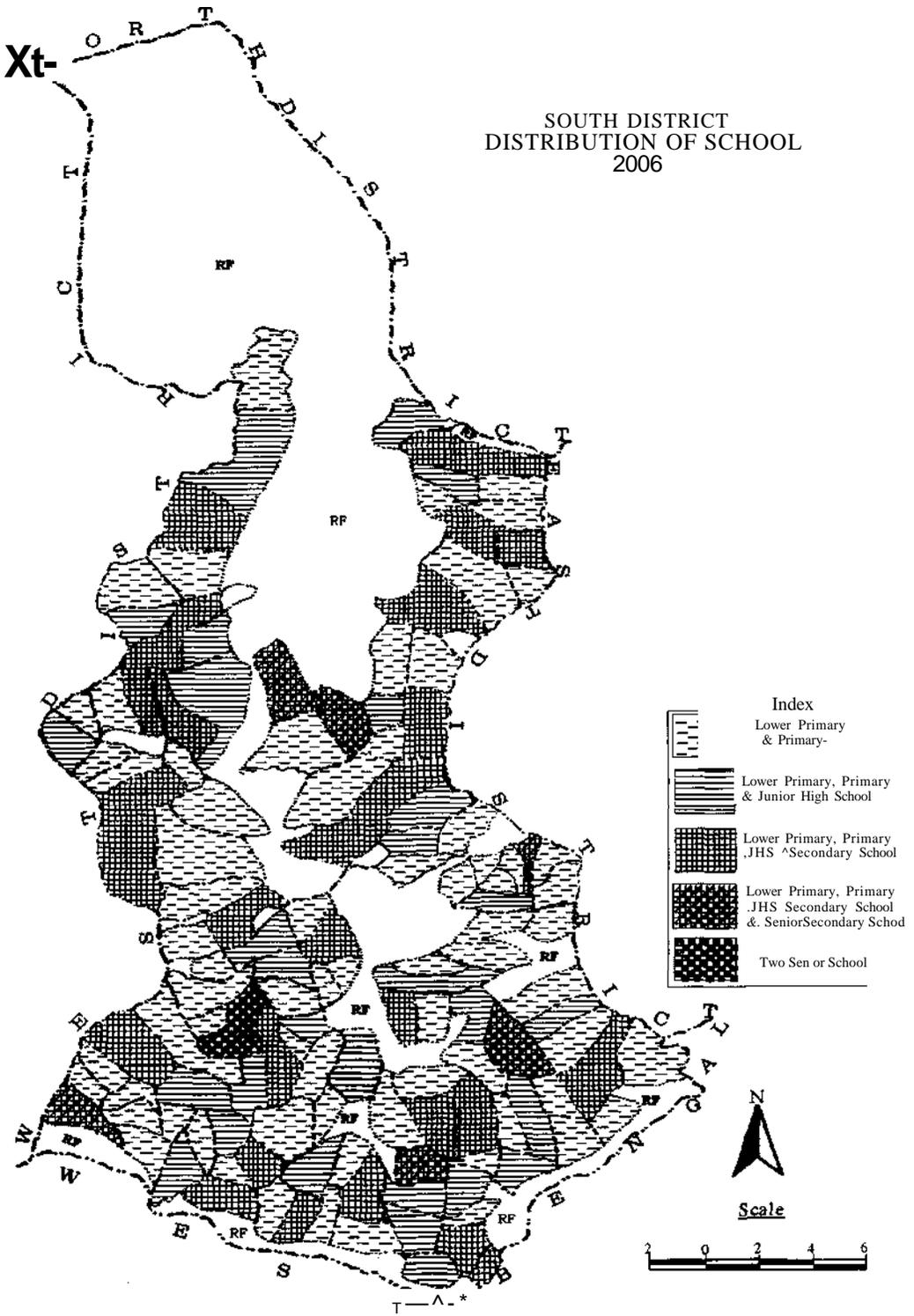
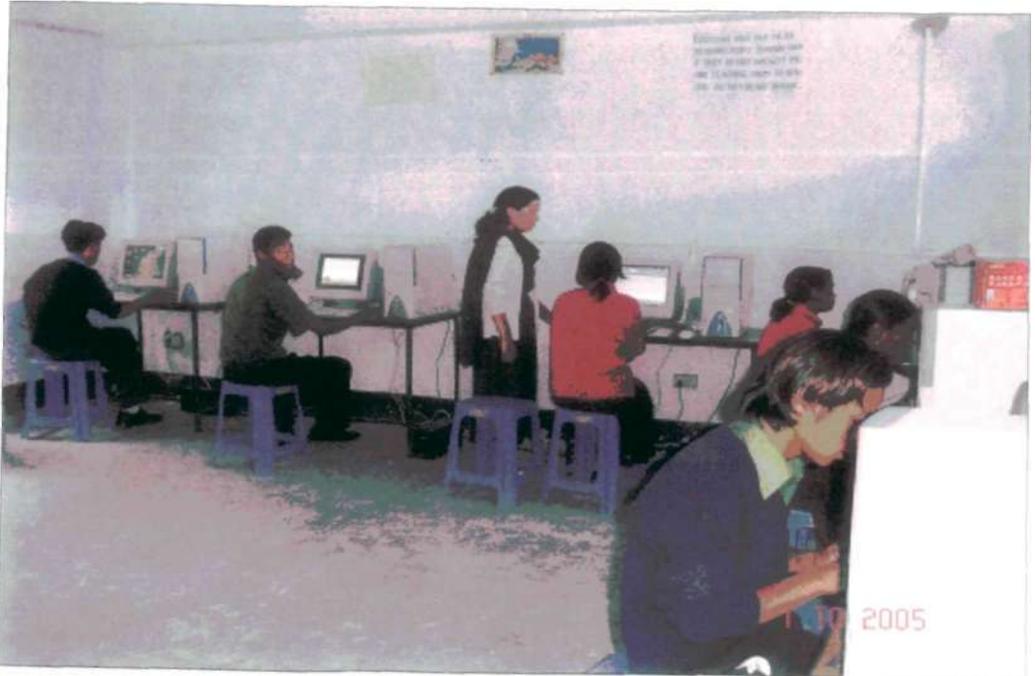


Fig 6.1

The educational infrastructural facility in the district is well developed and distributed all through the district and will benefit to the downtrodden population and ultimately benefit in the long run in the district.



Photograph 6.1 Primary School Building



Photograph 6.2 Technical Education

6.2 HEALTH CARE FACILITY

Good health is an essential input for the development of human resource and the quantity of life in terms of social and economic development of an area/ region. A positive health status is defined as a " a state of complete physical, mental and social well being and not merely the absence of diseases or infirmity (WHO 1971). Health is regarded as priority for sustained development intervention both at the individual, community and national level. Improved health is a part of total socio-economic development and is regarded as an index of social development. This index is by product of combine efforts of safe drinking water, sanitation, nutrition, and available health care facilities

The South District has been able to transverse a path of health development vis-a- vis other facets of development quite steadily. From a rudimentary in health care infrastructure, substantial progress has been made to build an appropriate health infrastructure with a view to elevate health status and improve quality of life of the people.

Table 6.2 Amenities not available in the Revenue Blocks in South District. 2001

Distance from Revenue Blocks (km)	No. of Revenue blocks	Revenue Blocks %
<5	74	51.03
5 - 10	28	19.13
>10	01	0.69
Total	103	70.85

* Source: Census of Sikkim.2001.

Table 6.2 shows the percentage of revenue blocks where any type amenities does not exist in more than 70 per cent revenue blocks about 51.37% revenue blocks are located 5 km away from the Primary Health Centre (PHC) or Primary Health Sub-Centre (PHSC). And around 20 per cent of the revenue blocks have avail the facility within 5 to 10 km distance. But only one revenue block viz, Ralong, is situated more than 10 km away from medical amenities. In the district 38 percent of the revenue blocks enjoy the facilities of medical amenities which were 31.11 percent in the year 1991.

Table 6.3 Availability of Health Care Amenities in South District. 1995&2005

Amenities/ Doctors	1991		2005	
	No of Amenities	Serving Population	No of Amenities	Serving Population
PHSC	14	6854	39	3089
PHC	24	4001	6	20039
Dispensary	1	96035	~	—
Hospital	3	32012	1	3005
MBBS	—	«	40	—
Dentist	~	—	07	—
Specialist	—	—	08	—
Homeopathic	—	--	01	~

* Source: Census of Sikkim 1991 & State Health Bulletin 2005.

Table 6.3 shows the available health care amenities in the district and indicates the increasing trend of available health care amenities. In 1991, the total number of PHSC and PHC were 38 which have increased to 45 in 2005. The number of doctors, specialists and nurses has also increased tremendously. New TB centre, Thyroid centre, Physiotherapy clinic, Blood bank, De-addiction centre and Counselling centres are also established. In 1991, one doctor serves 4242 persons but the situation is changed. In 2005 one doctor serves only 2268 persons. There are 15 staff nurses, 72 ANM, MPHW 72 and 7 private clinics, 13 lab technicians in the district. Besides, numbers of specialists is also increased. In 1991 there were not a single specialist in the district but in 2005 there are 2 Gynaecologists, 1 General Surgeon, 1 Medicine, 1 Paediatrician, 1 Radiologist, 1 Physiotherapist, and 1 Homeopathy doctor are available in the district.

According to state health bulletin 2005 there are 300 beds in different medical institutions in the district, occupying 26 percent of total beds available in the state, which was only 17 percent in 1991. The number of patients treated in various medical facilities is also increasing.

6.2.1 Mother and Child Health Care

Mother and child health care facility is considered as one of the important indicators of health care system. The availability of this facility is increasing in the district for last 6 or 7 years.

Table 6.3a Immunisation of Children in South District Sikkim, 2001&2006

Programme	Year	
	Achievement in (%) 2001	Achievement in (%) 2006
TT	72.40	96.66
DPT	91.17	98.30
OPV	98.59	99.00
Measles	85.29	99.76
DT	100.25	131.61

* Source: State Health Bulletin. 2006. Sikkim.

Table 6.3a shows the achievement of Mother and Child health care achievement in the district. All the programmes in Mother and Child health care have achieved more than 95 per cent. The TT immunisation has achieved 96.66% in 2006, 98.30% in DPT, and 99% in Oral Polio Vaccine. Measles also have 99.76% and DT more than 100 per cent. This means that the pre and post natal care of both the mother and child is very much improved in the district. This also indicates that the basic medical facility is improving.

Table 6.3b Achievement of Family Panning Programme in South District, 2001 & 2006

Programme	Year	
	Achievement in (%) 2001	Achievement in (%) 2006
Intra Uterus Device	66.77	111.90
Oral Pills	349.00	125.90
Sterilization	38.77	117.09

* Source: State Health Bulletin 2006. Sikkim.

The scenario in the family planning programme is also very encouraging. The three programmes which support the small family norms in the South District are IUD (Intra Uterus device), OP (Oral Pill) and Sterilization (NSV and Tubectomy). All these three programmes have achieved more than 100 percent in 2006. This figure shows that the small family norms policies and planning in the district is very satisfactory and encouraging. (Table6.3b)

The health care facilities and amenities in the South District are developing very fast. But still some of the revenue blocks which located in remote areas do not even get the first aid during the time of emergency. Appropriate health education programme evolving local communities especially Panchayat keeping in mind their cultural and traditions can achieve more coverage of health care facility within the local community. The encouragement of non governmental organisation for total health care will certainly benefit to the people living in remote areas. Besides encouragement of using alternate medical care systems like Homeopathic Ayurvedic and Unani along with the traditional methods like Tibetan medicine harmonising them

with modern system and evolve an integrated methods of affordable health care system for the poor and needy. Again encourage participation of private practice in health care facility will certainly improved the health care infrastructure in the district.

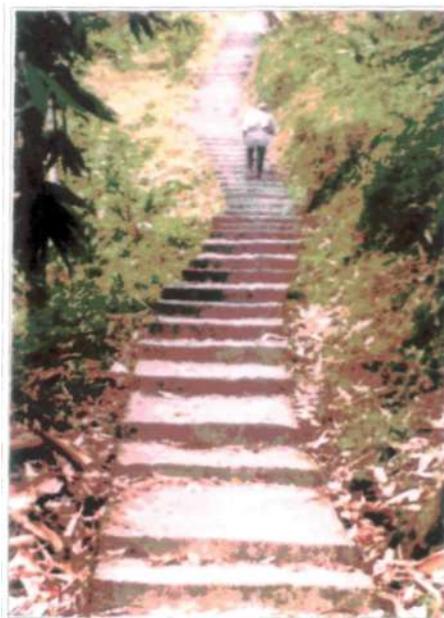
6.3 COMMUNICATION

Communication is the essential element for social changes. An elaboratively social change is the processes by which alternation occurs in the structure and functioning of a social system. It also provides to educate and participation in decision making and action taken that affect their lives. There fore, communication and of social changes leading to sustainable rural development go together.

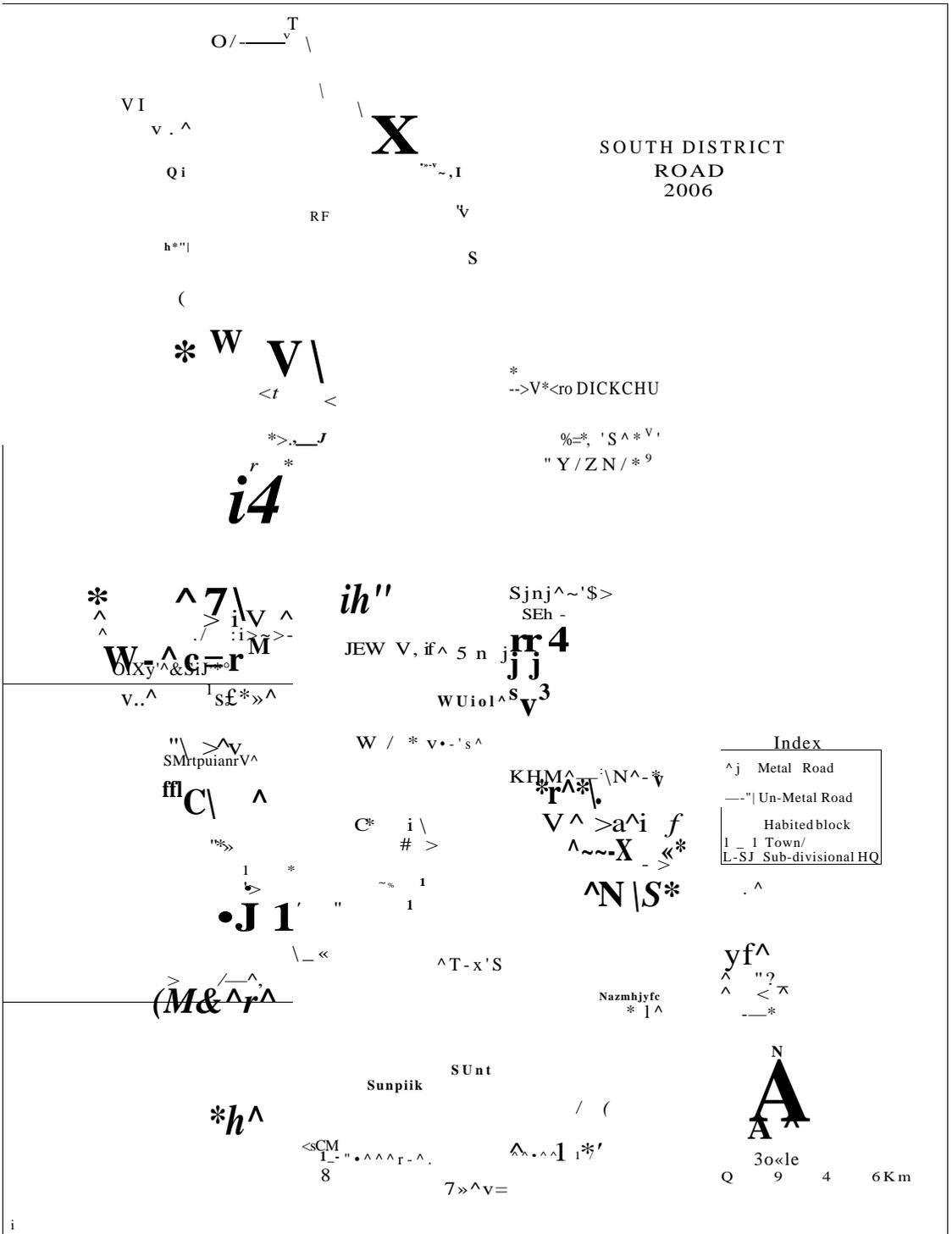
The communication system in the South District may be discussed in two heads; a) Transport and b) Postal and Telecommunication.

6.3.1 Transport

Transport is one of the most important infrastructures for the development in an area. Due to the physiographic constrains road transport is the most favourable means of transport in the district. The road density in the South District is the highest among the four districts of the state having 96% Table 6.5a. The total length of road altogether State High way, District Road and Blocks Road is 722 km in 2006. More than 45 per cent of the revenue blocks have access the public transport system. According to 2001 Census, in certain cases the distance between the relevant blocks and the most proximal points where one could avail him of public transport is 5 km. In the district, out of the total road net work 55.25 % where under the metal, pucca or all seasons road and another 30.55 per cent are under the category of un-metal road. (fig6.2)



Photograph 6.3 Foot path (Means of Rural Connectivity)



Source: N ATMO. DPS (S) & SPWD (S)

Fig 6.2

Besides road network footpath is one of the most suitable means of transportation in the steep hilly terrain, where the construction of road network is difficult. The Rural Development Department has so far constructed 205 km length footpath altogether in the district. Along with the construction of road network, the availability of transport

vehicles is also important component of the development of transport and communication system.

Table 6.4 Type of vehicles Registered in South District, ZVV5

Types of Vehicle.	No of Vehicle	Percentage to total
Two wheeler	420	31.10
Four Wheeler (Govt)	359	26.60
Four wheeler (private)	421	31.20
Trucks & Buses (Govt & private)	150	11.10
Total	1350	100.00

* Source: Department of Motor Vehicle, South District. 2006.

Table 6.4 represent the availability of vehicle in the district. The type of vehicle in the district is divided in to two types' viz., Government and private. Out of the total vehicles two wheelers mostly private constitute 31.10 per cent of the total vehicles in the district. The Government owned four vehicles occupy 26.66 percent of the total vehicles of the district and four wheelers owned by private constitute larger percentage having 31.20 per cent of the total vehicles. The category of trucks and buses won by both private and Government constitutes 11.10 percent of the total vehicles of the district. But in the cases of trucks it is mostly owned by private and in the cases of buses all of them are owned by the Government agency Sikkim Nationalise Transport Co-operation which took the burden of carrying the large passengers and goods in the district. But still more planning has to be done for further development of transport in the district.

6.3.2 Post, Telegraph and Tele communication

In spite the development of information technology still postal service is one of the important means of communication in rural and hilly areas. The postal and telegraphy infrastructure in the district is not adequate.

Table 6.4a Postal and Telecommunication Amenities in South District,2006.

Amenities	No of Revenue Blocks		Revenue Blocks (%)		Command Population
	Available	Unavailable	Available	Unavailable	
Post	64	81	44.13	55.86	4007
Telegraph	2	143	1.28	98.62	15029
Telephone	53	92	36.55	63.45	60115
National Information Centre	1	144	0.68	99.32	120239
Community information Centre	9	136	6.21	93.79	13359
Gramsat	91	54	62.75	37.25	1321

* Source: Sikkim Statistical Profile 2004-05

According to 2001 Census, there are 30 post offices (27 branch, 2 sub-centre and 1 district head office). Out of the total revenue blocks around 44 per cent have access the postal facility and remaining 56 per cent of the revenue blocks do not avail the facility. In the district, 1 post office has to serve 4007 persons. (Table 6.4a). Out of the total revenue blocks 76.55 per cent of the revenue blocks have the postal facility within 5km distance and 21.37 per cent of the revenue blocks have access the postal facility between 5 and 10km distance. The remaining 2.08 per cent of the revenue blocks have to access the facility beyond 10 km distance. (Table 6.5c). These revenue blocks are namely Manzing, Tokday, and Kolthang.

Table 6.4b Distance of available Communication Amenities in South District, 2001

Distance in (km)	Post Office		Telephone	
	No of Revenue Block	Revenue Blocks %	No of revenue Blocks	Revenue Blocks %
<5	111	76.55	23	15.86
5 - 10	31	21.37	89	61.39
. 10	03	2.08	33	22.75
Total	145	100.00	145	100.00

* Source: Census of Sikkim 2001.

Besides postal service, another important means of communication in the district is telephone. The state has the highest telephone density in India. Out of the total revenue blocks, 36.55 per cent of the revenue blocks have the telephone facility and 1 telephone exchange serves 15029 populations in the district. Again out of the total revenue blocks of the district, 15.86 per cent of the revenue blocks have access the telephone facility within 5 km distance. Another 61.39 per cent of the revenue blocks have access the facility between 5 and 10 km distance, only 22.75 per cent of the revenue blocks have access the facility by walking more than 10 km distance. But the scenario is changed after 2001, with the entering of mobile facility and wireless local loop system in the state. The communication by telephone and mobile is tremendously improved. As per the record, out of total households of the district 44.09 per cent have enjoyed these facilities. Another important means of communication in the district is Gramsat, which is also very suitable in the hilly terrain like South District. There are 91 Gramsat centre and all the Gram Panchayat office have connected by this means of communication. The third important and latest means of communication in the district is internet. In the district one national informatics centre (NIC), 9 community information centre (CIC) are located one each

in Namchi, Jorethang, Temi, Wak, Damthang, Sumbuk, Namthang, and Yanyang (fig5.2). Besides 15 cyber cafes are located in different selected towns of the district.

The over all picture of the communication facility in the district is developing in a fast pace, with the introduction of broad band internet facility.

6.4 MARKET

Traditionally market place is the important place for emergence of urban centre and economic development. Trade and commerce are most important functions in the rural areas and the trade is generally took place in a common place which is known as market (Jana 1998). South District is economically poor in both production and distribution of various commodities. The physiographic conditions further aggravated for the development of market centre. The market centre in the district is not located in proper place and they have grown haphazardly from the time immemorial with out any planning.

Table 6.5 Types of Markets in South District. 2005.

Types of Market.	2005	Total Markets %	Command Population
Bazaar Class II	4	9.52	4207
Bazaar Class III	8	19.04	
Rural Marketing Centre	30	71.42	
Total	42	100.00	2862.82

* Source: Department of Urban Development and Housing Development.2005.

There are three types of market centre in South District. They are a) Bazaar Class II, b) Bazaar Class III and c) Rural marketing Centre. The first categories have all the facilities of a market centre and are located in Namchi, Jorethang, Melli and Ravongla and constituted only 9.52 per cent of all the types of market. Table 6.5. The second type of market i.e. Bazar class III is less developed than the class II type where some of the facilities are not available. They occupy 19.04 per cent of the total markets. These types of markets are situated at Simchuthand, Majhitar, Temi, Damthang, Namthang, Kewzing, Yanyang, and Ralong. The third type of market is that where some small shops are agglomerated in rural area and where small volume of trade and commerce is going on to fulfilled the immediate local needs are called rural marketing centre. Some of the important rural marketing centres are Maniram, Sadam, Kitam, Wok, Nagi and Assangthang etc.

Another important characteristic of market in South district is that of the weekly market (locally known as hat). In a specific day, the traders from the class II

bazaar and neighbouring state came at rural marketing centre, where commodities which are not available in the rural market centres are brought and trade.



Photograph 6.4 Rural Market

The scenario of marketing infrastructure in the district is not satisfactory. As the economy of the district is based on the agriculture and agricultural production in the district is very low. The development of market centre is also moving in a slow pace. The ratio is that 1 market centre (any type) has to serve 2862 persons. Besides, most of the market centres have limited space. This lack of space has hampered the development of market centres except 4 notified market centres. All the class III market centres and Rural marketing centres neither have horizontal space for expansion nor housing and sanitation, proper connectivity of transport except a few. In order to solve this problem the department of rural development and management department has propose to construct one rural product market centre with proper building , sanitation, electricity, located near metal road net work with centrally located place of each Gram Panchayat unit will certainly be helpful in initiation of proper marketing mechanism in the district. So far such rural produce marketing centre has been completed. They are Nandugaon, Damthang, Temi, Tarku, and Namthang etc. These rural produce market centres will take the shape of rural business hubs and will provide marketing outlets for the farmers and non farmers like artisans product of the village as well as will provide basic amenities like toilet, snack stall, and PCO's to the tourists and locals at the same time.

SOUTH DISTRICT
LOCATION OF AMENITIES
2006

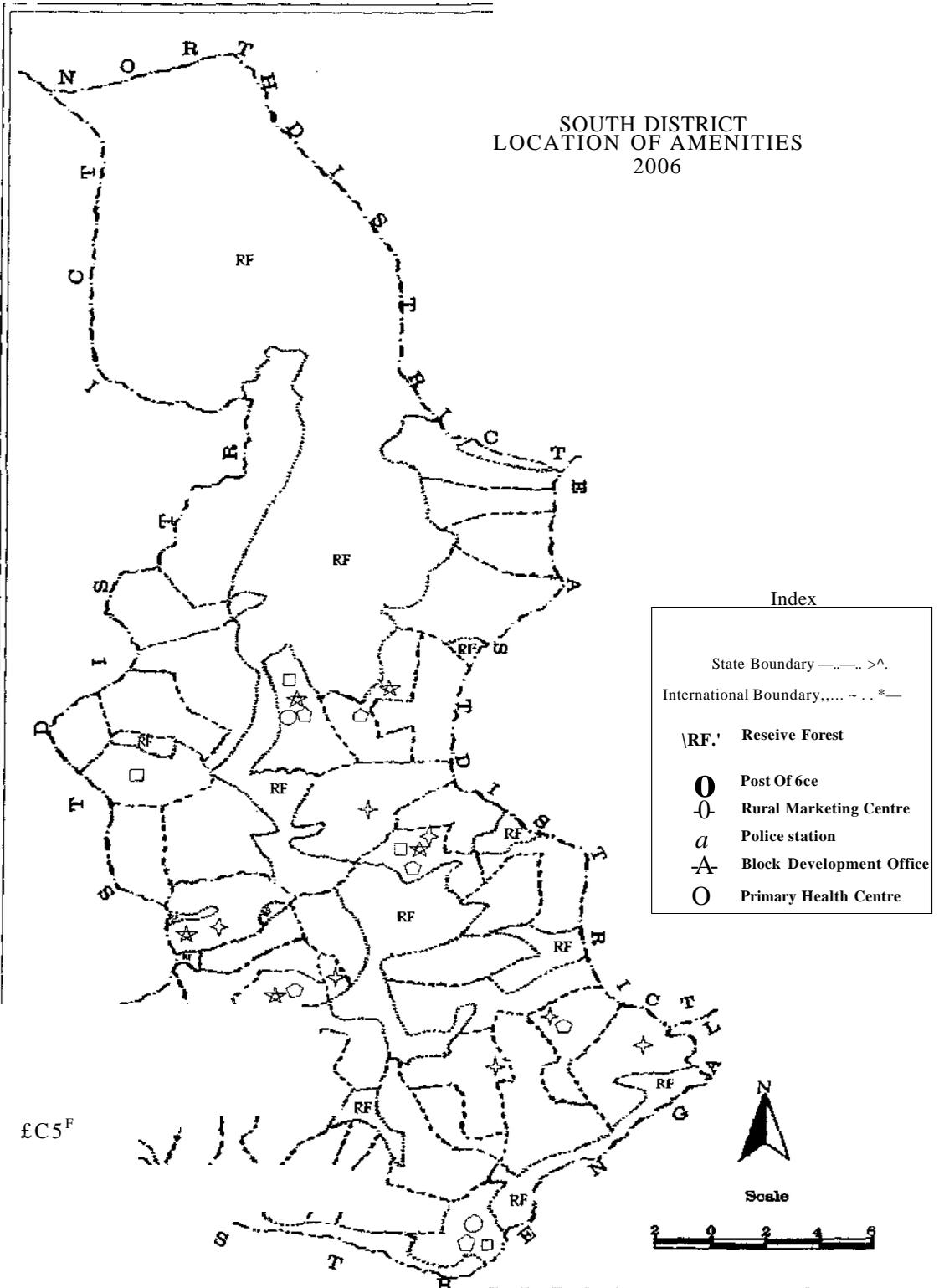


Fig 6.3

6.5 FINANCIAL INFRASTRUCTURE

Finance is a significant factor in any kind of development especially in agricultural development. Agricultural activity is concentrated in rural areas. Rural finance is a matter of great concern in an agrarian economy. It can be rightly said that the quantum of amount invested by financial institution can determine the level of agricultural development. Even it is a non-farm factor, but its contribution is immensely important.

The financial institution in the district may be divided into two types as;

- a) Banks, b) Co-operative - societies.

6.5.1 Banks

In the South District the number of banks is very few. There are 14 branches of banks. Of these SBI has 10 branches and among the rest 1 branch of Central Bank of India, 2 branches of Union Bank of India and 1 branch of United Bank of India. The SBI branches are located Namchi, Ravongla, Jorethang, Melli, Kewzing, Temi, Namthang, Singtam, Makha and Hingdam. Out of these branches Namchi has only core banking facility. The Union bank of India is situated at Namchi and Jorethang and UBI is located at Namchi only. The district headquarter Namchi has the highest number of bank facility.

In the South District, 33.53 percent of the accounts are occupied by agricultural sector 8.88 per cent by house hold industrial or secondary sectors and another 33.73 per cent by tertiary sector and remaining 23.84 per cent are instructed for non priority sector. This means that maximum accounts are occupied by primary and secondary sector of economy. But the financial support given by these banks in agricultural and allied sectors is not quite satisfactory. There is not much credit given to the farmers for agricultural development. Their nature of operation is only for urban oriented and mainly depends up on the quick recovery and high interest returns like housing loan, personal loans, vehicle loans etc. This nature of giving loans has suffered the small and marginal farmers. In the district, agricultural and allied activities loan is given only by recently open single co-operative bank SISCO (Sikkim co-operative bank limited). So far 1520 small and medium farmers get benefited from the banks in various field especially agriculture and allied activity. The Kishan Credit System, by which benefit the farmer directly, has been distributed by SISCO numbering 1039 till date, Altogether SISCO has spent money amounting up to 300

cores in South Sikkim in the field of training of skill development, mechanization of farms, technical supports etc.

6.5.2 Co-operative Societies

The discussion shows that the financial institutional supports in agriculture in the South District are not very strong. There is still a gap between the financial institution and farmers. The gap can be only filled up by strong co-operative movement. In the state, the co-operative movement starts with the enactment of Sikkim co-operative society's act 1978. The state has adopted two tier co-operative structures at state level, there are apex co-operative and at district level primary co-operative society. As the 80 per cent of the population in the district engaged in agriculture and allied activities, most of the members of the co-operative are farmers.

Table 6.6 Trends of growth of Co-Operative Society in South District.

Types of co-operative societies	2001	2002	2003	2004	2005	2005 (%)
Co-operative bank.	--	—	—	—	1	
Primary agricultural co-operative society	39	44	45	46	47	31.75
Farmer co-operative society	07	08	08	12	13	8.87
Non agricultural credit co-operative society	—	01	01	01	01	0.67
Labour contract co-operative society	—	—	—	—	06	4.05
Diary Co-operative Society.	25	25	28	29	33	22.29
Live stock co-operative society	02	02	06	06	08	5.40
Weavers co-operative society	01	01	01	01	03	2.04
	05	05	05	06	06	4.07
Consumer co-operative society	19	15	15	15	14	9.45
Marketing co-operative society	02	02	02	02	17	11.58
Total	100	104	111	118	148	100.00

* Source: Department of Co-operative, Govt of Sikkim. 2006.

The number of co-operative societies in South District is increasing (Table 6.7). It is 100, 103, 111, 118, and 148 in 2001,2002,2003,2004 and 2005 respectively. But the nature of co-operative society also varies. The largest share of co-operative society is occupied by Primary Agricultural Co-operative Society having 31.15 percent of the total co-operative societies of the district in 2005. The next higher percentage i.e. 22.29 per cent is also occupied by Diary Union Society. Another Agricultural Allied Co-operative Society is farmers and occupied 8.87 per cent. The third largest percentage of co-operative society is constituted by Marketing Co-

operative Society. Of these 12 are engaged in horticulture, floriculture and organic manure development. The 11th plan allocation of 624 lakhs for the development of co-operative society in the district for co-operative education, training, infrastructure, information and publicity, credit, consumer, go down and storage will certainly help the small and marginal farmers of the district.

6.6 RURAL DEVELOPEMNT

Sikkim is one of the least urbanised states in India. The composition of urban population is 11.10 per cent Census 2001. The case is same for South District, where 97 per cent of the population lived in rural area. The percentage rightly shows the state of development in the district. In order to change the scenario, 70 percent of state planning budget is devoted for various planning and programme of rural development. With the successful implementation of Panchatyati Raj system in the state, various planning and policies have been implemented for up lifting the economy of the rural population through sustainable income generation, development of village economy, and creation of rural infrastructure, creation of employment opportunities in rural areas, provide infrastructure for administrative and developmental activities, provision of safe drinking water, construction of road and communication, socio economic development giving prior importance to the economically weaker rural population.

Table 6.7 District Wise Zilla and Gram Panchayat in Sikkim,2005.

District	No of Zilla Panchayat	Total (%)	No of Gram Panchayat	Total (%)	Panchayat Ghar	No of CIC	No of Block Development office
North	20	20	20	12.05	15	2	6
West	25	25	51	30.72	25	8	10
South	24	24	45	27.11	37	6	10
East	31	31	50	30.12	25	4	10
Total	100	100.00	166	100.00	102	20	36

* Source: economic Survey (DES/ME) Govt, of Sikkim 2(006-07.

The pace of rural development is gaining momentum with the enactment of the Sikkim Panchayati Raj Act 1993 accommodating the provision of 73rd Amendment Bill. Table 5.9 represents the Panchayati Raj System in Sikkim. South district has 24 per cent of Zilla Panchayat, 27 per cent of Gram Panchayats and highest number of Panchayat Ghars in the state. Besides, 6 block development offices located one each in Yanyang, Temi-Tarku, Wak, Sumbuk, Namchi and Rong are located

In South District the grass root level developmental programmes and planning is implemented by Zila and Gram Panchat. Gram Panchayat and Zilla Panchayat are now have the power to prepare , sanction , supervised and implement the scheme up to rupees 3 lakhs and 10 lakhs in their own area under the supervision of Block Development Officer. The Block Development Office will be the nodal agency for implementations of various programmes at grass root level. All these tiers of rural development institutions have monitoring body known as Social-Audit cum Vigilance committee in each Gram Panchayat unit.

The institutional infrastructure in the district is very strong and devaluation of power and peoples participation in developmental planning will certainly achieved the goal of economic development.

6.7 AGRICULTURAL INPUT

Agricultural input is one of the important pre requisites as well as indicator of agricultural development. Out of the various components of inputs HYV, fertilizer, irrigation and power facility are the four most important items. The consumption pattern of these four inputs indicates the productivity level, development of agriculture, economic condition as well as the socio cultural aspects of the farmers.

In the district, there is discrepancy of information for the fertilizer consumption pattern, because of the declaration of the state as organic state and banning the use of chemical fertilizer and withdrawing of subsidy given to the chemical fertilizer by Government create the lack of information as the farmers can not instantly shift to the use of organic manure because of lack of scientific knowledge and high cost. Again due to the withdrawing of subsidy and banning farmers can not use the chemical fertilizer. These transition periods become a problem for collecting the data.

6.7.1 HYV Seeds

The total area under HYV seed coverage in the district is decreasing in the district. (Table5.11). But within the crops, the area under HYV seed coverage is varied. In 1999-2000, the highest HYV seed cover is occupied by Maize having occupying 54.60 per cent of the total HYV seed area. Again wheat, oil seed and rice occupy 19.43%, 14.22% and 10% respectively. The remaining crops occupy less than 1per cent of the total HYV seeds crop area of the district. In 2006-07, the order and

sequences of the crops under the HYV seeds is same but their percentage coverage is changed. Of the eight selected crops, three crops i.e. rice, pulses and oil seed has registered increase from 1999-2000 to 2006-07. The highest area under HYV is recorded by pulses having recorded more than 100 percent, the second highest is occupy by oil seed occupying 13.28 per cent and rice has only 1 per cent increase in HYV area.

Table 6.8 HYV Seeds Coverage in South District, (1999-2000 to 2006-07)

Crop	1999-2000		2006-2007		Changes in (%) 1999-2000 to 2006-07
	Area in (ha)	Total (%)	Area in (ha)	Total (%)	
Rice	1000	10.00	1010	10.40	1.00
Wheat	1940	19.43	1590	16.38	-18.04
Maize	5430	54.60	5370	55.36	-1.10
Finger Millet	60	0.60	24	0.24	-60.00
Barley	50	0.50	08	0.08	-84.00
Urad	40	0.40	07	0.07	-82.50
Pulses	35	0.35	76	0.78	117
Oil Seed	1430	14.22	1620	16.69	13.28
Total	9985	100.00	9720	100.00	

^Source: Annual reports, Department of Agriculture. Govt of Sikkim. 1999-2000 & 2006-07.

The area under HYV seed is decrease in wheat, maize, finger millet, barley and urad cultivated area. The highest decrease is recorded in barley area having 84% and lowest decrease is recorded in maize cultivated area 1.10%.

The figure shows that the area under HYV seeds in the district is decreasing due to various factors. The total area under HYV seeds was 9985 hectares in 1999-2000 and 9705 in 2006-07.

6.7.2 Fertilizers

Fertilizer is the second most important input for agricultural development. The changes of agricultural policy in the state for organic farming and banning of chemical fertilizers as well as withdrawal of subsidy has make a gap for reliable source and data about the consumption pattern of fertilizer in the district. The transition period from chemical fertilizer to organic has created problem to the farmers. Because of the various factors like lack of knowledge about how to use the new fertilizer, where to get, and high price of the organic fertilizer adversely affect to the agricultural productivity in the district. The shifting of chemical fertilizer to bio-fertilizer needs the cultivated field to left out for some time. During this time, farmer

has nothing to do which affects the economic condition of the farmers. According to the annual report by department of food security and agricultural development 2006-07, demonstration for the used of organic fertilizer has conducted in 262, 50 hectares of land, 150 hectares for bio-fertilizer, construction of rural composting cum urine pit 700 numbers and 1350 numbers of vermiculture pit has been so far constructed, besides training of field functionary and farmers has just started. Even though the benefit of organic farming is immensely benefited to the farmers in the long run but in the present scenario, it creates a problem to the farmers and development of agriculture in the district.

6.7.3 Irrigation

Irrigation is the third most important input for agricultural development. The provision of irrigation facility is very much necessary for the successful agricultural practice, especially in the South District where 80 per cent of the total area is under the dry field.

Table 6.9 Irrigated Area in the South District,2001

Irrigated area in (hectare)	Category	No of Revenue Blocks	Revenue Blocks %
<10	Very low	50	34.48
10-20	Low	20	13.79
20-30	Medium	12	8.27
30 -- 40	High	07	4.85
>40	Very high	16	11.30
Non available		40	27.58
Totaf		145	100.00

* Source: Census of Sikkim.2001.

According to 2001 Census, 34.48 per cent of the revenue blocks have very low (<10%) irrigated area. Another 13.79 per cent of the revenue blocks are under the category of low (10-20%) irrigated area and 8.27 per cent are under the category of medium (20 -30 %). Around 5 per cent of the revenue blocks has high (30-40%) irrigated area and more than 11 per cent of the revenue blocks have very high (>40%) irrigated area. The percentage of revenue blocks where the irrigation facility is not available is more than 27 per cent of the total revenue blocks. The picture of irrigation facility is very low and facility not available constitutes more than 75 per cent of the total cultivated area of the district. Table6.9

The available irrigation facility in the district can be group under the three category viz., i) Accelerated irrigation benefit programme (AIBP), ii) Small scheme

under taken by NABARD and iii) Private channel. The AIBP constitutes 87.5 percent of the total projects and small project has occupied 9 percent and again the private has occupied only 6 per cent.



Photograph 6.5 Water Conservation For Irrigation

The important method of irrigation in the district besides canal irrigation is sprinkled and drip irrigation methods. Sprinkle and drip irrigation methods occupy 60 per cent of irrigation facility concentrating in the higher altitudes and canal irrigation occupy 40 per cent of the total cultivated area of the district and are found in the lower altitude of the district especially in the river valley. The irrigation facility is not much developed in the district. More planning and efforts from the government side as well as common public contribution like development of small watershed, joint forest management for controlling the flow of water and retention will help the development of irrigation in the district.

6.7.4 Power

Power is also an important component of the agricultural development, especially in mechanisation of farming. The type of power use for agricultural purpose in the district can be grouped into three categories viz., electricity, animal power and man power. Out of total revenue blocks, there is not a single revenue block where the electricity is wholly used for agricultural purpose in spite of huge amount of electricity facility in the district. Only 39 percent of the electric consumption of the district is used for households' consumption, other purpose and agriculture. The most important source of power in agriculture in the district is human labours, due to the

difficult terrain. Animal power is the second most important power for agriculture. There are more than 2289 pairs of oxen and he buffaloes these have been using power in the district for agricultural tilling. Animal power is also very suitable for the hilly terrain because the use of machines in the hilly terrain has face numerable problems and due to high cost most of the farmers of district cannot afford the machines.

The agricultural input in the district is not up to the mark except in the category of HYV seeds. This shows that the state of agricultural development in the district is sedentary in nature. As the consumption of fertilizer, the low irrigational facility and utilisation of power which is still depends on human labours does not have any significant impact on the development of agriculture in the district.

6.8 DRINKING WATER

Almost all the inhabitant revenue blocks of the district has avail the dinking water facility. The sources of safe dinking water in the district depend on spring water and tap. (Census 2001). The provision of drinking water in the district is provided by two Governmental agency i.e. Rural Development Department in rural areas and Public Health Engineering Department in town and market place. In 1981, only 52 revenue blocks (38.52%) were connected with government tap water. The rest of the revenue blocks were dependent completely on spring. According to report of (DESME) 2007, around 139 revenue blocks are connected by tap drinking water whether it is from spring or reservoir, and so far 3990 household has been connected by tap water in towns/ market place by Public Health Engineering Department. (Table5.3). But the problem of drinking water scarcity is still prevailed in the district due to large gap in demand and supply. During the summer, the water sources are dried up due to deforestation which leads decrease the capacity of soil to retain water. Increase of population pressure, especially in the southern part of the district or Namchi Sub-division faces the problem of scarcity of dinking water. Even during the rainy seasons due to the disturbance at the source by landslide the problem of scarcity of drinking water for 3 or 4 days is a common phenomenon in the district. The problem of sewage contamination prevails in the towns and market places due to lack of proper planning. Thus, efforts are necessary on the part of government to ensure developmental work to provide adequate dinking water to the villagers.

Table 6.10 House Hold Distribution of Dinking Water in Selected Towns by PHED, 2007

Town /Place	No of Connection	Town/ Place	No of Connection
Namchi Bazaar	1480	Yangang	287
Temi	90	Ravongla	345
Damthang	32	Kewzing	98
Namthang	53	Melli	56
Majitar	360	Jorethang	1189
Total	2015		1975

*Source: PHED, South District. 2007

6.9 ELECTICITY(House hold Connection)

Electricity is one of the most important infrastructure elements for economic development. The availability of electricity reduces the pressure on the natural resources like forest and mineral to provide fuel in any area.

Table.6.11 Sources of House holds Lighting in South Distict.2001

Source	Urban House Hold	Percentage	Rural House Hold	Percentage
Electricity	794	99.37	17396	70.29
K.Oil	4	0.5	7138	28.81
Solar Energy	Nil	Nil	29	0.12
Other Oil	Nil	Nil	10	0.04
Any Other	1	0.13	10	0.04
No Facility	Nil	Nil	191	0.70
Total	799	100.00	24774	100.00

*Source: Census of Sikkim.2001.

Table 6.11 shows that the households lighting facilities in the district. Both in urban and rural areas electricity has occupied chunk of the percentage. In urban area electricity occupy more than 99% or 794 households, where as in rural households electricity occupied 70.29%. Within the districts revenue blocks of Boomtar, Singithang, Tinzir, Joethang, Melli, Lakeship and Ravongla have same percent household electrification. In 2007 up to 279663 MW units has been distributed during the winter season. Besides electricity kerosene oil is also use as one of the important means of household lighting in the district occupying 0.5% in urban area and 28%in rural area. The remaining house holds both in rural and urban area are depends up on the others sources of lighting. One of the notable features of household lighting in the district is that solar energy; it constitutes 0.12% of rural house hold lighting. The rural electrification in the district will be further improve in the current financial year up to same percent under the RGGVY programme and most of the substations will be

up graded 66kv from 1 lkv. The infrastructural facility of power in the district is very significant amongst the other three district of the State.

6.10 HOUSING

In the South District, general characteristics of housing facility is mainly made up of three types of dwelling viz., pucca, Semi- pucca and kutchha. (Table 5.15). The pucca house occupy almost 20 percent of all the house types, in the district and most of these houses are found in the four towns and class III bazaars of the district. The semi-pucca houses have occupied more than 51 per cent of the total houses in the district. Usually these houses are concentrated in sub urban fringe of the towns and rural market centres. The kutchha houses have constituted around 29 per cent of the total house type of the district.

Table 6.12 House Type in South District, 2007.

House Type	No of House	Total %	Facility	No of House	Total %
Pucca	4744	19.90	With toilet facility	16721	70.16
Semi-Pucca	12249	51.40	Without toilet facility	7109	28.84
Kutchha	6837	28.70	With Birth Room	15470	64.92
			With out birth room	8360	45.08
Total	23830	100.00			

* Source: DESME, 2007.

Out of total houses 70.16 % have toilet facility and 28.84% did not have the toilet facility. Again, 64.92% have bath room facility and another 45% does not have the bath room facility. Toilet and Bath room facilities are unavailable in the houses located in the villages. Another feature of housing in the district is that most of the semi-pucca and kucha houses which are located in villages have separate kitchen facility. But those houses located near the towns and market places do not have separate kitchen facility due to lack of space. One of the important factors for development of house type in the district is affected by lack of transportation facility. Most of the building materials like, bricks, rod, and cements has to be imported from outside the state. The revenue blocks where the road net work is not properly developed the type of house prevail in the area is semi-pucca and kutchha in nature because of high transportation cost. Even the rural folks who can afford for pucca building has been discourage due to this factor and ultimately cling to the old type of house which can be easily construct by the locally available materials.



Photograph 6.6 Modern House

CONCLUSION

The infrastructural facilities found in the district are improving gradually. In the field of higher education extra ordinary development is observed as establishing of Central University at Yanyang, computer training institutes at Shalghari and number of high and higher secondary is increasing very fast. Same trend is observed in the telecommunication sector achieving the highest telephone density in the country. In the field of health care facility, especially the mother and child healthcare and family planning many policies are implementing. But still has to improve in the filed. The transport is another field which indicates increasing trend having with highest road density among the district of the state. Higher rate of electrification, construction of rural market centres, with strong and solid decentralisation of policy making by full implementation of Panchayati Raj system will certainly boost the economic development of the district.

But still some infrastructure facilities shows inadequate and need more attention especially the financial sector and irrigational facilities. In the district, financial input in agricultural sector is very negligible and development of irrigational facility very low. These problems need proper address and attention. Without proper and adequate infrastructural facility (basic production and marketing infrastructure

and mechanism) development of agriculture in the hilly area like South District will be a Herculean task. These problems can be solved through public private participation and involvement of NGO's, Social organization and co-operative societies while formulating planning and policy and reformation of public support systems. In the district a concrete long term irrigational planning mechanism is urgently required involving the various department and agencies.

CHAPTER-VII

MAJOR PROBLEMS OF AGRICULTURAL DEVELOPMENT

INTRODUCTION

Agriculture is controlled by a host of natural conditions like, soil and other characteristics like rainfall, availability of soil moisture, and duration of sun shine etc. The hilly terrain conditions of the district have added more problems like variation in sunshine, which leads to longer duration of maturing of the crops. Another significant problem is slope. Due to high degree of slope the cultured fields are small and terraced cultivation are the common feature in this region. From the study, it is revealed that each part of the district faces a problem due to variation in physiographic, climate, soil, and water. These entire problems affect the agricultural development in the district. These problems can be broadly divided into three categories viz. physical, institutional and cultural.

7.1 PHYSICAL CONSTRAINTS IN AGRICULTURE

The physical constraint in agriculture can be divided into a number of categories on the basis of their origin. (Jana 1981)

These are:

- i) Topography
- ii Rainfall and sun shine
- iii) Deforestation
- iv). Soil fertility and soil erosion.

7.1.1 Topography

In the district agriculture is comparatively easier in the lower altitude of river valleys (<600m) and lower hills where the slope is gentle. These areas are located in the narrow tract of Rangit and Tista rivers bordering the district from three sides, with fertile alluvial soil field. In central part of the district, the slope is moderately gentle and terrace framing is practice, but the percentage of soil erosion is very high. In the northern part, the topography is mostly made up of rugged, escarpment and ridge with very steep slope (>59%). More over this part has high drainage density and relative relief with large tract of luxurious forest cover. These varied topographic conditions lead to the unique pattern of agriculture, from large permanent cultivated field in the

river valley to terrace farming in the middle altitude with low productivity. The type of crops cultivated in the district is also different along with the variations in physiographic conditions. In lower altitude, rice, maize and pulse are main crops and in higher altitude cash crops like cardamom, ginger and horticulture crops are cultivated. As a result, the economic conditions of cultivators and of land tenure system are widely varied in the district. (Jana 1981)

7.1.2 Uneven Distribution of Rainfall and Sunshine

The district enjoys the sub-tropical climatic conditions. The main characteristic of rainfall is control by variations in altitude and location. The rainfall ranges between 2400mm and 2800mm annually. But the rainfall pattern is uneven. The peak rainfall occurs during the months of June to September. It is low in the southern parts especially Namchi sub-division and the Ravongla sub-division has received higher amount of rainfall. This means that the distribution of soil moisture is not uniform throughout the district. Besides, the pattern of rainfall is fluctuated year by year. In some year, the rainfall is heavy causing landslide and havoc to the life and hampering agricultural practice. And in some year, the rainfall is less causing dryness affecting the survival of cultivated crops.

Along with rainfall is another important factor of climate which directly or indirectly influences the agricultural practice is sunshine. Heat and temperature is very important for germination and photosynthesis process, which leads to the growth and survival of plants and crops. The district experiences variation in sunshine, lower is the altitude higher is the temperature and longer the duration of sunshine and higher is the altitude lower is the temperature and shorter duration of sunshine. The variation in sunshine leads to the variation of cropping pattern and ripening season. In the southern part especially in the river valleys and lower hills the sowing and ripening of crops take shorter due to higher temperature and longer duration of sunshine and it constitutes only 40 percent of the total cultivated area. In the middle and higher altitude which is found in central and northern parts of the district experience shorter duration of sunshine and low temperature which cause longer duration of sowing and ripening and these areas occupied 60 percent of the cultivated area.

The peculiar type of the physiographic and climatic conditions prevails in the district has rise the problem of selecting crop which can be suited in this specific condition for maximum utilization of available cultivated land for increasing

productivity level. As well as the adaptation of locally suited cultivation methods will get booster productivity of the district.

7.1.3 Deforestation

Deforestation is another physical problem exists in South District. The main cause of deforestation is over grazing, used of firewood as fuel and excessive commercial exploitation of forest etc. Of which the impact of overgrazing and exploitation of farm fodder for deforestation is decreasing considerably, but the reckless cutting of woods for fire wood, wood charcoal, and raw material for building construction is increasing in the district. During the winter season, most of the villagers use fire wood for heating, cooking, and other purpose even the government provide LPG free of cost. In the town, the demand for charcoal is very high during the winter season for warming up because use of electricity is costlier. Beside, with the expansion of town the number of building is also increased and these leads to higher demand for wood as building materials. Another cause of deforestation is that lack of transparency in forest policy. There is not a single saw mill and wood show room where local people buy woods when ever they need in reasonable price. Due to banning and lack of this facility, villagers have to take permission form the competent authority for cutting down tree. Many a time villagers has cut woods beyond permit and sale the wood in black market in absorbent price. In the district, there is still some persons whose main business is selling woods in black market and earn their livelihood.

7.1.4 Loss of Fertile Soil

Successful practice of agriculture depends on the fertility of soil. The fertility of soil is different in different parts of the district. The general characteristic of soil in the district is that, in the upper part of the slope there is formation of washed off soils and towards the base of the slope there is formation of washed in soils. In terms of soil property and chemical composition, the soil of South District is acidic and low organic composition. As the formation of organic matter in the soil is a biological process, the low temperature at higher altitude of northern and central parts has the experience of slow decomposition rate restricting the microbial activities causing low organic composition. Towards the south where the temperature is higher

the microbial activities are also high and the organic composition is also rapid. Due to variation of temperature in the district, the existence of organic matters in the soil is high in the river valley, moderate in the middle altitude and very low or almost less in the extreme northern parts. These phenomena also create the variation of soil fertility. The acidic nature and low organic composition of the soil character makes problem for the development of agriculture in the district.

One of the menaces in agriculture is soil erosion. Soil erosion is caused by various factors like climatic condition, topography of land, type and area of drainage, nature and extent of vegetation cover and the physio-chemical constituents of soil. Out of the total cultivated area of the district, 80 per cent of the area is affected by soil erosion. In the southern part of the district, the nature of the soil erosion is moderate and loss of top soil is caused by deforestation and agricultural practice. The middle part of the district, soil erosion has the characteristics of severe loss of top soil due to water erosion of dominant extent also caused by deforestation and agricultural practice. In the northern part of the district the soil erosion has stable terrain with moderate loss of top soil. (Das, Sarkar and Seghal 1995). Thus the main character of soil erosion is loss of top soil in the district. It is known fact that once the top soil is lost it is irreversible particularly, where a top fertile soil is replaced by a compact acidic sub-soil. The rate of soil degradation by different process is generally increased by using land for what ever it is not capable of and unsuitable methods of soil and crop management. Consequently, soil degradation set in resulting in wide spread occurrence of sheet and gully erosion and ultimately encroachment by silt on highly eroded land of middle and northern part where the swift streams are flows.

Another factor of soil degradation is landslide. It is considered to be a type of slope failure in which movement take place along a single or several sets of discrete shear plane. The cause of landslide in the district is deforestation and lack of scientific methods in infrastructural development especially for the construction of road network. Still in the district high dependency on the forest resources for fodder, commercial exploitation and over grazing prevails, which cause exposing of rocks causing ultimately landslide. Besides, the construction of new road network slopes has been cut leaving the back side of the road to more than 90° where landslide can be initiated. If these back side cutting is made into 45° the intensity of landslide may be less. The main cause of landslide in the district is due to this nature. Land slide is occurred in the blocks of Lingding, Upper Manzing, Temi, Tarku, Pakzer, Boomtar,

and Wak. In the district, land slide is usually occurred during rainy season, after a long rainy days and alternate sunny day due to differential hydraulic pressure. The important consequence of land'slide is loss of life, loss of agricultural land and adverse affect on fertility of soil which damage to forest area and its wealth.

7.2 INSTITUTIONAL PROBLEMS

Physical factor does not solely control the development of agriculture in an area. Agricultural development also involved complex process and procedure of institutional features. Amongst the important institutional factors which contribute to the development of agriculture are; i) Land right and ownership ii) Size of holding and its fragmentation iii) Land tenure system iv) Labour availability

7.2.1 Land Right and Ownership System

Historically, the back ground of land rights and ownership in the state shows, that there is no clear fact available to trace out the system of settlement in olden days in South District and Sikkim as a whole. It is however, appeared from the history of Sikkim that during the regime of Chandra Palla Dynasty, the system of measuring the size land Dhoor or pace of land and right of enjoying the taxes accruing from the tenant who lived in that land was in existence in the state. During the time of Namgyal Dansty (1641 AD.) the Kazis were holding the grant of land from the former Maharajas, some as confirmation of their hereditary title on the land held by them, some as reward for service and some as a special inducement. Later on to encourage settlement the lease of some of the areas were also transfer to Nepali landholders. During the tenure of Bengal Government (1889 to 1895) and again (1906-1917) the state was under the direct superintendency of Government of India period that settlement was made with all the landholder who were then found in possession of their land in the state by issue of lease deeds (renewable). This leads to the emergence of Zamindari system of ownership in the state. The distinctive feature of zamindari system in the state was that land holder was bound to the land for payment of revenue amount for the whole term of settlement. The holder could not at his wishes relinquish the estate which means that there is a contract between the holder and the state and for this; the landholder has to pay a fixed sum as land revenue besides collection from the estate. This shows that all the land in the state during these periods belongs to the state.

The introduction of land tenancy system after 1975 has abolished the Zamindari system and changes the right, ownership rights of the landholders. This leads to demise the land by government to the individual properties in different holdings. Again, the right and status of the tenant are established.

The land ownership system in the district is two types as i) Primary holder and ii) Secondary holder. The primary holder includes bustywala (villagers) or the farmer in the village who own the land in their name and the landlords who has given their land to tenant on lease. The secondary owner is two types locally known as Kuatidar and Adiadar. Kuatidars are those people who engaged to cultivate on condition of rendering a stipulated amount of crops or cash to the primary holders. And Adhiadar are those persons who engaged to cultivate on condition of rendering half the produce to the primary holders.

The law of the state has also protected the tribal ownership rights for Bhutia and Lepcha community. The government prohibit land alienation by these to community to other community and the civil court are also debarred from sanctioning sales of land to other communities another peculiar protection is that land which is earlier settled by these two communities can not be settled by other community with out permission from Government..

7.2.2 Size of Land Holding

The picture of land holding has also unique character in the district. According to the "law of limitation" 1924, the ceiling of land holding on agricultural land was fixed as under:-

- i) Bustiwala (Raiyot) - 40 hectares.
- ii) Mondals « 60 hectares.
- iii) Kazis, Thikadar (landlords) - 200 to 400 hectares.

"The land holding system was again modified the rayots are allow to perchance land up to 30 acres of land in the name of each member of his family and rayots whose holding is more than 15 hectares of land are allow to shale of land. This system of holding was further modified by land reform act of 1977. which has fixed the limit of 36 standard hectares of land for a family consisting of 5 members, and in the case of family having more than 5 members can hold the land of 6 hectares of land for every increased number of family their ceiling should not be more than 60

hectares .But these limitations are not bound to the Kazis and Thikadars. The land holding pattern show that there is no uniform pattern in the district

The size of the operational holdings is also another important factor for which influence the farming decision.

Table 7.1 show the operational holding pattern and fragmentation of land holding in the South District.

The table reveals the following facts :-

i).In the district for all the categories of the number of holdings has fluctuating trend in 1977-78. It is 10,271 and had increased in 1980-81 to 16,340, but had decreased in 1995-96 12,854 and again it increased to 22796 in 2005-06. In the case of area of holdings out of the four recorded year only 1995-96 has decreased recording 29336 hectare, but other remaining years its show increasing trend as it is 24366.66 hectare in 1977-78 and 29498 hectare in 1980-81 and 30302 hectare in 2005-06.

ii). The category wise analysis of the distribution of land holdings reveals interesting facts. Out of all the holdings, marginal (<1 hectare) holding category total no of holding has ups and down trend having 29.03%, 43.23%, 43.97% , and 73.73% in 1977-78,1980-81,1995-96 and 2005-06 respectively. The area occupy by marginal farmers shows also fluctuating picture having 7.47%, 12.04%, 9.61% and 9.93% in 1977-78, 1980-81, 1995-96 and 2005-06 respectively.

iii). The highest percentage of holdings is found in the category of small holding (1-2 hectare). The category also has the fluctuating trend. The percentage of number of holding in 1977-78, 1980-81, 1995-96 and 2005-06 were 27.83%, 26.56%, 24.97% and 32.62 respectively. The area occupy by the small holdings has lesser percentage having 17.86%,21.14%, 18.52% and 18.55 % of the total holdings of 1977-78, 1980-81, 1995-96 and 2005-06 respectively.

iv). The semi-medium category has declining tendency both in the number of holdings and area of holdings in all the recorded years. The number of holdings is in semi-medium (2- 4 ha) category has 28.07%, 20.36%, 18.16% and 17.54% in 1977-78, 1980-81, 1995-96 and 2005-06 respectively and the area occupied by this category is also recorded decreasing trend having 34.42%, 31.51%, 26.81% and 25.98% in 1977-78,1980-81, 1995-96 and 2005-06 respectively. The significant changes are observed in 1980-81 to 1995-96.

Table 7.1 Pattern of Operational Holdings, South District 1977 - 78 & 2005 - 06

Type of holding	Size of holding in (ha)	1977-78		1980-81					
		No of Holding	Area of Holding	No of Holding	Area of Holding				
Marginal	< 1	2984	1752.51	7064	3552				
		(29.03)%	(7.47)%	(34.23)%	(12.04)%				
Small	1 - 2	2859	4140.81	4340	6238				
		(27.83)%	(17.98)%	(26.56)%	(21.14)%				
Semi-Medium	2 - 4	2884	8075	3328	9295				
		(28.07)%	(34.42)%	(20.36)%	(32.51)%				
Medium	4 - 10	1457	8298.98	1453	8306				
		(14.18)%	(35.38)	(8.89)%	(28.15)%				
Large	>10	87	1199.26	155	2107				
		(0.85)%	(5.11)	(0.95)%	(7.14)%				
All Category		10271	24366.66	16340	29498				
		(100.00)	(100.00)	(100.00)	(100.00)				

*Source: Agricultural Census of Sikkim, 1977-78, 1980-81, 1995-96 and Economic

v).The medium category (4-10 ha) has different type of trend in total number of holdings and area occupy by the category. The total number of holdings in this category has fluctuating trend having 14.18%, 8.89%, 10.00%, and 8.76% in 1977-78, 1980-81, 1995-96 and 2005-06 respectively. Where as area occupy by medium category shows decreasing trend having 35.38%, 28.15%, 24.34% and 24.20% respectively.

vi).The changing pattern of large category (>10 hectare) shows that the consolidation of holdings in this category. In the category, both the area of holdings as well as number of holdings is increasing. The percentage of total number of holdings is 0.85%, 0.95%, 2.96% and 5.34% and area occupy by large category are as 5.11%, 7.14%, 21.33% and 21.37 % respectively in all the recorded years.

vii).The marginal and small holders together occupy more than 50 per cent than the other three categories and increasing trend in these two category shows the fragmentation of holdings is still a character in the district. And the higher percentage in these two categories also reveals the fact that the development and mechanization of farming is very slow and negligible in the district.

viii).Another important fact reveals by the discussion is that of consolidation of holding is observed in the category of large holding.

7.2.3 Land Tenure

The land tenure system exists in the district like the land tenure system exists in other parts of the country. In the district, there are two types of tenants viz, Kutiadar and Ahiadar. But there are various laws which control the system of leasing to the tenants. Any person cant be become tenant of he/she has own land more than six hectares of land means that tenants should owned less than six hectares of land or a land less labour. Another important feature is that any persons who have own land less than six hectares of land can not lend his/her land to tenant.

Besides any persons who are outsider can not became a tenant. But in reality it is not true. Most of the Kutiadars and Adhiadars are outsiders coming from Nepal and Bhutan. Besides, another peculiar type of land tenant system was exists in the district. They are Nangjen and Charey. The first one is selfdom and second one is regular and hereditary servant. Both of them possesses land from the land lord or Bustywala for cultivation but does not retain any thing after ripening the crops, their expenses are

borne by the owner of the land. Most of these systems were followed by monastery. Now, these two systems were abolished and freed them. The government allow them to acquire the land in their possession.

The feature of protection for tenants rights is very interesting, According to Sikkim Cultivators Protection Act 1975. "That any owner of the land is not entitled to terminate the cultivators of his/her land except in execution of an order made by prescribe authority on the ground that the cultivator has without any reasonable case failed to cultivate the land". But this protection has meaning less as the same act stated that the agreement between Kutiadar and Adhiadars and owner of the land is only for one agricultural season, there after left at the will of the primary holders. Its means that in actual senses there is not any protection of tenants rights. These hamper the agricultural production.

Table 7.2 Leased Holdings in South District.

Category	1980-81				1995-96			
	No of holding	Total (%)	Area in (ha)	Total (%)	No of holding	Total (%)	Area In (ha)	Total (%)
Marginal	3048	58.42	1381	21.54	1460	69.19	519	22.00
Small	1231	23.59	1719	26.81	421	19.95	578	24.56
Semi-medium	708	13.56	1954	30.48	172	8.15	202	8.56
Medium	218	4.17	1179	18.40	45	2.13	240	10.17
Large	14	0.26	178	2.77	12	0.56	558	23.65
Total	5217	100.00	6411	100.00	2110	100.00	2359	100.00

* Source: Agricultural Census of Sikkim .1980-81 & 1995-96.

Table 7.2 represents the wholly lease tenant and area under leased cultivation in the district. In 1980-81 the total percentage of leased tenants and leased area was 31.93% and 21.73%. But it is decreased in 1995-96 becoming 16.42 and 8.05%. The category- wise leased tenants and area under leased shows another picture. The category of marginal, small, semi-medium, medium and large leased tenant has occupied 58.42%, 20.59%, 13.56%, 4.17% and 0.26% respectively. But the percentage in all these categories shows another trend in 1995-96. In the case of marginal and large categories it increased from 1980-81 to 1995-96 having 69.19 per cent and 0.56 per cent respectively. The small, semi-medium and medium shows decreasing trend recording 19.95 %, 8.15% and 2.13 % respectively. And the area under the leased cultivation shows different picture. The category of marginal, small, semi-medium and large leased tenant cultivators constitute 21.54%, 26.81%, 30.48%,

18.40% and 2.77% in 1980-81. But in 1995-96, the marginal and large category shows increased percentage having recorded 22.0% and 23.65%, and the remaining categories of small, semi-medium and medium shows declining trends having recorded 24.50%, 6.56% and 10.17%.

The caste wise composition in leased tenants and area under leased also shows another picture. There are 30.71 per cent of scheduled caste lease tenants in total scheduled caste cultivators and the area occupy by scheduled caste lease tenants constitute 16.35% per cent to total scheduled caste cultivated area. The scheduled tribe lease cultivators and area cover by them is different from scheduled caste. The scheduled caste lease cultivators occupy only 4.33 per cent to the total scheduled tribe cultivators and the area occupy them also has only 4.37% to the total area cultivated by scheduled tribe in the district. The discussion shows that the number of leased tenant and area occupy them is decreasing.

7.2.4 Labour

Labour is also a major component in agricultural development and changing of cropping pattern of any region. In the district, the rate of mechanisation and use of improved farm equipment is very negligible due to physical constraints, these leads to the maximum dependence on manual labour specially crops like cardamom and horticulture cultivation. Every year during the month of June and July many farm labourer have to be imported from the neighbouring areas of Nepal and Bhutan for weeding and clearing the crops and again during the months of October and November a large number of labourers are required for plucking the seed and drying properly. Besides, a labourer is also required in other type of agricultural practice also. The average size of the family in the district is small; the numbers of persons who engaged in the agriculture and allied activities are limited and is decreasing over the year because of the pulling forces of labours by the towns. The increasing rate of literacy as well as urbanization leads to migration of younger generation to towns leaving the responsibility of agriculture and farms to elders' rural folks in the district. The other factors which cause the low percentage of labour in the district are low productivity, sedentary nature of agriculture, low wages and lesser percentage of land less labours.

Table 7.3. Agricultural Landless Labourer in South District.

Year	No of Agricultural Landless Labourer	Total populations (%)
1981	538	2.91
1991	1325	7.16
2001	2258	5.42
2005	2324	5.72

•Source: Census of Sikkim .1981, 91, 2001 & Economic Survey (DESME) 2005.

Table 6.3 shows the composition of agricultural labourers to the total cultivated farmers of the South District. The percentage of landless agricultural labourers in the district is 2.91%, 7.16%, 5.42% and 5.72% in 1981, 1991, 2002 and 2005. One of the important characteristics of the landless agricultural labourer in the district is that their percentage is very low in comparison to other districts, but their importance is very significant. Another factor of low agricultural labourers in the district is that the labourers after two or three agricultural seasons they become Kutiadar or Adhiadar because the owner has migrated in the towns due to various reasons. This low percentage of agricultural labourer indicates the low productivity in agriculture because mechanisation is very low and dependency upon the low agricultural labourer does not give desired result as the agriculture is labour intensive practice.

7.2 .5 Mechanisation in Agriculture

The technological inputs including the use of modern mechanised like tools, tractors, threshers, and other implements make it possible to carry out farming operations more quickly and efficiently for maximizing output. The degree of mechanisation in the South District is very negligible. This is due to various factors like physical, illiteracy, and poor economic conditions. Of these physical constraint is the most important factor of low degree of mechanisation in the district. As the district is located in the southern slope of Himalayan Mountain system, the cultivated fields are located in the steep slopes. These high degree slopes do not favour the use of machines for various purposes of agriculture. Besides, lack of knowledge and field experiment by the concerned department for locally suited tools and farm machines, if tried only the machines which are suited for plain areas discourage the mechanisation. The socio cultural and economic as well as the mindset of the farmers did not encourage the use of machine for higher agricultural productivity. Even the instrument and tools like sprayer which is used for spraying insecticide and fertiliser

to the field have to be hire from the block agricultural demonstration farm or block development office. .

The agricultural farms and block development office does not have adequate number of sprayer. Usually one agricultural farm and block development office has only 3 to 4 sprayer, which is not enough to cover all the blocks during the on set of agricultural seasons.

Table 7.4 Agricultural Tools in South District

Year	Iron Plough	Sprayer	Rubber Pipe for spring and drift irrigation.
2001	19	19	100
2005	30	30	300

* Source: Food Security and Agricultural Development Department, Govt of Sikkim.

Table 7.4 shows the status of important farm implement in the district. There are only 19 iron ploughs and same number of sprayer machines and 100 numbers of pipes for using irrigation, if these numbers of implements has distributed to 4 agricultural circles, only 4 to 5 implements and 50 pipes are in a circle. Again one circle has more than 30 revenue blocks it is not possible to cover such numbers by very little implements. Besides, higher number of farming community has hampered the mechanisation processes. Still large number of farmers clings to the traditional ploughing methods, than the iron or new type of plough due to physical conditions. The poor economic conditions are also another factor for hampering the process of mechanisation. Last not the least the large numbers of small holdings also affect the mechanisation process in the district.

Table 7.4a Agricultural Implement in South District, 2007

Manual and Animal Operated			Power Operated		
Implement	Number	Percentage	Implement	Number	Percentage
Seed fertilizer drill	101	0.98	Seed fertilizer drill	166	85.56
Thresher	7	0.07	Thresher	4	2.06
Plough (wooden)	4772	46.4	Mould plough	11	5.69
Plough (Steel)	12	0.11	Power tiller	6	3.09
Leveler	84	0.82	Disc harrows	2	1.03
Wet land puddler	12	0.12	Hay harvester	5	2.57
Ghani	21	0.20			
Chaff cutter	15	0.15			
Horticultural tools	5260	100.00			
Total	10284	100.00		194	100.00

* Source: Live stock census. Sikkim. 2003.and DESME. Govt of Sikkim.2007

Table 6.b represents the total agricultural implements use in the South District.. The manual and animal operated tools and implements constitute larger percentage. In manual and animal drawn plough occupied 46.4% and horticultural tools constitute 51.15% of the total implements. The remaining are constituted by seed fertilizer 0.98%, wet land puddler 0.12%, ghani 0.20%, and poultry chaff cutter 0.15%. The picture of power operated implements is very insignificant. Of these power seed fertilizer drill constitutes 85.56% of the total power operated implements and tools, power thresher 2.06%, mould plough 5.67, power tiller 3.09%, disc harrows 1.03% hay harvester 2.57%.

The picture reveals that of the total implement together manual, animal and power driven, the manual and animal driven has still constitutes 98% of the total implements use in the district. The fact also reveals that most of the policies and planning of mechanization in the district is not successful. One of the important factors of this situation of mechanization is the terrain conditions of the district, where the adoption of power operated implements are not suitable. Most of these implements are developed to suit the plain areas. Their modification with due consideration to local situation is strongly necessary. And they are not afforded by the small and marginal farmers of the district due to higher cost. So improvement of the traditional practice implements is the need of the hours

7.2.6 Lack of Irrigational Facilities

Lack of irrigation is one of the important problems faces by the framers of the district. The existing irrigational facility in the district is canals and springs which are entirely, depends up on the monsoon rain. The terrain condition does not allow water storage and streams are very swift and fast. Again, storage of large volume of water in hilly slope is a major problem and needs adequate technical know how. It can be rightly say that agriculture in the district is in the mercy of nature. During the rabi crop seasons, limited sprinkle and drift irrigation is use for cultivation of rabi crops from the natural storage like springs but due to the deforestation and infrastructural development the natural reservoirs of spring are destroyed and the volume of available spring water is decreasing. The rainfall distribution pattern in the district has varied due to the variation in altitude which adversely affects the cultivation of crops. The available water during the rainy seasons also can not be store and run down very

fast. The economic conditions of the farmers, also does not encourage for the large scale use of irrigation and lack of mechanisation like pump sets for lifting water does not exist in the district in spite of abundant power resource. The main practice of canal irrigation is also concentrated in the lower altitudes. Thus, the irrigation facility in the district is not developing up to the desired level which hampers the high productivity level of agriculture.

7.2.7 Lack of Financial Inputs

The district is lacking in the agricultural financial support mechanism. The higher rate of fragmentation of land holdings which leads to low productivity does not favour the inflow of financial investment in the district. The traditional farming system of sedentary nature, low adaptation of scientific methods of cultivation and mechanisation does not require huge capital investment in agriculture. Out of the total crops cultivated in the district, highest investment is found in ginger and cardamom cultivation. The volumes of investment in both the crops are different. Ginger attracts smaller volume and the cardamom has higher volume of investment because the ginger cultivated area in the district is lesser than the cardamom and needs intensive capital inputs.

The low of financial investment in the agricultural sector in the district is also caused by the lack of knowledge about the financial institutions' policies and facilities by the farmers of the district. Again, when the farmers approach the institutions for credit and loans, banks did not show enthusiasm because of the small nature of the loans and low return. Even granted, the farmers have to go through a long, tedious process of clearance that has discouraged the farmers to approach the financial institutions for loans. Instead, the farmers prefer to invest whatever they save and loan from the local money lenders, who lend loans of small amounts very readily but at a higher interest rate. These factors lead to the sedentary nature of agriculture in the district.

Thus, the role of financial inputs and financial institutions in the district has a limited role for agricultural development.

7.3 SOCIO-CULTURAL PROBLEMS

The process of decision making and implementation of agricultural practice in rural areas are very much influenced by social-cultural factors like religious importance of the crop, local demands and traditional values of the crops etc. The

socio-cultural influence changes of cropping pattern, crop diversification, and crop combination. In the district, traditional agricultural practice is still prevailed in almost all the villages. This is may be due to higher percentage of illiteracy in farming community. Usually, the farming community in the district does not take up the agriculture very seriously and they are easy going nature. Their main objective of agriculture is to survive and meet the day to day needs. Even local farmers did not bother to cultivate HYV seed which gave higher yields. Most of the framers thought that HYV seeds are preserved by using chemicals which is harmful to consumption after ripening the crops and higher cost of HYV seeds also affect the choice of crops. The concept is same in the case of chemical fertilizer. These problems are mainly arising from the lack of agri-extension service and financial in put. The degree of crop diversification is very low as the farmers prefer to cultivated the crops which they have through knowledge and want to use the seeds which they preserved for next year e.g. the cultivation of maize is still practice even its importance is decreased as a food crops and lesser market values, still in various religious ceremonies and traditional food item it is un avoidable item. Only a handful of farmers started to cultivate ginger instead of maize but their percentage is very low, these means that most of the farmers still wanted to preserved the traditionally important maize crop and cropping pattern. Another factor is that most of the farmers do not have the knowledge of newly develop methods of cultivation. The case is same is in crop combination also. Still in the district old age practices of maize- pulse domination prevail. The farmer does not want to shift the combination of maize- oilseed-ginger which gave more productivity and benefit. Thus it can be rightly concluded that traditional outlook of farming community is not changes much.

CONCLUSION

In the district, there is no significant agricultural development. The traditional practice of agriculture is still prevailed in the district, utilising the owned or lease land, limited family labour(with a few wage paid labour during peak season), owned or hire oxen power, owned seeds and limited quantity of organic manure from one's own reared animals. The used of high yielding variety seeds is decreasing in most of the crops. The percentage of cultivable land in the district is decreasing and fragmentation of land holdings is increasing due to encroachment of land for infrastructural development and increased in population in the district. The policy of

convening the state into total organic farming also adversely affects the development of agriculture. The farmers could not afford the costly organic fertilizer even though environmental friendly. Besides the technology and methods of using organic fertilizer is not filtered to the common farmers. Still farmers want to use the limited and easily available old age knowledge of manure and limited use of fertilizers. Mechanisation of farming is still in the primitive conditions, still the framers depends on old age implement due to lack of knowledge and physical limitation. The irrigation system is pathetic condition still using the old methods except changes of all season rubber pipes from bamboo for transporting water from source to field. Neither has strong financial and credit support.

In the district still scarcity of labour still prevails. The scenario is more deteriorating, as the younger generation have tendency to migrate to urban areas leaving the agricultural farming to older people, which is also not in the state of sound health.

CHAPTER -VIII

POLICIES AND STRATEGIES FOR THE AGRICULTURAL DEVELOPMENT

INTRODUCTION

Among the land resources agricultural land has played a vital role since time immemorial, owing to increasing population pressures on land and ever growing demands of food and raw materials, the agricultural developmental history in the district and state as a whole can be traced back to the beginning of planned economic development in Sikkim. The First Planned period is conceived in 1954 with the help of a technical team of planning commission of India. It was seven years planned period from 1954 to 1961. During this planned period, a separate directorate of agriculture and horticulture was formed. These first seven years plan was followed by three 5 years plan viz. 1961-66, 1966-71 and 1971-76. But during these three 5 years plan the main emphasis is only on the infrastructural development, except some improvement in the land tenure system.

The agricultural development in the district and state as a whole accelerated after merger the Sikkim state with India. The over all policies and planning for agricultural development in the South District can be discuss as;

1. Earlier Strategies or pre reform period (1975-1993)
2. Present Strategies or post reform period (1993-2007)
3. Future Strategies

8.1. EARLIER STRATEGIES OR PRE REFORM PERIOD (1975-1993)

This period is started from after merging the state with Indian Union in 1975. The development of agriculture was accelerated. A clear cut policy and planning in agricultural sector is emerged for the state, but there is no separate planning for district level, even though the state has been divided into four districts. Most of the policies and planning in this period are the continuation of the earlier policies of seven five years plan. Prior to 1975 there is uncertainties about land tenure right, negligible public investment, Zamindari system, over dependence on traditional methods of cultivation , low productivity, lack of market facility, low inputs and other institutional backwardness like ineffective structure of agriculture were prevails.

The initial phase of this period is main focus of policy and planning is more in establishing foundation for a strong administrative and agri-infrastructural development only. The policies like regional concept of agricultural development were initiated, dividing the whole state into various regional centers. The South District has been divided into two regional centers and one sub regional center where establish with 20VLW centers. The scenario is not much change in 1981 .A high level team for land use planning for the state was formed and drawn up a detail plan of action were suggested for various planning and policies for agricultural development in the state. Some of the important policies and planning suggested by the committee are, preparation of detail land use plan for the whole state, this plan should be in consideration and understanding the existing problem of state, like climatic condition, ecology, inventories of natural resources and infrastructural development, adoption of suitable crop and cropping system, classification of different physio-climatic zones, instruction of horticulture and starting of agro-forestry and farm forestry in the areas with 33% slope areas, Beside, encouragement of terrace farming, reclamation of land slide areas, liking up of knowledge gap, man power training and giving incentives. But the suggestion can not be considered as purely agricultural policy and planning because it is mostly focus on the overall economic policy of the stat. Following the suggestion made by the team, the important steps taken for the development of agriculture in the district are; establishing and strengthening the agricultural farms for the formulating a package of measures covering adoptive trial , demonstration, seed multiplication and prorogation of planting materials including distribution of agricultural material inputs through net work of centers, manure and fertilizer and controlling of diseases for various crops by spray, seed treatment, soil treatment and pest control and farmers training etc. Dry land development, water harvesting and introduction of HYV seeds are the main thrust of the period.

But the main problems is still persists like the lack of train main power, lack of extension service and ineffective management of water resource etc. leads to the vicious cycle of low production, clinging to traditional practice of agriculture and low income from the agriculture. Nevertheless this phase laid the foundation for the agricultural development in the district and state as a whole.

8.2. PRESENT STRATEGIES OR POST REFORM PERIOD (1993-2007)

In accordance with the structural adjustment programmed of the country after 1993 or liberalization programmed. The policy and planning in the district has change tremendously from the earlier period in this phase. The lacunas which arise in the earlier phase have been address in this period. The first half of this period is also the continuation of the earlier phase with little change of policy and planning but the main theme is the strengthening of agricultural administrative in the district. Some of the notable policy and planning is the policy for development of oilseed and pulse in the district beside the traditional maize and rice development. Soil conservation and watershed management are some of the key policy. The second half of this period, the main focus of the agricultural policy and planning is on the development of organic farming along with the declaring of the state as organic farming state. With this change host of new policies and planning were formulated, first by converting all the agricultural farms into organic farms. Introduction of EMI technology, introduction of bio-fertilizer, encouragement of compost manure production, integrated pest management programme. Post and pre harvest operation by using new technologies and modification and adoption of indigenous implements to make them more efficient in agricultural practice. One of the important agricultural policies during the period is the introduction of National Agricultural Scheme, prior to this period in the state and district there is no policy of crop insurance which can benefit the farmers.

Table 8.1 Budget Allocation for Agricultural Development, South District

Head	2003-04		2004-05		2005-06	
	Rs in ('000)	(%)	Rs in ('000)	(%)	Rs in ('000)	(%)
Crop husbandry	1534	34.38	1433	32.95	2155	39.69
Manure and fertilizer	119	2.66	150	3.45	250	4.70
Plant protection	235	5.29	290	6.70	317	5.88
Extension and training	833	18.67	735	16.90	807	14.90
Organic farming	1740	39.00	1740	40.00	1860	34.83
Total	4461	100.00	4348	100.00	5389	100.00

* Source: Department of Finance and Public Accounts, Government of Sikkim.2006

Another notable change of agricultural policy in this period is going back to the village idea which gives emphasis to the educated rural youths to develop other means of income generation by practicing mushroom cultivation and development, capacity development, rearing of rabbits and floriculture etc. Table 8.1 shows the

budgetary allocation in agricultural sector in the South District for the last three years. In accordance with the view, to convert the state into organic farming, the maximum financial allocation has been to the development of organic farming occupying 39%, 40% and 34.83% in 2003-04, 2004-0 and 2005-06 respectively. Crop husbandry occupies second place having 34.38%, 32.95% and 39.69 in the same financial year. The development of manure and fertilizer sector has the lowest percentage among the agricultural investments having 2.66%, 3.45% and 4.70% respectively, but having an increasing trend. The Plant Protection has fluctuating trend having 5.29%, 6.70% and 5.88% of total agricultural allocation in the district in the corresponding years. The extension and training has constituted a sizable percentage of budgetary allocation in agriculture in the district having 18.67%, 16.90% and 14.90% with a decreasing trend. This decreasing trend reveals the underlying problem of lack of understanding, the problem of agricultural development as a government policy of converting the state into organic state, there is need of increased budgetary allocation in agricultural extension and training because the adoption of new methods of farming needs wide spread knowledge and technical know how to the farmers , without training and extension services successful implementation of the policy of organic farming will face a Herculean task.

Another important strategy for the agricultural development in the district which is notable to discuss is the adoption of National agricultural Technology Project (NATP) and Innovation in Technology Dissemination (ITD). In the South district for implementing the (NATD) and (ITD), Agricultural Technology Management Agency (ATMA) is formed as main nodal agency. The main thrust of the (ATMA) is to support the programme for the extension reforms and policy frame work. The main policies are viz. reforming public sector extension, promoting private sector to effectively complement, supplement and where ever possible substitutes public support for extension, main streaming gender concerned in extension and capacity building/ skill up gradation of farmers and extension functionaries.

The novel approaches of this cafeteria approach, which includes cost norms and policy parameters. The new initiatives are multi-agency extension strategies farming system approach, farmer centric extension service accordingly in the district. The Strategic Research and Extension Plan (SREP) have prepared Agro-ecological Situation (AES) by involving NGO's, private participation, scientific community. The whole South District has been divided into three (AES) as AES-I (high altitude 1501-

5000mt with high rainfall, low temperature/rainfed), AES-II (Medium altitude 801-1500mt with medium rainfall, medium temperature/springfed) and AES-III (low altitude 300- 800mt with low rainfall, high temperature/ Channel irrigation). This classification is one of the important steps for agricultural development policy. This (AES) can be considered as agricultural regions in the district for the future planning as the criteria is base on the local physio-climatic conditions. This will helps the farmers to choose the right kind of crop and farming methods, which will boost the agricultural productivity in the district.

Besides, the SREP also gave emphasis on macro management in agricultural development by suggesting the following:

- i). Sustainable development with watershed approach to achieve the twin objectives of enhancing productivity with simultaneously conserving the natural resource, like soil, land, plant nutrient and moisture with public and private participation in village level.
- ii). Water harvesting methods will be strengthening by encouraging the roof water harvesting with incentives and protection development as well as find out new water source.
- iii) Demonstration on package of technology involves HYV seeds, organic manure and IPM.
- iv) Popularization of mushroom cultivation and production
- v) Farm mechanization and human resource development are the major components.

8.3 FUTURE STRATEGIES FOR DEVELOPMENT

Both the pre and post strategy does not address some of the important issues of agricultural development like, credit, capital inputs, labour problems and choice of crop. It is ironic that farmers are not able to get good supporting price of their product after so much of sweat and toil. Marketing and getting good price for the produce is a matter of concerned. It is therefore very important for the co-operative agencies, operating in South District should come forward to procure the produce from the farmers there by reducing involvement of middlemen and helping the farmers to earn profit. The institutions like PACs/Nationalize Banks/ NABARD have to come forward to assist the farmers financially as well as in the form of inputs not only for the big farmers but also for the small and marginal farmers. Arrangement should be made to avoid middlemen interference and also involvement of moneylenders.

Since a major portion of the produce come from the village, they have to be brought to nearby towns only. Therefore storage facilities have to be developed. So far, not a single storage facility is available in the district. During the winter after ripening the horticultural product and the cardamom, due to the lack of storage facility, the farmers have to sell off the production at cheap and throw away price. To solve the problem, co-operative societies have to be encouraged for storing and purchasing of products. Efficient marketing system is essential to help the producers. Farmers in the district face a number of constraints due to the lack of various facilities. The nature, seasonality and high degree of perisibility of goods also aggravated the problems. Hence, marketing management need to be strengthened by evolving marketing department, transport department both lending and storing of agricultural products in the district.

The pre and post reform policies and planning has left out the major problems of choosing crops in this direction. The AES suggested by SREP can be applied with some modification as farming system which can more beneficial to the farmers as the suggestion is based on the local physio-climatic conditions as well as the traditional cropping patterns are considered.

Table 8.2 Farming System, South District

Size	AES-I	AES-II	AES-III
Big Farmer	Agri+Hor+Fro+AH	Agri+Hor+Fro+AH	Agri+Hor+MP+AH
Marginal Farmer	Agri+AH+Fro	Agri+AH+Fro	Agri+AH+Fro
Small Farmer	Agri+PT+AH+BC	Agri+PT+AH+BC	Agri+Fro+AH

*Agri: Agriculture, Hor: Horticulture, AH: Animal husbandry, PT: Poultry, Flo: Floriculture, MP: Medicinal Plant

Table 8.2 represents the suitable farming system in the district. Along with the agriculture and horticulture, the emerging agricultural and allied practice likes floriculture mushroom cultivation and augmentation of all practice of animal husbandry, poultry, and medicinal plant cultivation with altitudinal suitability. Besides, horticulture and floriculture, the cultivation of medicinal plant is also an emerging field which farmers can practice in hilly terrain and climatic conditions which very favorable for medicinal plants and herbs cultivation, but it is in infantile stage of development. So far, more than 45 numbers of medicinal value plants and herbs are identified. If proper training, policy and planning is provided to the farmers it can become one of the important ventures in the South District especially for the

farmers of the district. These also can change the cropping pattern by shifting from low profit crops cultivation to high value crop cultivation.

In order to solve the various problems, lacuna and loopholes in the earlier policy and planning, for the future development of economic conditions based upon agriculture and allied sector, the following suggestions may be adopted.

- i). Popularization of high yielding, improved and locally suitable varieties of crops.
- ii). Proper and natural management of crop with scientific and traditional methods of practice
- iii). Research and improvement of indigenous varieties of seed crops.
- iv) A proper market linkage facility should be developed.
- v). Pre and post harvest management should value added and properly manage.
- vi). Streamlining and strengthening research and extension with farmer's participation.
- vii). Promotion of mix farming system which insure the failure of a particular crops e.g. cultivation of maize and soybean will help the farmers as the maize does not give higher profit to the farmers will compensated by selling the soybean . Like this, the new cropping pattern likes ginger+ maize, pea + oilseed; ginger + pulses and turmeric cultivation can help the farmers.
- viii). In hilly area, like South District the conservation of soil is very important, approach to the treatment of catchments area, integration of sartorial measures for comprehensive watershed management. The concept of public private participation (PPP) be emphasized on sustainability and treatment of watershed area, a micro-economic unit will uplift the economic conditions of the farmers and solved the problems of soil erosion.
- ix). Lack of irrigational facility is the most important problem in the district. The agricultural practice in the district is base upon the rainfed. This problem can be some what solved by practicing roof water harvesting, during the rainy seasons the excessive water can be collected in the tank and can be use latter on, it can also use for the recharging of ground water.
- x). Water shade and catchments area development approach is one of the important soil water conservation practices for sustainable agricultural development in hilly area. This approach can be adopted in the district by participating farmers, local body and planners.
- xi). Application of improve traditional means of implements and experimentation of traditionally use implements with suitable modification will help to minimize the

labour cost in agricultural practice. Encouragement of mix and double cropping with supports from authority will increase the productivity.

xii). Setting up of regulated market with infrastructure and providing market information along with transport facilities will help the farmers to get the proper price of produce commodity

xiii). Financial input institutions in agricultural sector in the district are very poor. Proper policy and planning for procurement of inputs, sales of products, proper and stringent norms to eliminate middlemen, will increase production and income as well as the agricultural development in the district.

xiv). Introducing and encouraging the farmers to adopt the scientific package of practice for medicinal plant, identification and collections of indigenously found medicinal and aromatic plant, formulation of integrated pest and disease management policy and training of local practitioner for the identification and importance of medicinal plants in scientific way and formulation of mechanism for market linkage for medicinal and aromatic plants will benefit the agricultural development.

xv). Horticulture and floricultural sector becomes another important area where the farmers can flourish. Proper guidance policy and planning is needed to develop these two fields. Both the venture requires large investment, proper financial helps from the institutions. Until and unless the financial institution came forward, the opportunity can not be materialize. Even after getting the financial supports, the farmer does not know where to sell the products. If proper guidance is given them, it can be one of the important sectors of agricultural development

xvi). The policy of organic farming should be strengthened. Because this is only ways and mean by which the result of long term sustainable agriculture can be practiced without affecting the immediate environment. But there is a big question about the norm and policy to protect the contamination of product and the price. To honours the work of the farmers and also in respect to nature conservation and human well being, they need to get a price premium for their products.

xvii). Last not the least motivation of the farmers in the right direction and their participation will be encourage for various planning and policy implementation is very necessary.

CONCLUSION

The policies and planning for agricultural development in the district has emerged after merging the state with Indian Union in 1975. A clear cut policy and planning in agricultural sector specially establishing strong foundation for agricultural administration is the main focus of the initial period. After this agri-infrastructural, regional concept of agricultural development, expanding and strengthening of dry land farming giving more emphasis to the oilseed and pulse along with the tradition crops like rice and maize are the some of the important step taken during the period. Besides, implementation of soil conservation and watershed management for the agricultural development are the important measures taken during the stage. The second half of the second planning period's main focus is the large scale adaptation of organic farming. With these shift host of new policy and planning were formulated, like introduction of EMI technology, introduction of bio-fertilizer, encouragement of compost manure production, integrated pest management programme, improvement of traditional agricultural tools and post and pre harvest operation etc. The future policy and planning which were formulated for the development of agriculture are the adaptation of national agricultural technology project and innovation technology dissemination etc. These policies and planning were executed and monitor by Agricultural Technology Management Agency. The main focus of ATMA are reformation of public sector extension, promoting private sector to effectively complemented, supplementing main streaming gender concerned in extension capacity building/skill up gradation of farmers and expansion of farmer centric extension as well as formulation of agro-ecological situation are the important policy which will certainly develop the agriculture in the district.

CHAPTER-IX

SUGGESTIONS AND CONCLUSION

INTRODUCTION

The main problem of the hill agricultural system is lack of irrigation facility. There is neither explicit government policy for expanding irrigation facility in the hill nor specific programme for developing rainfed agricultural technology for the hilly region. Despite considerable annual investment in agricultural, sector new recommended technologies have not reach to the majority of farmers even in the vicinity of the district headquarters. The policies and planning for agricultural development in the district should be area specific. While formulating the planning the situation and problems exist in the ground should be keep in mind and proper understanding of the problem is very necessary. Many a time while formulating the policy and planning lack of proper analysis of the ground reality, arises many hurdles and create another problem instead of solving the existing problems. The following suggestion can be adopted for the development of agriculture in the South District which one of the important cultivated region of the State.

SUGGESTIONS FOR SUSTAINABLE LAND USE PLANNING FOR SOUTH DISTRICT.

i). Multidisciplinary Approach:

Multidisciplinary approach for the identification of priorities to research and adoption of technologies for better utilization of soil fertility and rehabilitation of degraded land (Avasthe, Bhaduria 2006)

ii). Land tenure system:

The land tenure systems in the district have various underlying problems. Without proper land tenure system, policy and planning the development of agriculture and allied sector is not possible. Proper land holding survey, maintaining of land records by using modern and scientific means and methods like computer recording, GIS, etc. will help in the development of agriculture.

iii). Public Private Participation (PPP):

Involvement of local farmers in identifying the problems of land resource, degradation , constraints and opportunities to change land use through research extension and training for the solution to the future generation survivals.

iv).Modification of land tenure system:

Land tenure system in the district has various underlying problems, without proper land tenure planning and policy and proper system, the development of agriculture and allied sector is not possible. Scientific and proper land holding survey and maintaining for future reference by using various GIS and maintaining up-to-date computerize records will help these regard.

v). Promotion of Mix farming: Promotion of mix and rotation practice will be encouraged, these practice insures the failure of crop and retaining of soil nutrient. In the district, The mixed farming set up is naturally the most appropriate farming system for the small and marginal farming units of the Sikkim(Balaraman1998)the maize+soyabean, maize+ginger, pea+oilseed, ginger+pulses+turmeric, rice+vegetable combination and rotation will help the farmers.

vi). Watershed approach:

Watershed approach for the agricultural development with public private participation (PPP) will be encouraged. Watershed approach is an integrated effort of land development for effective soil and water conservation with a view to "in-situ" utilization of rain water for crop production and animal husbandry is the basic approach for watershed management (Verma 1998, Verma, Srivastava 1999). Watershed approach benefits the farmers through improve soil health, better drainage and more efficient use of rain water with the possibility of excess water being store in suitable structure for the use during scarcity period (Misra 1996)

vii). Adoption of modern technologies:

The practice of modern scientific methods of agriculture e.g. green house technology will be strengthened, which can be easily established small patch of land especially in hilly area. As a profession, agriculture is not attractive for educated youths, which is partly due to the drudgeries associated with field work. To motivate the educated youths, agriculture has to be developed as a remunerative and drudgery less industry as comparative as any other industry using agricultural technology like green house (Sunwal,Yadav, Patel 2004). Many a time the modern technologies which is develop for the plain area are push to the mountainous areas without trying

their suitability, which cause various problems and discourage mechanization of farming in the hilly area. The adoption of locally suitable modern technology will certainly boost the production and solved the problem of unemployment and under employment in the district.

viii).Diversification in Agriculture:

Diversification in agricultural sector is strongly related with strong development of infrastructural facility. In the district, diversification of agriculture and allied sector can be done in the field of horticulture, olericulture, floriculture, cultivation of medicinal and aromatic plant as the prevailing condition of physio-climate is suitable for successful practice of olericulture, horticulture, floriculture cultivation of medicinal plants and aromatic plants. Besides, diversification is also an effective way of optimizing the use of socio-capital (e.g. rural labour) in rural areas.



Photograph 9.1Floriculture(Gadulus Flower)

ix). Infrastructural facilities:

Besides, other facilities the availability of market infrastructure and mechanism is very essential for agricultural development. Setting up of regulated market with infrastructural facilities with proper market information along with the development of transport facilities on one hand and encouragement of financial institution and co-operative to investment in agricultural sector is very much needed in the district. With out strong capital input, the question of successful development

in agriculture and diversification in horticulture, floriculture, and other allied sectors like processing, packaging, and cool storage is not possible.



Photograph 9.2 Oreliculture

x). Organic farming:

The entire agricultural practice in the district is shifted to the organic farming practice, as a government policy and the favorable conditions exist in the district. Among all the farming systems, organic farming is gaining wide attention among farmers, entrepreneur, policy makers and agricultural scientists for various reasons (Rai 2005). But proper planning and implementation with proper institutional support are required especially in the case of contamination of products. Certification and marketing of the product are a big challenge due to the certain regulations and laws exist for organic farming products. Keeping in mind, the planners and policy makers should solve these problems by formulating a proper policy and planning, to compete the national and international standards than only the farmers of the district can benefit of the organic farming.



Photograph 9.3 Improved Compost Pit

xi).Alternative Agriculture:

The success of horticulture, floriculture, mushroom culture, medicinal plants cultivation and olericulture is linked with the success of fruit processing units and storage facility, because of poor marketing and transport facility (Mishra & Satapathy 2003). The processing industry can help in shorting out the problem of proper disposal of the perishable commodities. Till today there is hardly any cold storage facility available, only a single fruit processing unit exists in the district but are not to the desired capacity. Use of pre and post harvest practice for horticultural, floricultural, mushroom cultural, medicinal plant cultivation is vital for the success of the crops and return to the growers. Unfortunately, this is the weakest spot in the district. Establishment of processing and preserving unit with private participation especially by the educated unemployed youths will solve these problems. Value addition can be given only by establishing these facilities. Production of oleoverin from ginger, turmeric powder making, chilly sauce processing and preparation can be further develop.

xii) Live stock farming and animal husbandry:

Live stock farming is an integral part of the farming community of the district. The rearing of different species of animal (cattle, goat, poultry, piggery etc) is done for draught, milk and meat purposes and these animals also provide manure to meet the crops requirement of nutrient for organic farming. The production of dairy by cattle on small land holding in the rural areas in conjunction with primary agriculture production creates employment and contributes substantially to the domestic income and obtaining better utilization of farm resources.(Avasthe,Pritam, Bhaduria 2002) Rearing of locally adaptable variety of poultry, rabbit, goat and pig can be encouraged.

xiii) Development of farm Fodder:

In the South District, plenty of grasses are available during the monsoon period and scarcity only occurs during winter (Nov to March). The only practical alternative is available to encourage the propagation and planting of tree species and grass (e.g. broom, banana) on village waste and marginal land, community grazing land, out scrub between in and around cultivated farms and terrace bunds etc under the different afforestation programme for their topping of leaves to meet the feeds requirement during the lean seasons. The leaf of some fodder trees is almost as nutritious as that of leguminous crops and offers an added advantage of the

production of fuel wood as byproduct. Leguminous fodder trees enrich the site through nitrogen fixing which help in effective soil and water conservation.

xiv) Pre-urban planning:

The pre-urban areas of the some of the revenue blocks in the district has facing the problems of encroachment of agricultural land and forest area, mass movement of soil during monsoon, diversions of water and labour, indiscriminate and haphazard dispose of solid water form the construction, un plan dispose of sewage and effluent etc. All these problems require system oriented research approach to identify the problems on the technical and scientific level. The development of cities has no limit the technical personals should not ignore while formulating land use planning in the district.

CONCLUSION

The land resource in the district is very limited as the district has the mountainous topography where the snow capped mountain, steep slope,(more than 50%) dissected precipitous cliffs and escarpments with high drainage density (up to $3/\text{km}^2$) with swift flowing streams and acidic soils. Out of the total 750 km^2 only 12% of the area can be available for agriculture and allied activities. This limited agricultural land is decreasing due to the conversion of cultivable land into non-agricultural purposes, like establishment of industries, expansion of town, construction of roads, hydel-projects and educational institutions etc. The increasing population pressure on the land also leads to the declining of land resources of the district. The density of population in the district is increasing steadily as 44 persons per km^2 in 1981 to 76 persons per km^2 . These increased population leads to the fragmentation of land holding. The pre urban characteristics of most of the small towns is also encroaching the available land resources of the district. The general land use pattern also shows that the total operational holdings is increasing, but these increase in the total operational holdings is due to the encroachment in forest land in the district as the percentage of forest land is declining in the district. The areas under scrub and fallow land have the same tendency. These also show that the intensity of available land is maximum, as the area of fallow land indicates that available cropped area is not leaving for natural reoccupation which is very important for the hilly and mountainous region. The study also shows an increase in the cultivated area. Out of the total revenue blocks, 54.36% registered increase in cultivated area. In the general

land use pattern, the build up area has recorded highest amongst the positive changes of land used in the district revealing the fact of conversion of agricultural land into non-agricultural uses, Amongst the revenue blocks Singithang, Jorethang, Likship, Chisopani, Yangang where the pre-urban characteristics prevails have shown higher percentage of decrease in the cultivated area. The percentages of net shown area also have the declining trends recording 82.90%, 73.37%, 52.42% and 69.04% in 1076-77, 1981-82, 1991-92 and 2001-02 respectively and on the other hand, the percentage of un-cultivated area is increasing having 18.86%, in 1977-78 to 20.34% in 2001-02. These show that the fragmentations of land holding are due to the increase in population, landslide, deforestation, soil erosion, expansion of infrastructural facilities and urbanization in one hand and lack of proper planning and policy in the agricultural development in the district on the other.

These changes of land use in the South District have both negative and positive impact on agricultural development and future planning for the district. The negative changes are observed in wheat, maize and cardamom cultivated and vegetable cropped areas. The factors which lead to the decreasing of these cropped area are may be social, cultural, economic and institutional. Besides, the changes of food habits of the people also help in decreasing these crop area, e.g. in old days main meal cooked mixing with rice, used as animal feeds and for brewing local spirits but these practice have changed tremendously. The main staple food of the people is rice, and use of animal feeds is decreasing due to the availability of artificial animal feeds as the new improved high breeds are animals domesticated in the district without studying the local suitability. Another notable negative change of land use is the decrease in main cash crops i.e. cardamom cultivated area in the district. The main factor of decreasing the cardamom cultivated area is low demand in markets due to the stiff competition from the neighboring countries like Nepal and Bhutan. Besides, lack of scientific methods of cultivation and involvement of middle men due to the lack of proper market mechanism has further aggravated the problems of decrease in cardamom cultivation.

The decrease in horticulture (vegetable) cultivated area is due to population increase which leads to the conversion of vegetable cultivated land into the build up area. And urbanization leads to the encroachment of cultivated area as well as transfer of water and labourers for non agricultural uses. The changes of socio - economic and cultural changes out of look of the people also help in the changes, of land use.

Farmers have to choose the market demand crop for profit as the crops for profits as the crop insurance is not available in the district.

The positive changes have shown a variable path for the development of agriculture, and future panning and policy of the district. The positive increase in rice, pulses, and oilseed, potato, ginger and horticulture cropped areas indicated that future agricultural planning should be on these crop oriented. The underlying factors of positive changes of these crops can be summaries as; in the case of rice, the changing food habits give more thrust to change the cropped area and higher price of rice in the district e.g. the locally produce rice get around Rs. 40 per kg and demand for locally produce rice is ever increasing. Still there is a gap between supply and demand and this leads the farmers to shift the other crop cultivated area into rice cultivation. Crops like potato, pulses, and ginger and oil seed have also registered positive change due to less labour intensive, lesser fertile soil and low soil moisture conditions. These crops can be cultivated in the rainfed area. High local demand, market value and non perishable nature of these crops lead to increase of cropped area. Besides, these crops do not required specific facilities after harvesting; they can be stored by using simple traditional methods of storing.

The crop concentration pattern also shows that, the concentration of pulses and oilseed is uniform throughout the district. But the crops like cardamom, potato and horticulture has the tendency to concentrate only in selected pockets. This nature of concentration shows that, the dry land farming practice will be one of the viable, successful, adoptable and affordable agricultural practices in the district.

The crop combination pattern of the district is very interesting. The cropping pattern is mostly maize dominance. Out of the 41 GPUs, maize is the first ranking crop and another 5 GPUs have the cardamom as the first ranking crop. Over all characteristics of crop combination patterns in the district shows the micro crop regions as maize and pulse in western parts of the district, maize and rice in the southern parts and maize and cardamom in central and northern parts. The micro crop region shows that, the dominance of traditional practice of agriculture is still prevails in the district.

The picture of crop diversification in the South District has strong characteristics of mono-crop culture as rice in river valleys, maize in middle altitudes and cardamom in higher altitudes. But this character of mono-crop is not by the

agricultural development and advance farm management but due to constrain lay down by the physio-climatic conditions.

The pattern of crop production in the district shows that the character of regional concentration for crops like rice, maize, cardamom and horticultural crops has regional concentration and in some selected few pockets. But the crops like ginger, pulses, oilseed has uniform characteristics all over the district.

The general infrastructural facilities in the district is steadily developing, but the very important infrastructure and inputs for the agricultural development is lagging behind e.g. negligible irrigation facility, lack of financial and institutional facility and proper market mechanism



Photograph 9.4 Terrace Farming (Means Of Soil Conservation)

The land use pattern in the South District is changing for the last 15 years. The impact of these changes upon agriculture is very significant. The changes have a great impact on the fragile environmental conditions of the district. These impact upon the environment should be counted while formulating the feature policy and planning. In order to maintain the equilibrium between the land use changes and requirement of the local people in the fragile region of the district, the traditional land race-base indigenous knowledge system with scientific modification with locally suitable system would play a significant role for making value addition to the traditional cropping practice (Nautiyal 2001). Intensive farming practice suitable for the low land areas can be disastrous when use on hilly and mountainous areas without proven

technologies and experience promoting deforestation, soil erosion and reducing land productivity(Thakur, Dutt, Sandayal, 2005). Here, study and experimentations of old aged practice of agriculture is needed in modern scientific manner to address the problem of suitability of technologies. As the problem of sustainable agriculture in the district is more in technical and institutional one, involving the limited research and development.



Photograph 9.5 Tea Plantation (Eco-friendly Cultivation)

The physio-climatic constrain which does not allow to flourish the agricultural practice can be utilized into positive approaches. These hilly and mountainous terrain and climatic conditions are very favorable for the horticultural, floricultural, olericultural (especially the chilly in the South District) and medicinal plants cultivation can be successfully practiced. These are new sectors of agriculture where the farmers of the district can diversify their economy. Another emerging important means of sustainable agricultural practice with out disturbing the fragile environmental condition is organic farming; as the farmer of the district is practicing the organic farming from the time immemorial, but not large scale and scientific way. The goal of organic farming is to create a sustainable agricultural system. Organic agricultural relies largely on the locally available resources and is dependent upon the maintaining ecological balance and developing biological process to their optimum. The protection of soil and of the environment is the fundamental of the organic farming (Rai 2005). But it should be supported by the new suitable technologies, which are not only the cost effective but also easily adoptable to the farmers of the

district. Another important aspect while practicing the organic farming is that of contamination of the product due to the lack of knowledge and appropriate technology of packaging and preservation.

But the practice of sustainable organic farming and commercial olericulture, floriculture, as well as organic farming can only be viable depending upon the availability of minimum irrigation facility in the district. In the South district, agriculture is base upon the rainfed and negligible spring irrigation in higher and middle altitudes, due to the sloping nature of the terrain. Rain water runs down very swiftly causing soil erosion and landslide. These problem can be solved by strengthening the old-aged practice of terrace farming, instead of leaving the terrace buns openly, the bun area can be used as hedge grow by planting broom and banana plants which can provide farm fodder from the plants and supplements the income of the farmers selling broom and banana. Another water storage practice for this swift flowing rain water is digging small pond and patches in the cultivated field. These pond and patches can retain the swift flowing waters collecting the wash away soils and helping the recharge of the ground water. In some of the larger field, the size of the ponds can be increase for practicing pesiculture especially for the locally suitable fishes. Besides, roof rain water harvesting can be compulsory to the entire rural households. It can support the recharge of the ground water and can be used for domestic consumption. In the district, as in many revenue blocks this practice is successful practicing by implementing policy and planning.

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