# AGRICULTURE IN THE HILLS OF SIKKIM

J. R. SUBBA

# Preface

Sikkim the twenty Second state of India, is a beautiful hill state and lies in the Eastern Himalayas. It is wholly a mountainous state. It has large variety of flora and fauna, good water resources and climate suitable for growth of a large variety of crops and fruit plants. To its north, lies the vast stretches of Tibetan plateau ; to the west, the kingdom of Nepal ; to the east, the kingdom of Bhutan and the Chumbi valley of Tibet and to south, the Darjeeling District of West Bengal.

Sikkim has an area of 7096 Km.$^2$ and total population of 3.15 lakh. Agriculture covers only 11.2% of the total area. However, the majority of population (83% of the total) lives in rural areas and are dependent on agricuture for their livelihood. In the absence of scientific development of the natural endowments of the state, its economic potential has largely remained unexploited till its merger to the Indian Union (1975). Now it has been realised that a speedy development of agriculture is vital to the alround progress of the State. To secure maximum crop production, the best use of the limited available land has to be made and the latest methods of crop production technology put into practice to feed the fast growing population of the state. But this depends on the availability of scientific information and technology on the aspects of agriculture in an easily digestible form.

The state Department of Agriculture I.C. A.R. Complex, Cardamom Board and other allied Institutions of Sikkim, have been issuing palmphlets, leaflets, 'Krishi Samachar' etc. on different aspects of crop husbandry from time to time. It was however, considered that there was a need for a publication which would contain comprehensive information on the salient features of hill agriculture with special reference to Sikkim condition and indicate the lines on which improvement can be effected. The Reviewing Committee of the State Department of Agriculture had realised this important fact in April, 1981 and the matter was discussed at length. However, this aspiration could not be materialised till todate and the author aims to fulfill this gap by publication of this book.

# Contents

CHAPTER 1

# History of Agricultural Development in Sikkim

The history of Agricultural development in Sikkim date backs to the beginning of planned economic development in Sikkim. When, the then Chogyal, Late Palden Thondup Namgyal conceived the importance of Agricultural Development in this valley during fifties. He managed to co-ordinate with the government of India and initiated planned economic Development in Sikkim in 1954. With the help of a technical team of the planning commission a seven year plan from 1954 to 1961 was formulated. A separate directorate of Agriculture was started with Dr. K.L. Narsingham as Director of Agriculture and Animal Husbandry in 1954.

The details of investment on Agriculture and Horticulture, during the period 1954 to 1960 is presented below which reflects the emphasis laid on various aspects during that period.

**Seven Years Development Plan of Sikkim**
**(Statement Expenditure 1954-1960)**

SCHEME

A. AGRICULTURE AND RURAL DEVELOPMENT

| | | Total Expenditure (in Rs.) |
|---|---|---|
| 1. | Demonstration farms at Gangtok | 5,41,449 |
| 2. | Demonstration farm at Lachung | 11,482 |
| 3. | Seed certification farm, West Distt. | 73,452 |
| 4. | Cardamom-Installation of an entomological and pest control Lab. | 1,849 |
| 5. | Training | 14,040 |
| 6. | Agriculture loans | 49,209 |

| | | |
|---|---|---|
| 7. | Agriculture information service, staff, equipment | 5,000 |
| 8. | Acquisition of lands for cardamom nurseries | 2,349 |
| 9. | Fair price shops | 2,04,198 |
| 10. | National Extension Service Organisation | 3,96,955 |
| | Total | 12,99,983 |

B. HORTICULTURE

| | | |
|---|---|---|
| 1. | Staff quarters | 34,613 |
| 2. | Pay of staff etc. | 81,262 |
| 3. | Cost of Equipment, seed, fertilizers insecticides etc. | 1,74,439 |
| 4. | Rent of store godowns for manure etc. | 2,393 |
| 5. | Loans to fruit growers | 300 |
| 6. | Training | 1,863 |
| 7. | Fruit Preservation & canning factory | 7,05,224 |
| 8. | Horticultural nurseries | 25,221 |
| 9. | Plant Protection-cum-Horticultural mobile teams | 94,760 |
| | Total | 11,20,075 |

SOURCE—FINANCE DEPARTMENT

The first Seven Year Plan was followed by three Five Year Plans, namely 1961-66, 1966-71 and 1971-76. A separate Department of Animal Husbandry was created with Dr.R.C. Khera as the Director in 1974.

Sikkim became a part of Indian Union in May 1975 when the fourth plan was driving to a close. The development of agriculture was accelerated after the merger of Sikkim into Indian Union. The state was experimented with Regional concept of agriculture development during the Fifth Five Year Plan. Now the state is divided into nine Regional Centres a number of sub-centres and V.L.W. Circles. The following are the expenditures incurred and allocation on agriculture and allied services in different economic plans of Sikkim.

A. PRE-MERGER

| Sector | First Plan 1954-61 in lakhs | Second Plan 1961-66 in lakhs | Third Plan 1966-71 in lakhs | Fourth Plan 1971-76 in lakhs |
|---|---|---|---|---|
| Agriculture & allied Services | 53.00 (actual) | 103.00 (actual) | 137.00 (actual) | 817.00 (actual) |

B. POST-MERGER

| Sector | Fifth Plan 1976-80 (in lakhs) | Sixth Plan 1980-85 (in lakhs) |
|---|---|---|
| Agriculture & allied Services | 1,608,27 (actual) | 4,540,00 (Proposed) |

As a result of the planned economic development, agriculture is well established in Sikkim as compared to other hill states in the N.E. Hills. At present agricultural land use covers about 11% of the total geographical area of the state. Out of the total agricultural land, 82.1% land is under crops, 9.5% under fallow and 8.4% land is not available for cultivation within the operational holdings. The state has an estimated 85,000 hectares of cultivated land which is as under :—

**Distribution of Cultivated area According to Crops (1980-81)**

| Crop 1 | Area in hectares 2 | Percentage of total 3 |
|---|---|---|
| Maize | 30,200 | 31.5 |
| Paddy | 14,800 | 15.4 |
| Cardamom | 14,000 | 14.6 |

| 1 | 2 | 3 |
|---|---|---|
| Orange | 2,620 | 2.7 |
| Apple | 500 | 0.5 |
| Potato | 1,900 | 2.0 |
| Wheat & Barley | 10,200 | 16.6 |
| Buck wheat | 2,700 | 2.9 |
| Millets | 5,000 | 5.2 |
| Peas, Beans, pulses | 6,700 | 7.2 |
| Ginger | 640 | 0.7 |
| Oil seeds | 3,000 | 3.2 |
| Others | 3,510 | 3.7 |
| Total | 95,832 | 100.0 |

SOURCE—REPORT OF HIGH LEVEL TEAM FOR LAND USE PLAN OF SIKKIM

The total cropped area is 95,832 hectare as cardamom is also included in it. Agricultural lands are situated from an elevation of 300 to 3,000 m but most of the cultivated area lies below 1800 m elevation.

In Sikkim most of the area of cultivable land is terraced and the farmers have settled in their holdings and have established regular cropping systems. Crescent shaped narrow bench terraces (of 4.5 to 7.5 m long and 2.5 to 3.5 m wide) across the steep mountain slopes constitute the agricultural land holding. The terraces are level having 2-3 percent gradient lengthwise and are provided with small hand made bunds all along the outer margins. Wet paddy is cultivated only in such terraces. A portion of land above the paddy terraces is left unterraced in which maize, millet and vegetables are cultivated. Agriculture on 30 to 40% slope is very common and above 1500 m agricultural lands having slope of 60 to 70% are not uncommon.

Cropping intensity is closely associated with the altitude. At lower altitudes it is possible to have multiple cropping, at mid altitudes double cropping and at high altitudes only mono-cropping. Since the rainfall is high and the number of rainy days is large, also rainfall is received in rabi as well as in kharif season, it is possible to grow suitable crops during pre-kharif, kharif and rabi even without irrigation by proper choice of varieties and manipulation of sowing dates. Due to rugged steep terrain of the whole state,

agriculture is a very difficult and tidious task needing very hard manual labour and in general, net gain per unit area in case of cereals is not as remunerative as in the plains.

The prevalent climatic condition ranges from subtropical to alpine with major area under temperate climate. The ecological situations vary greatly at very short distances which limits the adaptation of crop species and their varieties within a narrow range. This has the advantage of growing many kind of fruits, seasonal and off-season vegetables and other commercial crops in the hills at different altitude and in different seasons. The important fruit crops are mandarin orange, guava, lime, lemon and temperate fruits like apple, pear, plum etc. Among the commercial crops large cardamom ranks the first followed by seed potato, ginger and vegetables.

Sikkim has been divided into four districts for administrative purpose viz. District East with its head-quarter at Gangtok, District West at Gyalshing, District North at Mangan and District South at Namchi. The state has been divided into nine regions with 5 sub-centres and 105 VLW circles for agricultural development purposes. They are given below :—

| District<br>1 | Region<br>2 | Sub-Region<br>3 | VLW Circles.<br>4 |
|---|---|---|---|
| East | Najitam | Marchak | Ranipool, Ranka, Tadong, Middle cmap, Rumtek, Sichey busty, Gaucharan, Martam, Nazitam, Sang, Simik lingzey, Lower Khamdong, Upper Khamdong, Ragdongtintek, Samdong, Lower Samdong, Lingdok, Burtuk, Penlong. |
| | Pakyong | | Lingtam, Rangli, Rhenok, Mamring, Rorathang, Thekabong, Pakyong, Pacheykhani Padamchey, |

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| | | | Aritar, Machung, Barapathing. |
| | Majitar | — | Duga, Central Pandem, Sirwani, Majitar, Ralep, West Pandem, Sumin. |
| West | Gyalshing | — | Kaluk, Bermiok, Hee, Dentam, Utterey, Sardong, Lingchom, Pelling, Darap, Thingling, Yoksom, Gerethang, Tashiding, Sakyong, Gyalshing, Legship, Reshi, Takuthang, Pipaley. |
| | Hilley | Daramdin | Sirbadam, Soreng, Timberbong, Burikhop, Chakung, Zoom, Chumbong, Budang, Malbasey, Tharpu, Daramdin, Sombaria, Tikpur, Okharey, Ribdi. |
| South | Namchi | Namthang | Namchi, Nandugaon, Kitam, Mikhola, Maniram, Salghari, Vok, Tinkitam, Sumbuk, Damthang, Rateypani, Mellidara, Sodam. |
| | Tokal Bermiok | | Total Bermiok, Tarku, Rabhongla, Yangang, Kewzing, Lingmu, Lingipayong. |
| North | Mangan | Dzongu | Mangan, Kabi, Namok, Phodong, Phensang, Hee-Gyathang, Dikchu, Lingthem, Tingbong, Naga. |
| | Lachung | Lachen | Lachung, Lachen, Chungthang. |
| Total 4 | 9 | 5 | 105 |

(See the enclosed map of Sikkim)

A high level team for land use plan of Sikkim visited the state in 1981. The team drawn up a detail plan of action to be taken up for the over all development of the state. The various institutions of the state and Central Government are working as per the recommendations of the high level team. The recommendations of the team is summarily as follows :

1. STRATEGY

The detailed land use plan of Sikkim should be based on the considerations of climate ecology economics, energy conservation and employment generation.

2. SURVEY OF RESOURCES

Inventories of natural resources (such as soils, water, vegetation, land use, geology etc.) and infrastructure (such as roads, marketing, manpower etc.) should be updated.

3. AGRICULTURE AND HORTICULTURE

(a) Mixed farming system should be improved and intensified.

(b) Intensive agriculture rather than expanding the area under agriculture should be the immediate strategy in areas with slopes less than 33% for achieving self sufficiency in food, fuel and fodder.

(c) Suitable crops and cropping systems should be developed for different areas at various altitude and popularised.

(d) Horticulture, agrohorticulture, agro-forestry and farm forestry etc. should receive due place in areas with slopes above 33%.

(e) Slopes beyond 100% should be only under preservation forestry.

(f) It may be advisable to introduce garland/necklace rows or trees/shrubs/grasses in currently cultivated terraced lands to restore ecological balance to some extent.

4. SOIL CONSERVATION

(a) Land use must be based on land capability classification.

(b) Improvement and maintenance of bench terraces through proper management practices should be encouraged.

(c) Soil Conservation works should follow a well-planned programme on watershed basis.

(d) Landslide prone areas should be demarcated for treatment.

5. HYDROPOWER

Perennial stream sources may be surveyed and suitably exploited for generation of hydropower.

6. MARKETING

(a) Marketing infrastructure should be developed.

(b) Procurement, processing and marketing of cardamom, oranges, apples etc. should receive proper attention.

(c) Agro-based industries for processing, preservation and for producing value added products should be encouraged.

7. KNOWLEDGE GAP

(a) The Centre of ICAR Research Complex at Gangtok should be adequately strengthened to enable it to give proper support to developmental activities in the state.

(b) Research on improvement of cardamom for yield and disease resistence etc. should receive priority.

(c) Suitable agro-forestry systems should be developed, demonstrated and translated on the farmer's fields.

8. INFRASTRUCTURE AND PUBLIC POLICIES

(a) Manpower training should receive due attention for supporting all the developmental activities in a planned manner.

(b) Incentives should be provided for working in rural and remote areas.

(c) Peoples participation in proper land use planning should be ensured in an organised manner.

CHAPTER 2

# Agriculture Advances and Rural Economy in Sikkim

Although planned agricultural development in Sikkim was started during 1954-55, it gained momentum only in 1976-77, that is during the fifth Five Year Plan. The state technologists assisted by central experts experimented a Regional Concept of Agricultural Development for the first time in Sikkim. Based on Agro-climatic condition, the state has been agriculturaly divided into nine Regional Centres and various Sub-Centres. These Centres are serving as the focal point of developmental activity. The technologist of each centre studies the production problems of each area and find out the solutions through experimentation in the Regional Farms and help the farmers in solving their multifacet problems by providing improved technology such as designing cropping pattern suited to the different elevations of the area, supplying improved seeds, improved cultural practices, supplying right type of fertilizers, soil ammendments, pesticides and motivating them with demonstrations, training and guiding in all respects.

A large number of different varieties of crops are collected, experimented for adoption and best ones are quickly multiplied in. the Regional Farms and distributed to the farmers through V.L.W Centres located at different places of each region in the rural areas. These Regional Centres and Sub-Centres are properly guided by technologist in the District and Directorate in their various works.

Farmers Training Centres in the District help the farmers by demonstration, organising field days, crop competition, and imparting residential and non-residential training courses in the District and the villages.

V.L.W. Circles are provided in the midst of 3 to 4 villages from where production technology and improved seeds, fertilizers,

pesticides and other inputs are made available to the farmers.

## HOW FAR THE PROGRESS HAS BEEN MADE

It is a matter of pride that the agricultural development in Sikkim is being spoken outside also as one of the leading in the North-Eastern States. At least we are satisfied to note that the practice of mono-cropping has been changed to double or tripple cropping by relay cropping or multiple cropping, or mixed farming irrespective of elevation and agro-climatic adverses. With the introduction of short duration photo-insensitive high yielding varieties of paddy, maize, dwarf wheat etc. production has certainly gone up. But this is not all, as we are still bringing huge quantity of food-grains from other states. We are still far away from self-sufficiency. Let us discuss some of the important factors responsible for such insufficiency in food-grains one by one.

**Limited area of cultivable land**

Sikkim is a very small state of India and the cultivable land is limited. The slopy difficult hill terrain has already exceeded deforestation below the minimum critical level. We are already heading towards dangerous soil erosion, land slide and other natural calamities. Further extension of cultivable land means extinction of human being from the hilly state.

**Production per unit area is low**

Major crops of Sikkim are grown in kharif season. Rabi crops constitute only about twenty percent of kharif crops. During kharif season our lands are mostly covered with clouds and rains. A limited quantum of solar energy is available to the plants for energy transformation. As such food production per hectare is very low. Such cloudy and rainy conditions often subject our crops to diseases and insect out-break. Hence the production per hectare is not only less but uncertain.

**Irrigation**

Irrigation in the hills is difficult. The springs and small revulets seen in the summer also get dry during rabi season. In the hills construction of big channels for irrigation is not feasible, as it often causes land slides and a permanent loss of lands. Unlike the

plains there is no underground water for digging it for irrigation. The capillary movement of soil moisture is horizontal in the hills unlike vertical in plains. Once the soil gets dry there is no means of irrigation unless there is a rain. Rain during rabi season is uncertain. Tapping of microwatersheds will not be sufficient to irrigate large areas. Thus, the farming in the state is mostly a semi dry farming which depends mostly on rain water.

**Limited agro mechanization**

Mechanization in the hills is difficult due to slopy hill terrain often cultivated with difficulty by the manual labour. As such the cost of cultivation is not only high but also depends on the skill of the farmer and the coverage of the area within a short limit of sowing time.

**Slow adoption of high yielding varieties**

The farming communities are mostly illiterate and the adoption of high yielding varieties is very slow.

**Lack of suitable varieties**

Since agro-climatic condition differs from pocket to pocket due to its ununiform topography and elevation the varieties of crops suitable for each pockets and elevation is lacking in the state.

**Cultivation of traditional crops**

Paddy is cultivated right from 300 to 1700 m above MSL. Cultivation of paddy above 1200 m elevation is not at all economical as the yield per hectare is low. Dry land farming is more profitable at higher elevations, but the tradition of paddy cultivation by the farmers at all irrigated area that results uneconomical and low yield per unit area, have to be modified by the farmers.

**High rate of influx of floating population**

Floating population is also responsible to a great extent for huge quality of food requierment. The working class for the construction of roads, bridges, buildings, carpenters and in industries are almost all from other states as the development is not keeping pace with the manual labour available in the state.

Biological use of agriculture product is worst in the state.