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A Comparative Review of Advances of Agriculture Versus Horticulture: A Study of Sikkim

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Abstract: Like all the hilly and mountainous regions of India, agriculture is still backward in nature in Sikkim and it is characterised by problems of diverse topography, difficult terrain, inaccessible habitation, extreme vulnerability of natural calamity, poor infrastructure and distinctive gender dimensions. In 2003 a major decision was taken by the Sikkim state government to fully adapt to organic means of agricultural production. In 2016 Sikkim was declared as the first organic state in India. The present study reviews the performance of the agriculture and horticulture sector during the period 2003 to 2016. The results of the study reveal that horticulture made a considerable progress compared to agriculture in Sikkim in the study period. To further improve the performance of the horticultural sector the state government has to take series of reform measures such as integration of production and markets, provide technical assistance to the farmers, improve transportation and warehousing facilities, improve the thrust on agriculture in terms of investment and planning and increase the area coverage of horticultural crops in the state.

INTRODUCTION

Agriculture in Sikkim, like rest of the other hilly and mountainous regions in India is generally characterised by problems of diverse topography, difficult terrain, inaccessible habitation, extreme vulnerability of natural calamity, poor infrastructure and distinctive gender dimensions[1]. Owing to the physical features of the state terrace cultivation is required, majority of the land holdings are small in size, the technologies of production are outmoded, there is an inadequate thrust on agriculture in terms of investment and planning and also there is inadequate infrastructural support such as transportation, irrigation, technical research and marketing.

Although backward in nature agriculture and allied field activities serve as the backbone of the rural population in Sikkim and agriculture is practiced in approximately 11per cent of the total area of the state. About

64 per cent of the population depend on the same. The net cultivated area is 80,000 hectares including the large cardamom fields.[2] The practice of agriculture in Sikkim has always been organic in nature in Sikkim but in 2003 Sikkim became the first Indian state to initiate organic farming and banned the use of chemical fertilizers in farming.

In terms of practice, organic cultivation has its issues related to low yield as compared to traditional cultivation, incidence of pest and disease infestation, etc. However the scenario is different in Sikkim as compared to rest of India. Sikkim possesses certain advantages such as low average fertilizer consumption of just 7 kg/ha, low levels of pesticide consumption, the soil in Sikkim is rich in organic matter content which ranges from 2.7 per cent organic carbon and more than 15000 ha is under cardamom cultivation with forest cover where fertilizer and pesticides has never been applied[3].After the government's decision of making Sikkim an organic state, the government of Sikkim stopped receiving government of India quota of chemical fertilizers from 2005. Sikkim organic mission was launched in 2010 with a target area of 74,303 ha to be brought under organic certification. As on 2015 Sikkim achieved organic certification area of 76169.604 ha with 66,227 farmers and 191 growing groups practicing organic cultivation[4]. In 2016 Sikkim was declared as the first organic state of India in terms of agriculture production. Organic farming is being promoted in Sikkim in recent times, in view to protect the soil degradation owing to the limited size of the land available for cultivation, to protect the rich environment and ecology and for the healthy living of its people[5].

The location of Sikkim provides optimum condition for cultivation of wide range of agricultural and horticultural crops. The agro-climate varies from subtropical to alpine and no single crop or variety can suit all the elevation ranges so crop diversification and mixed farming is practiced. Rainfall in the state is quite high and agriculture is predominantly rain fed, the area under irrigation is hardly around 11per cent of the operational area and assured irrigation is even less than 5 per cent. The main season for cultivation of agricultural crops in the state is the Kharif season[6]. Rice, wheat, maize, millet, barley, buckwheat etc are the major agricultural crops grown in Sikkim. Fruits, vegetables, roots and tubers and spices such as turmeric, ginger and large cardamom are the major horticultural crops grown in Sikkim. Since, the agro climate suits the cultivation of both agricultural and horticultural crops and given the limited size of agricultural land available for cultivation there needs to be a choice made between the agricultural and horticultural crops cultivation in terms of its economic viability.

With respect to Sikkim, horticulture has a number of advantages compared to agriculture crops. First it's more remunerative and horticulture can be done on dry and hilly land. Water utilisation is lower and risk of crop failure is also lower for horticultural crop. Horticultural farms can be much smaller where marginal farmers can earn a livelihood from their small landholdings unlike in the case for large scale cereal farming. Mixed farming and crop diversification can also be practiced in the small land holdings. But in terms of consumption rice is the staple crop of the general Sikkimese population and maize is major fodder crop used for the livestock in Sikkim.

In view of the present scenario in Sikkim, this paper is an attempt to analyse and compare the growth performance of agriculture and horticulture sectors in the Sikkim from the period of initiation of organic farming in 2003 to the attainment of full organic status in 2016.

DATA AND METHODOLOGY

The study covers the period of 13 years (2003-2016), secondary data for the study were collected from different published, unpublished sources and government reports. This paper uses compound annual growth rates and share of different crops in the overall growth of crop sector for both agriculture and horticulture.

Compound Growth Rates

The compound growth rates was computed to understand the pace and pattern of agricultural and horticultural sectors. To estimate the compound growth rate following formula was used:

$\log Y = a + \beta t$

Growth rate = $(\exp(\beta) - 1) * 100$

Where,

Y = Area and production

a = Intercept

t = Time

β = Slope coefficient

Share of different crops

The contribution of different crops to overall growth in crop sector is estimated as the sum of annual changes in area of crop 'i' (from year t to t+1) divided by the sum of changes in area of all crops.

$$S_i = \frac{\Sigma_{t=1}^{T} \Delta Area_{it}}{\Sigma_{t=1}^{T} \Sigma_{i=1}^{n} \Delta Area_{it}}$$

Si = The share of crop 'i' in the overall growth of crop sector

Δ Area = Change in area of crop 'i' (i=1 to n) from year t to t+1 (t=1 to T)

RESULTS AND DISCUSSIONS

Share of Different Sectors

Agriculture and allied activities accounted for about 21.45 percent in the total share of State Gross Domestic Product (GSDP) for the year 2003 but there has been a gradual decline in its share in the following years. In the year 2016 its share in the GSDP is just 7.60 percent. The fall in the share of agriculture sector is juxtaposed to the growth in the secondary sector.

Table I
Share of Different Sectors in GSDP

Year	*Share of agriculture and allied activities*	*Share of Industry*	*Share of Tertiary sector*
2003	21.45	28.57	49.96
2004	20.54	30.21	49.23
2005	19.72	31.57	48.69
2006	16.80	28.68	54.50
2007	16.67	30.12	53.19
2008	14.70	35.90	49.37
2009	8.52	56.27	35.19
2010	8.31	60.99	30.69
2011	11.37	60.64	27.98
2012	10.74	60.61	27.63
2013	10.34	62.61	27.04
2014	8.40	59.90	31.70
2015	8.00	61.20	30.80
2016	7.60	62.30	30.10

Source: Authors calculation from CSO data on State Domestic Product and Directorate of Economics, Statistics, Monitoring and Evaluation (Govt. Of Sikkim)

The share of secondary sector has risen from 28.57 percent in 2013 to 62.30 percent in 2013. Although in terms of GSDP in current prices the contribution of crops has increased but the increase has been outweighed by the increase in sectoral contribution of the secondary sector. The growth in the secondary sector is mainly due to the growth of the manufacturing and construction[7]. The share of tertiary sector has also decreased in the

period 2003-16 but the decrease has been gradual. Tourism services are the major contributor in the share of the tertiary sector. Although there has been a fall in the sectoral contribution of agriculture and allied activities it still remains the highest contributor in terms of employment generation. In 2011–12, close to 62% of the Sikkimese were employed in agriculture and allied activities[8].

COMPOUND ANNUAL GROWTH RATES

Compound annual growth rates (CAGR) for the various crops in terms of area and production was calculated for the period 2003-04 to 2015-16. It is evident from Table II that horticultural crops namely fruits, vegetables, roots and tubers and spices all have a positive CAGR in terms of both area and production. Fruits have the highest CAGR with 7.80 percent and 7.39 percent in terms of area and production respectively. Large cardamom is the major spice grown in Sikkim and it contributes significantly to the total production of large cardamom in India. CAGR in terms of area is 0.34 percent and in terms of production is 4.89 percent for spices in Sikkim for the study period. Vegetable production, which is a main source for income generation for the rural population also shows a positive growth in the study period. In terms of area, the CAGR for vegetables is 4.95 percent and 6.50 percent in terms of production.

Table II
Compound Annual Growth Rates of Area and Production of Various Crops

Crops	*Cagr (Area)*	*Cagr (Production)*
FRUITS	7.80	7.39
VEGETABLES	4.95	6.50
ROOTS AND TUBERS	3.34	4.48
SPICES	0.34	4.89
PADDY	-2.72	-0.65
WHEAT	-24.37	-26.72
MAIZE	0.58	1.53
MILLET	-3.75	-2.43
BARLEY	-8.33	-9.33
BUCKWHEAT	7.29	9.50
URAD	-1.18	0.58
OTHER PULSES	0.002	-2.32
SOYABEAN	-1.15	-0.29
RAPESEED	-2.17	-0.35

Source: Authors calculation from Annual Reports, Department of Agriculture and Horticulture, Government of Sikkim 2003-04 to 2015-16.

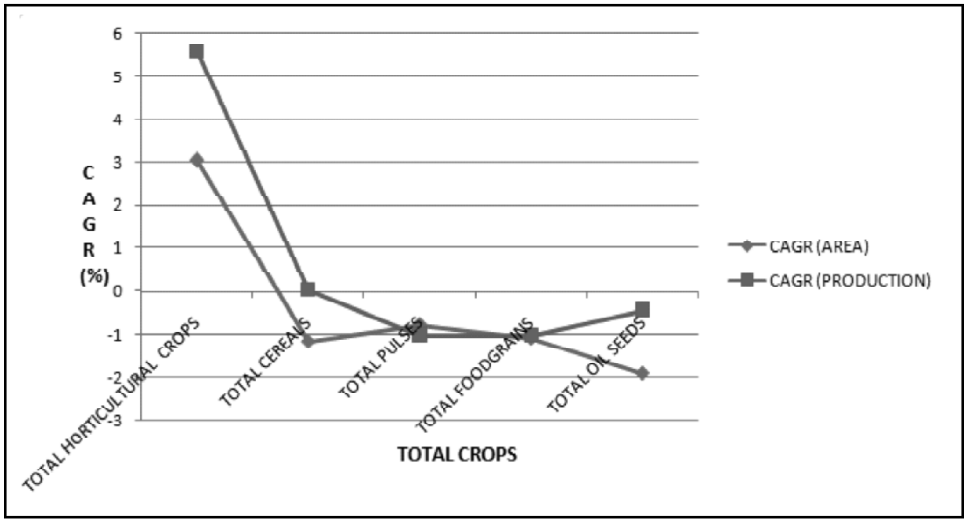
During the period of the study majority of the agriculture crops show a negative CAGR in terms of both area and production. Only maize and buckwheat record a positive CAGR for both area and production. CAGR in area is 0.58 percent and 1.53 percent in production for maize and buckwheat records an impressive 7.29 percent CAGR in area and 9.50 percent CAGR in terms of production.

Table III
Compound Annual Growth Rates of Area and Production of Total Horticultural and Agricultural Crops

Crops	*Cagr (Area)*	*Cagr (Production)*
TOTAL HORTICULTURAL CROPS	3.03	5.59
TOTAL CERIALS	-1.15	0.02
TOTAL PULSES	-0.76	-1.00
TOTAL FOODGRAINS	-1.08	-1.01
TOTAL OIL SEEDS	-1.91	-0.43

Source: Authors calculation from Annual Reports, Department of Agriculture and Horticulture, Government of Sikkim 2003-04 to 2015-16.

Figure 1



Source: Authors calculation from Annual Reports, Department of Agriculture and Horticulture, Government of Sikkim 2003-04 to 2015-16.

From Table III, for the study period total horticultural crops have a CAGR of 3.03 percent for area and 5.59 percent in terms of production. Total cereals record a negative CAGR of -1.15 percent in terms of area but a negligible positive CAGR of 0.02 percent for production. Total pulses

record a CAGR of -0.76 percent and -1.00 percent for area and production respectively. Total food grains and total oil seeds also record a negative CAGR for the study period.

SHARE OF DIFFERENT CROPS IN TOTAL CROPPED AREA

Share of different crops in the total cropped area was calculated for the study period. Rice, maize and spices had the majority share in the total area in the year 2003-04. Maize had the highest share of 28.73 percent, spices had a share of 24.82 percent and rice had a share of 11.54 percent in the total cropped area. Over the years, during the study period the percentage share of maize in total area cropped has remained fairly uniform. In 2015-16 the share of maize stood at 28.65 percent. The share of rice in the cropped area has seen a considerable decrease to 7.84 percent in 2015-16. The share of spices in the total area also decreased in the study period to 21.67 percent in 2015-16 but the decrease has been negligible. The share of other agricultural crops viz, wheat, millet, barley and pulses have all decreased during the study period except the share of buckwheat which has increased. The share of other horticultural crops in the total cropped area has also seen a considerable increase in the study period.

Table II
Percentage Share of Different Crops in Total Area in Different Year

Year	*Rice*	*Wheat*	*Maize*	*Millet*	*Barley*	*Pulses*	*Buck wheat*	*Fruits*	*Vegeta-bles*	*Roots*	*Spices*
2003-04	11.54	4.49	28.73	3.24	0.963	5.25	1.57	5.96	7.19	6.19	24.82
2004-05	11.48	4.47	28.59	3.23	0.95	5.22	1.56	6.42	7.01	6.22	24.80
2005-06	11.79	4.59	29.36	3.32	0.98	5.44	1.60	7.08	7.59	6.43	21.78
2006-07	11.31	5.10	32.67	3.31	0.91	4.76	1.63	7.57	9.47	6.73	17.42
2007-08	11.32	3.59	31.61	3.04	0.57	4.90	1.64	8.48	10.34	7.03	17.42
2008-09	9.93	2.98	29.96	2.87	0.38	4.49	4.23	9.31	10.45	7.49	17.85
2009-10	9.01	3.82	29.03	3.12	0.73	4.77	4.07	9.47	10.58	7.43	17.91
2010-11	9.08	1.98	30.06	2.24	0.47	5.01	3.28	10.02	10.91	7.81	19.08
2011-12	8.92	1.85	29.86	2.60	0.48	5.03	3.71	9.95	10.84	7.76	18.95
2012-13	8.79	0.38	29.48	2.19	0.43	4.69	2.62	11.82	11.18	8.08	20.30
2013-14	8.14	0.26	29.15	2.16	0.42	4.59	2.65	12.84	11.07	7.99	20.68
2014-15	8.07	0.28	28.45	2.24	0.41	4.40	2.39	12.82	11.34	8.01	21.54
2015-16	7.84	0.23	28.65	2.09	0.33	4.17	2.62	12.89	11.41	8.05	21.67

Source: Authors calculation from Annual Reports, Department of Agriculture and Horticulture, Government of Sikkim 2003-04 to 2015-16.

The share of fruits increased from 5.96 percent in 20013-04 to 12.89 percent in 2015-16. The share of vegetables and roots and tubers increased

from 7.17 percent and 6.19 percent to 11.41 percent and 8.05 percent respectively in the same period.

CONCLUSION

The results of the study shows that during the period 2003-16 horticulture in Sikkim has made considerable progress compared to agriculture in terms of both CAGR and share in the total cropped area. Attainment of self sufficiency in food production may not be possible for Sikkim due to its limited area under cultivation and presence of large number of small farms. According to census 2011, the population growth of Sikkim stands at 12.89 percent per annum so there is high degree of population growth Sikkim and also being a tourism hotspot there is a presence of large number of floating population in Sikkim, so Sikkim, will have to rely on imports of food grains under Public Distribution system.

The results of the study suggest that there has been a focus shift towards horticulture in Sikkim. Horticulture being more remunerative than agriculture, will aid in more income generation for the rural population in Sikkim and it will also help boost employment generation for the state. For the further betterment of horticulture in the state government has to take series of reform measures to integrate production and markets, provide technical training to the farmers, improve transportation and warehousing facilities, improve thrust on agriculture in terms of investment and planning and increase the area coverage of horticultural crops in the state.

Notes

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