

# Chapter 8

## Major Findings, Conclusion and Suggestions

### Major Findings

Despite adversities, agriculture is the main occupation of the inhabitants in the mountain state of Sikkim and it forms the basis of the socio-cultural pattern of the territory. Basically, land and water are the two important aspects of natural resources which contribute considerably to agriculture of Sikkim. Food crops, usually grown in valleys, terraces and hill slopes, supplemented by some animal products satisfy the basic energy intake of the inhabitants.

The habitable areas in Sikkim extend from 300 to 2100 m, but the actual settlement has been confined only below 1800 m amsl. According to 2011 census more than 75 percent of people live in rural areas. Due to the absence of any sizeable flat land the distribution of population is sparse throughout the state.

Agricultural development in the districts as well as the state gained momentum immediately after the merger of Sikkim with India. The state's economy is largely agrarian, based on the terraced farming of rice and the cultivation of crops such as maize, millet, buckwheat, wheat, barley, pulses, oilseeds, potato, ginger, oranges, tea and cardamom.

Sikkim occupies only 0.2 percent of geographical area of the country. But most of the land is unfit for agricultural use due to rocky precipitous slopes, rugged topography etc. The department of Agriculture and Horticulture has prepared a month-wise calendar for the cultivation, transplanting, harvesting etc. of different crops in Sikkim. Similarly, different communities of Sikkim – Bhutia, Lepcha and Nepali have also prepared the month-wise calendar according to their tradition, culture and religious aspects in relation to agricultural activities.

The agro-economics of the entire state is determined by physiographic conditions and socio-cultural compounds. The state has been divided into four districts according to administrative convenience and regional location i.e. East, West, North and South. The South district has 148 Revenue Blocks, 452 villages, 47 Gram Panchayat Units and 271 Panchayat wards. For the purpose of research only 15 Gram Panchayat Units (GPUs) were randomly selected on the basis of agro-climatic zones. Altogether there were 8,975 households in the 15 GPUs under

study, out of which 1,500 households were sampled. To reach the target of above 15 percent, 100 households from each GPU were selected by random sampling method. The selection of GPUs was done as follows: Set I - 300m to 900m (Namphing, Legship, Rong-Bul, Tarku, Turung-Mamring), Set II - 900m to 1500m (Sadam-Suntaley, Tinik Chisopani, Namthang-Maneydara-Assangthang-Wok-Omchu,) and Set III - 1500m to 2100m (Borong-Phamthang, Barfung-Zarong, Paiyong, Tinkitam-Rayong and Perbing-Dovan).

The agricultural activities for livelihood in study areas are mainly categorized into three groups - mainly subsistence, mainly commercial and no agricultural activity. The highest number of Sikkim's farmers depends on mainly subsistence which covers around 96 percent of the households, while a handful (3.4 percent) are progressive farmers, in the sense they prefer commercial farming over traditional agriculture. Some of the households i.e. 0.33 percent in villages are not involved in agricultural activity due to small size of family, water scarcity, old age, etc and are involved in other non-farm activities.

The food chain system of the state is mainly dependent upon crop and animal production which is largely based on fixed farming. Under the land-locked situations prevailing in most parts of the state, field crop production occupies the primary position and agriculture and livestock play supplementary and subsidiary roles. Moreover, cattle supply the farm power by means of bullocks which are the backbone of agricultural operations where mechanization of farm power is not feasible due to topographical features. The animals under this system thus have a multi-functional utility and their products such as milk, meat and eggs are by and large utilised domestically and surplus if any is sold in the neighbourhood or in nearby market. Cattle, goats, pigs and poultry, especially chicken which are reared in the mid and lower hills by the settled farming community come under the subsidiary system.

Agriculture along with livestock is the single largest source of employment in the state. Over 80 percent of the farmers in the state own livestock and earn supplementary incomes from them. The four main livestock – cattle, goat, pig and poultry are main economic support to the villagers. As for the number of livestock available in selected GPUs i.e. poultry has the highest number, cattle comes second, goat third and pig, last. Many problems have come up in the state due to high population growth, limitation of land and increasing unemployment. Revamping of the farming systems by incorporating science and technology interventions is imminent. Livestock development has enormous potential in bringing about a favourable change in the rural economy of the marginal farmers.

The main agricultural and horticultural crops grown in the district within the elevation of 300m to 2100m are – maize, ginger, paddy, barley, buckwheat, mustard, pulses, cardamom, orange and vegetables. On the whole, eight different crops such as maize, rice, wheat, finger-millet, barley, buckwheat, pulses and oilseeds are taken into consideration in the state. The

crops found in study areas are maize, rice, ginger, paddy, barley, buckwheat, mustard, pulses, cardamom, orange and vegetables. Some of the crops are grown in very limited areas. As for availability of crops, maize and ginger constitutes nearly 50 percent. Maize is the main crop followed by rice, wheat, pulses, potato and vegetables that are predominantly grown in hill terraces. Few cash crops such as ginger, cardamom, tea, orange etc. play an important role in the economy of the district.

The predominant crops of Set I GPUs are rice, maize, pulses, ginger, wheat, mustard, potato, cabbage, cauliflower, millet, beans, soybean, buckwheat, orange, cardamom and vegetables.

In Set II (900m -1500m) the main crops of five GPUs are rice, maize, pulses, ginger, wheat, mustard, millet, soybean, buckwheat and vegetables.

In Set III (1500m- 2100m) the main crops of five GPUs are rice, maize, pulses, ginger, wheat, mustard, millet, soybean, buckwheat, wheat and vegetables.

Crop combinations in the study area according to field survey are: paddy-pulses-vegetables, paddy-vegetables-fallow, paddy-ginger, maize-pulses-vegetables, maize-soybean-vegetables, maize-buckwheat-vegetables, paddy+pulses, paddy+pulses+vegetables, maize+pulses+vegetables and maize+ginger. But maize-buckwheat-vegetables show fewer practises in comparison to other types of cropping.

Farmers still use traditional equipments in agricultural field. Though the power tiller is distributed to the progressive farmers by the Agriculture Department, Government of Sikkim, it has remained only as a trial and error tool. Power tiller's success in a hill state like Sikkim is yet to be proven. Moreover, 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.

After 2003, Sikkim government suddenly banned the use of chemical fertilizers in the agricultural field and instead encouraged organic farming only. In 2016, Sikkim was declared as the first fully organic state in India. After banning of chemical fertilizers, villagers started using different types of organic fertilizers such as cow dung, goat manure, pig manure, poultry manure, leaves collected from vicinity jungle, compost, and sometimes organic fertilizers provided by Agriculture and Horticulture Department.

Sikkim's agriculture has been developing fast over the last decades. It started to happen after the introduction of better farming techniques and better irrigation facilities which help increase agriculture production. The government has encouraged organic farming in the state with a view to produce eco-friendly crops, vegetables and fruits. In order to improve more in

organic farming the state government has started training and awareness programmes for farmers on EM composting training, methods for preparing organic manures, negative impacts of chemical fertilizers etc. and further to create awareness levels to the farming community and improve their organic practices and many more innovative programme for the long term benefit of the rural farmers.

The state is fully focused for the betterment of people of Sikkim in general and poor people/rural people in particular. The state authorities have initiated lots of schemes for the people so that they can be benefited and improve the quality and quantity of different food items as well as improve the purchasing power of people. To uplift the lot of BPL people relief is given from time to time by distribution of milk cow, pig, cardamom sapling, ginger, turmeric, HYV of seeds, organic manure, green house scheme, water tank, poly pipe, power tiller machine, different farmer trainings etc.

In the month of June, 2018 as per the 14<sup>th</sup> Finance Commission 2017-18, state government has opened organic stalls at Singtam highway side, by providing stalls for vendors worth Rs. 4,63,650. After the declaration of organic state, initiatives have been taken to set up many organic stalls in different places of Sikkim. The main target of government is to open at least one or two organic stall in the main town of every district.

Though maize is never a part of the staple food item, it is taken as substitute food sometimes in absence of rice in Sikkim. Its production still contributes over 70 percent of the total food grains production in Sikkim. The production of maize in South district has always been at the top among all crops but it cannot fulfil the requirement of food. The productivity of maize has been increasing. Within a period of five years it has increased by 4.9 percent from 2000-01 to 2005-06, likewise from the years of 2005-06 to 2010-11 increased by 4.8 percent, and again by 9.5 percent from 2010-11 to 2015-16.

Horticultural crops such as large cardamom, ginger and mandarin orange are the main cash crops which support the ecology and agro-climatic conditions of Sikkim. Horticulture is now one of the chief economic activities of the people of Sikkim. Large cardamom, ginger and turmeric are the principal spice crops, while mandarin orange, guava, mango, banana and so on are the principal fruits grown in the state. The department of Horticulture is deeply involved in motivating and providing technical guidance to local farmers. Sikkim is also famous for flowers. The scheme of Horticulture Mission for North East and Himalayan States (HMNEH) stands as a backbone of horticulture development in Sikkim and through it there has been a considerable enhancement in funding and amendment in pattern of assistance.

Agriculture pattern has been changing slowly in Sikkim with the progress of concepts and agricultural technology. Agricultural pattern has transformed itself from shifting to subsistence

and in the recent past has oriented itself towards commercial production, the reasons being the cultivation of off-season vegetables for generating good income.

The South district of Sikkim stood 1<sup>st</sup> in the state in vegetables production. The officials of Horticultural Department, Government of Sikkim, have adopted many schemes sponsored by central government in 2007, such as 'Vegetable Initiative' at the national level under the Rashtriya Krishi Vikas Yojana. The state has been benefited from another centrally sponsored scheme particularly the Horticulture Mission for North-East and Himalayan states – which was launched during 2001-02 under the Technology Mission for North-East for integrated development of horticulture. Sikkim government initiated an action plan especially in Gangtok, East district and Namchi, the South district headquarter, for practicing the vegetable initiative scheme.

At the present scenario, demographic and economic expansions have challenged the limits of economic, social and ecological sustainability, giving rise to questions about food security at a global level.

Population growth and food security are directly linked with food supply, food habits, health and nutrition. Population growth always wants for basic needs of food and shelter. If the requirements are fulfilled then there is no question of any effect on people's health and nutrition; otherwise the consequences will be counterproductive as far as health conditions, nutrition intensity and the quality of life are concerned. Food supply relies on the domestic food grains production and import quantity. Food production in the mountains depends on land available for cultivation, feasibility for cultivation of different crops and different facilities that would benefit the farmers. Rapidly increasing population juxtaposes reduction in total size of arable land which indicates a serious problem.

Sikkim faces food deficit due to unfavourable agro-climatic conditions, physical features etc. The state obtains food grains to the tune of 45,849 tons of rice and 636 tons of wheat annually under different Centrally Sponsored and State programme from FCI and distribute to the consumers through PDS (Subba, 2008). Economic Survey 2006-07 stated that Sikkim continues to remain a highly food deficit State. The deficits are seen more remarkably in oilseeds and pulses production.

According to HDR, 2001 maize cannot be considered as staple food in Sikkim, even though its production has steadily increased since 1980-81, and contributes over 50 percent of the foodgrains production in the state. But the share of rice, the main food item in the traditional diet, in total food production, has increased only by 20.7 percent. As Sikkim has been declared a food deficit state, there is no indication of marketing food grains outside the state.

Besides maize and paddy, various other cereals crops also grown in Sikkim. Though the contribution to other cereals in agriculture production is only 0.33 percent, they generate income and are important sources of food. Expenditure on cereals occupies the highest position in household budgets. Frequency of pulse consumption is little higher than the frequency of consumption of meat and fruits for the sample rural households.

According to Socio-Economic Survey 2006, the state is allotted 34,400 quintals of rice every month under APL and BPL scheme and 2,450 quintals of wheat. The annual requirement of food grains to tide over the scarcity of food in Sikkim in the past decade can be understood from the fact that during 2007 the government of Sikkim demanded 5000 metric tons of rice as buffer stock. The government of Sikkim also accepted in 2009 that there is shortfall of 18,254 tons of fruits and vegetables, 2,050 metric tons of beef per annum, pork per annum 380 metric tons and 135.24 lakhs eggs per annum.

In 2009 two schemes were announced by the state, namely, Mukhya Mantri Poustha Ahaar Yojana – monthly free distribution of 4 kg of mixed pulses to BPL families and Mukhya Mantri Jeevan Rakshyak Kosh. In India the per capita Calorie (Kcal/day) intake of rural population is 2233 and urban population is 2206, but in Sikkim it is 1614 for rural and 1890 only for urban population as per 2011-12 data. Sikkim has low per capita intake of Protein and fat as compared to India in both rural and urban areas.

There is a deficit of nearly 72,000 MT (food grain) 12500 MT (pulses) and 3500 MT (oilseeds) respectively. Rice is the staple food even though sometimes *Makai ko Chamal* substitutes rice. The highest average consumption of rice per family is between 1kg (1000gm) - 2kg (2000gm). As per data on family size, the average number of persons in a family is five. Family size always affects the rate of food consumption. The requirement of rice per member per family is 300 grams per day = (1500gm/5 members= 300gm) but the per capita availability of rice in the state is 158 gms/day, which is far below the National average of 417 gm during 2001-02.

If the per capita consumption of rice per day is 300 grams, then state needs 65,942 tons of rice per annum. The domestic production of rice as per 2015-16 report is only 19,690 tons. In other words, there is shortfall of 46,252 tons of rice per annum. It is clear that only 22.99 percent is contributed by domestic production while remaining 77.01 percent is imported from other states. Needless to say the state is food deficit and insecure. In the survey areas the people were seen to take chapattis, momo (meat or vegetable dumplings) and other items from wheat (maida/atta), though not frequently. The monthly consumption of wheat on an average is 3-4 kg. If the average family size is five persons, then per year need amounts to 5,935 tons, but the state produces very small quantity of wheat, about 350 tons only (2015-16). Therefore, there is a shortage of 5,585 tons of wheat per annum in the state. Clearly, 94.43 percent of wheat

requirement depends on other states and only 5.57 percent comes from home production. Overall it is seen that there is foodgrains deficit in Sikkim. The state arranges to distribute very low cost rice to the BPL families. If allotted rice is withdrawn by the government there will be problems of feeding for as much as 63.74 % of households in the surveyed area. However, 36.26 % would not get affected if food subsidy is withdrawn. Still, the situation seems to be alarming as far as food security is concerned.

In the case of vegetables production and consumption, per capita per day scenario in Sikkim is very interesting and impressive one. As per field report per capita consumption is around 250 grams per day, but according to recent data (2015-16) prepared by Horticulture department it is stated that per capita consumption is 280 grams. The state's own production of vegetable is 80,976 tons while domestic requirement is 61,546 tons. It gives the positive indication in state that there is about 19,430 tons of surpluses in vegetable production. That answers the question why Sikkim government has banned the import of inorganic vegetables from outside state. Actually it is for the betterment of Sikkim's people.

To make sure about storage and proper distribution of foodgrains many new food godowns have come up at Chungthang, Pakyong, Ravangla, Chongrang and Dentam. For the implementation of different schemes and policies, the Food & Civil Supplies and Consumer Affairs Department, Government of Sikkim operates a total of 27 Food Godowns in the State which are under supervision of the District Food and Civil Supply Officials. From these Godowns essential commodities such as rice, sugar, salt and 'atta' (wheat flour) are distributed through Fair Price Shops registered with the Food & Civil Supplies Department. Again, department has issued license to 1,538 shops including Cooperative Societies to run as Fair Price Shops all over the state.

The increasing gap between the population and resources shall ultimately lead to the point where gloom and poverty shall become unavoidable. The concept of Malthus theory applies in Sikkim with respect to population growth and production of food grains, where population increases in lakhs but the production is increasing in thousands of tons only. Thus there is always a gap between two aspects and it is for this reason that the state is food insecure.

## Conclusion

Physical environment and human economic activities are very closely linked. From the beginning human being is conscious about insecurity in terms of food and shelter. Human being always tries to make relation with physical environment in order to sustain life. People living in mountain environment have to work harder to maintain this relation. Mountain agricultural environment is not very conducive for bountiful production, particularly food grain production, and often cannot meet the food requirements of mountain households.

The main spotlight of this dissertation is on i) Agro-economic environment and ii) Food security in Sikkim. In order to understand the aforementioned aspects and different stages of agriculture development in Sikkim in general and South district in particular, studies have been made on people tilling the agriculture field, adopting traditional as well as modern methods, practicing different cropping patterns, off season vegetables cultivation, adopting new concept on horticulture i.e. organic farming, rearing of animals, development plan for agriculture improvement and policy instruments for making cultivation environmental friendly – all that would make the state more food secure.

Agricultural economics is that branch of knowledge which takes into account agriculture and economics together. The study of agricultural economics is of recent origin. Agricultural economics is a social science which teaches how to maximize production, yields outputs and returns from agricultural activities. Following the thumb rules of agro-economics, most of the farmers now follow the mixed farming system i.e. Agriculture+Horticulture+Animal Husbandry. In Sikkim too, mixed farming like raising Crops+Animals+Trees together is being practiced.

The agro-economic activities which are now being adopted by the farmers can make the socio-economic environment healthier and stronger. Environment can be either natural or manmade; generally the latter one is more active in the case of agro-economic milieu. Almost every system in agriculture is essentially formed of mixed farming with arable cultivation of cereals and tubers, livestock-rearing and intensive use of forests. The rugged topography offers very little of its land for cultivation (estimated as only 11.13%. However some data indicate 15.36 % as the total operated area in the state). According to the 2015-16 progress report of Food Security & Agriculture Development Department, Government of Sikkim, if horticulture and agriculture are combined together (total land 73,612.8 ha+69,423 ha=1,43,035.8 ha), 20.15 % operated land is estimated to have been dedicated to agriculture+horticulture as whole. As per 2015-16 data agriculture+horticulture land use cover in South district is estimated to be around 41,790 hectares or about 5.89 percent of the total geographical area.

The habitable region in Sikkim extends up to 2100m, which constitutes about 23.9% of the total geographical area; settlements are mainly limited to the area lying below 1800m and are generally clustered in the southern part of the state. The average slope of the study area is 39 degrees. The sloping lands are three to four times less capable in meeting the food requirements of calorie and protein because it can hardly sustain three to four persons per ha per annum against the sustainability of nine to ten persons in a plain land.

More than 65% of the population of Sikkim is engaged in agricultural activities. Land plays vital role where the socio-economic development is limited particularly when economy is largely based on agriculture. More than 70 percent of the rural population depends on agriculture and other allied sectors in order to secure their economic, food and nutritional aspects.

Sikkim is known as '*Renjong*' or '*Denzong*' or 'the valley of rice'. There are two main rivers i.e. Teesta and Rangit which drain the state from north to south, forming wide valleys in the lower parts of Sikkim. However rice cultivation is possible only in the irrigated and terraced lands. It can be grown in the areas which have altitude ranging from 300 to 1700 metres. For centuries most of cultivable land as well as cardamom plantations were under the controls of Bhutia *kazis* (landlords and aristocrats), which continues even today.

In the past there were land reform demands consisting of three points: abolition of landlordism, introduction of responsible government and Sikkim's accession to India. A set of land reforms and land ceiling were implemented after the abolition of monarchy and Sikkim's annexation with India. Regarding ceiling on agricultural land some of the important points that were decided are: single adult person can hold up to six and half acres of land, two adult family members can hold twelve and half acres, and families having more than five members can hold twenty and half acres of land. For the religious institutions (monastery estates) the ceiling is much higher, ranging between twenty to sixty acres of land. But the ceiling is not properly maintained in the case of Lepcha and Bhutia land; as such their land cannot be purchased by other communities except the tribal communities. So agriculture is not fostering due to unequal distribution of land. In Sikkim, the all India land ceiling of 12 acres, which is blanket ceiling irrespective of topographical variations, is difficult to implement. The *Kazis* in Sikkim still hold considerable amount of land, some reportedly have 1500 acres of land even today.

For the first time detail land utilization statistics of Sikkim was published in 1995-96 by the Department of Agriculture, Government of Sikkim. The land holdings in Sikkim are large, medium and small/marginal. The large land holdings, mostly owned by the Bhutia landlords are few in number. In the South district maximum land holdings are in marginal category. As per primary and secondary data, marginal land holders constitute 67.03 percent which is

obviously much more than the other categories combined together. In South district about 68.33 percent of households are located in dry, rain-deficient area. Consequently, much of the land holdings in the district are dry land. Community-wise distribution of households shows that the Rai community owns most of the dry land holdings due to major share in population (Socio-economic Report 2006).

The number of workers in rural areas of South district is much higher than in urban areas. A large number of workers in the district are marginal. The female marginal workers are more in number (13,826) than male workers (10,029), 15.92 percent more than male marginal workers. The male workers are mostly main workers but the female workers have less time for outdoor activities. Among the selected GPUs, Barfung-Zarung and Namphing GPU has the highest main worker. Animal Husbandry helps to supplement income and food for the farming households in the forms of dairy, poultry, goatery and piggery. Dairy is the main income source in upper GPUs (1500 - 2100 metres amsl), poultry in middle (between 900 to 1500 metres amsl) and again dairy in lower GPUs (300-900 metres amsl). Though self consumption is often found to be the main reason for rearing of livestock, in some households poultry farming is done in small/medium scale on commercial basis. Average income and expenditure of farmers/villagers fall within the range of Rs. 30,000-40,000 per annum.

Workers remain involved in agricultural activities between 6 months to 9 months. Agricultural land remains uncultivated (fallow) for more than 3 months in a year due to scarcity of water, lack of proper irrigational facilities and lack of man power. Earlier, to fulfil the shortage of labourers, the farmers used to practice '*Parma System*' (exchange of agricultural labourers) from one family to other family during the time of sowing and harvesting. However, '*Parma System*' has slowly disappeared due to decrease in the number of family members, individual involvements in various other vocations, and the onset of compulsory education policies of the government.

The annual growth of Gross State Domestic Product of Sikkim at current prices in 2014-15 accounted by agriculture is 13.35 percent. Sikkim's Gross Domestic Product was estimated at US dollar 1.57 billion in 2014.

Mainly two types of cropping seasons have been found i.e. kharif season and rabi season, but recently a sort of agricultural revolution has occurred in the form of off-season vegetables which has changed the horticulture scenario in Sikkim. In 2016, Sikkim has been declared as the first fully organic state in India. Nowadays the farmers are using only organic manures in their agriculture field. As a corollary to the government of Sikkim announcement of November, 2017, vegetables grown inorganically outside the state have been banned in Sikkim after 31<sup>st</sup> March, 2018. The Government of Sikkim has made it compulsory to grow only organic vegetables in the state, so that people of Sikkim can have access to hygienic and

healthy vegetables in order to protect themselves as well as horticultural crops from various diseases. Access and availability of healthy and hygienic crops and vegetables is one of the essential elements under food security. Moreover, horticulture is nowadays gaining popularity for domestic consumption as well as marketability.

Maize is the main crop in Sikkim, and also in the study areas, followed by rice, pulses, potato, ginger, vegetables etc. Maize is one of the staple as well as substitute foods of rural people in the state. Though rice is the primary staple food, sometimes *makai ko chamal* (maize granules) is consumed as substitute of rice. As for cash crops, ginger is a good income source for small and marginal farmers that can be grown up to an altitude of 1500m above mean sea level. However, it was observed during field survey that some of the farmers have of late reduced the cultivation of ginger due to low market price. Farmers are still found to rely on traditional crops more than modern or HYV crops.

The farmers in the study area often get frustrated due to low rainfall/lack of irrigational facilities and crops destruction by wild animals. From the villagers' point of view they are food insecure due to low production, scarcity of water, crop destruction by wild animals, soil erosion, land fragmentation, rugged topography etc. They spend more than 1/3 of their budget to procure their food items. The main reasons for shortage of food in a household is low agricultural production, lack of proper storage, shortage of food at the time of landslides and lack of purchasing power.

The sources of food grains in the households are domestic production, purchased from market and government ration. Food shortage becomes acute when low agricultural production is coupled with lack of purchasing power that constitutes around 81.97 percent. It is obvious that most of the people have to depend on market for food grains.

The percentage of population living below poverty line in Sikkim in the year 2006 was 19.33. But by the year 2011-12 it came down to 8.19. Even then Sikkim had higher percentage of population below poverty line during 2011-12 compared to states like Goa (5.09 %), Kerala (7.05%) and Himachal Pradesh (8.06 %) respectively.

In order to bring relief to high percentage of people living below poverty line the National Food Security Act (NFSA), 2013 suggests coverage of up to 75% of the rural population and up to 50% of the urban population for receiving subsidized food grains under Targeted Public Distribution System (TPDS).

The correlation coefficient of population growth is 99 percent, but the production correlation coefficient is only 0.06. Hence, a very poor correlation has been observed between the two

variables. Therefore, people of Sikkim depend on imports from other states for different commodities.

Despite considerable annual investment in agricultural sector new recommended technologies have not reached to the majority of farmers. The deficit of the above could be linked to the meagre number of young people unwilling to enter the field of agriculture.

Sikkim needs immediate measures to transform agriculture by developing in-house measures and investing more on research and development by the government to bridge the deficit that exists and if not worked upon immediately may lead to a more broadened state.

It is interesting to note that the concerned department for agricultural development in Sikkim is called Department of Food Security and Agriculture Development. The message is clear that this tiny Himalayan state with a population of less than 7,00,000 strives to make its inhabitants food secure by re-vamping agro-economic activities.

## Suggestions

- Due to lack of storage facilities, farmers have to sell the ripened horticultural products and cardamom at low cost at throw away prices. As a medium for the purchase of the products and the platform for storage, co-operative societies have to be encouraged. In addition, a farmer centric, minimum support price for the horticultural products and cardamom have to be fixed by the government as a support measure to the farmers.
- A comprehensive in-depth research must be undertaken in every cluster and block levels for generating a rationale based protocol that guides the farmers for cultivating crops according to soil, climate, elevation, slope etc. of a particular region. A mission oriented popularization of high yielding, improved and locally suitable varieties of crops are need of the hour.
- Scientific based cultivation of appropriate and naturally growing crops, simultaneously with traditional methods of practice are desirable.
- Measures for the improvement of indigeneous varieties of seed crops is required.
- Strict adherence to pre and post harvest management practices appears essential for food security.
- Reforms are required to strengthen research and implementation of extension programmes for farmer's participation.
- Requirement to encourage the practice of mixed farming system to avoid failure of particular crop. For example, cultivation of maize and soybean together will help the farmers benefit. Though maize does not offer high dividend to the farmers, selling soybean may act as a compensation. Similarly, new cropping pattern like ginger + maize, pea+oilseed, ginger+ pulses and turmeric cultivation can help the farmers benefit.
- In hilly area, like south district, an approach on conservation of soil is very crucial for the treatment of catchments and watershed areas. Setting up of a micro-economic unit may boost the economic conditions of the farmers and also solve problems of soil erosion.
- Lack of irrigation facility is an immense problem in the district. The agricultural practice in the district is mostly rainfed. This problem may be solved to a certain extent by practicing roof water harvesting. The excess rains during rainy season can be collected in the tank for future use and also for the recharging of the ground water. Roof rain water harvesting should be made mandatory for every household in the villages.
- Water shade and catchments area development approach is one of the essential soil water conservation practices for sustainable agricultural development in hilly area. This approach can be successfully actualized on a holistic basis only if there is the participation of various stakeholders that include, farmers, local bodies and planners.

- Setting up regulated market with facilities in terms of infrastructure, market information and transport will help farmers obtain suitable price for their produced commodities. In every panchayat ward the rate chart of vegetables and other essential items should be displayed for the general awareness of the villagers.
- Financial input institutions in agricultural sector is essential in every district. Proper policy and planning for procurement of inputs, sales of products, proper and appropriate norms to get rid of middlemen, will enhance production and income as well as the agricultural development in the district.
- Inspiration and motivation to the farmers in the right direction and their participation will encourage them to implement the execution of various plans and policies of the state.
- The fertile land suitable for paddy cultivation should not be leased to different companies/pharmaceutical/factories.
- Implementation of schemes of animal husbandry should be done only after undertaking research in the field. Also, hands-on experience focussed on practical learning should be imparted to the villagers engaged in such activities.
- For raising the productivity of livestock, rearing of improved breeds and setting up of artificial insemination centres in all corners should be encouraged.
- Frequent livestock health check up becomes mandatory and most essential.
- It appears that there is some sort of regional specialisation in relation to livestock rearing for example, sheep and yak farming in the himalayan region, cattle, goat etc. in middle hills and poultry farming in the lower belt and this practice requires continuity.
- Improved varieties of grasses have to be introduced so that the problem of fodder and pasture gets reduced.
- Building buffer stocks is essential during the time of rainy season.
- Improving food distribution –building of proper Public Distribution System (PDS).
- Improving household food scarcity through:
  - a. Improving purchasing power.
  - b. Food for work programme (like MNGREGS).
  - c. Direct or Indirect food subsidy to all villagers.
- Food supplementation to properly address special needs of the susceptible groups through Integrated Child Development Services (ICDS), Mid-Day meals etc.
- Sun light or solar light plays crucial role in increasing crop production and positively influences poultry farming. Every living creature is a music lover and historically

music has been an integral part of our lives. Therefore, music may be experimented as an option to enhance milk production.