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An analysis of area, production and productivity of cabbage in Meghalaya

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ABSTRACT

India confers good potentiality for cultivating the vegetables. The production of vegetables helps to enhance the economy of the country. India is the second largest producer of vegetables like Potato, Cabbage, Cauliflower, Eggplant, Cucumber, Onion, Garlic and Okra. (GoI, 2018). Cabbage is one of the most important cole crop which was originated from Mediterranean region. Cabbage is major vegetable crop in Meghalaya after potato. The present study was conducted in East Khasi Hills district of Meghalaya as it was showing highest in area, production and productivity of cabbage. Compound Annual Growth Rate (CAGR) for area, production and productivity for cabbage was estimated. The growth rate in area in Meghalaya found to be 2.59 per cent, 2.86 per cent for production and 0.40 per cent for productivity annually. Similarly the growth rate under area in East Khasi Hills was found to be 0.83 per cent, 1.6 per cent for production and 0.84 per cent for productivity for cabbage. The reason for the low growth rate might be lack of knowledge on latest agricultural practices, seasonal pest infestation and lack of extension and training advisory. However the highest growth rate in area and production was found in Ri-Bhoi district of Meghalaya.

1. Introduction

India's agriculture and horticultural sectors registered an impressive growth during the past few decades and plays as an important source of revenue for government. The production of vegetables helps to enhance the economy of the country. Vegetables are the important supplement diet for human. Vegetables are not only a sustainable option to the food needs of millions of resource poor farmers but it exploits in commercial way also. India is the second largest producer of vegetables like cabbage, cauliflower, potato, okra, Brinjal *etc.* Cabbage is embraced for its nutritional benefits which has highest contribution in vitamin A, vitamin C, carotenoids, calcium, magnesium and some other dietary fibres. It keeps bones healthy, and it helps to reduce the risk of cancer and aids in reducing the blood pressure. Cabbage has low fats (0.1 %) and carbohydrates (4.6 %). The juice of cabbage is used for the remedy against poisonous mushroom and used for the gargle against the hoarseness. Most of the people give priority to the food which accounts for low fats. So, it might be the reason why cabbage is preferred by the people who are health conscious.

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Table1.0 Major Cabbage producing states in India and their percentage share:

S.no	State	Production in' 000 tonnes	%
1	West Bengal	2,288.50	25.32
2	Orissa	1058.78	11.72
3	Madhya Pradesh	686.91	7.60
4	Bihar	673.44	7.45
5	Assam	640.13	7.80
6	Gujarat	629.13	6.97
7	Chattisgarh	414.19	4.58
8	Haryana	342.45	3.79
9	Jharkhand	326.22	3.61
10	Uttar Pradesh	302.97	3.35
11	Karnataka	233.4	2.58

(Source: GoI, 2018)

From the table 1.0 it can be seen that west Bengal stands highest in production which shares 25.32 per cent in the overall share for cabbage production followed by Orissa (11.72%) Madhya Pradesh (7.60%) Bihar (7.45%) Assam (7.80%).

Table 2.0 Major Cabbage producing states in North East India.

Sl.No.	State	Production in' 000 tonnes	%
1	Assam	640.13	7.80
2	Nagaland	151.13	1.67
3	Manipur	101.63	1.12
4	Tripura	78.17	0.87
5	Mizoram	49.72	0.55
6	Meghalaya	43.58	0.48
7	Arunachal Pradesh	5.60	0.06

(Source: GoI, 2018)

In North Eastern region the state Assam stands highest in production, area and productivity of cabbage followed by Nagaland, Manipur, Tripura, Mizoram, Meghalaya and Arunachal Pradesh. From the table 2.0, it can be observed that Assam was the major cabbage producing state in North East India with share of (7.80 %) followed by Nagaland (1.67%).

The area, production and productivity of vegetables in Meghalaya showed increasing in area from 1485 hectare with production of 30423 MT in the year 2005-06 to 19824 hectares with 274550 MT in the year 2017-18 (GoM, 2017). The area under cabbage in Meghalaya was 1943 hectares; the production was 42677 MT with a yield of 178129 kg per hectare (GoM, 2017). Among the different districts of Meghalaya, the East Khasi Hills district was contributing highest in area, production and yield with respect to the cabbage. The agro-climatic conditions of East Khasi Hills district in Meghalaya are highly favourable for cultivating various vegetable crops especially cole crops. So, keeping in the view the study was conducted for cabbage in Meghalaya with special reference to East Khasi Hills come up with the objective: To assess the growth trends of cabbage in Meghalaya.

Table 3.0 Area, production and productivity of cabbage in different districts of Meghalaya are given below.

Districts	Area (ha)	Production (MT)	Productivity (kg/ha)
Ri Bhoi	62	1265	20403
	(3.2)	(2.96)	(11.5)
East Khasi	1063	29330	27592
	(54.7)	(68.7)	(15.5)
West Khasi	85	1162	13671
	(4.4)	(2.7)	(7.7)
South West Khasi	28	363	12964
	(1.4)	(0.85)	(7.3)
East Jaintia	33	358	10848
	(1.7)	(0.8)	(6.1)
West Jaintia	104	1134	10904
	(5.4)	(2.7)	(6.1)
East Garo	139	3312	23827
	(7.2)	(7.8)	(13.4)
North Garo	72	1816	25222
	(3.7)	(4.3)	(14.16)
West Garo	170	1955	11500
	(8.7)	(4.6)	(6.5)
South West Garo	92	975	10598
	(4.7)	(2.3)	(5.9)
South Garo	95	1007	10600
	(4.9)	(2.4)	(6.0)
Total	1943	42677	178129
	(100.0)	(100.0)	(100.0)

Note: Figures in the parentheses are percentages in total.

2. Materials and methods

Meghalaya is one of the seven sister states and hilly region in North Eastern India with the capital city of Shillong. During British rule in India the Imperial authorities nick named Meghalaya as "Scotland of the East." The state Meghalaya is popularly known as "Abode of clouds." This state is bounded on the north and east by Assam; on the south by the Bangladesh divisions of Mymensingh syheit; and to the west by the Bangladesh divisions of Rangapur. Meghalaya is spread over an area of 22,429 square kilometres bearing length to breadth ratio of 3:1. It lies between 85.49°E and 92.52°E longitude 20.1°N and 26.5°N latitude. Minimum temperature to maximum temperature in Meghalaya ranges from two degree centigrade to thirty six degree centigrade. Meghalaya is expansively an agrarian economy with notable commercial forestry industry. It is rural based with agriculture carrying a predominant role in state economy. 81 per cent of state population depends on agriculture as their source of livelihood. The administrative district of Meghalaya is East Khasi hills and district headquarters is Shillong. The geographical area of this district is 2752 sq.mt which has two sub divisions. It lies between 25°07' & 25°41'N latitude. and 91°21' & 92°09' E longitude. Since the production of cabbage was higher in Meghalaya after potato, study was conducted to know the growth rate of cabbage in East Khasi Hills district of Meghalaya. Secondary data was collected from Directorate of Horticulture, Dhanketi, Shillong.

3. Analytical Technique

To find out the production performance of Cabbage, trends growth analysis was calculated both for area, production and productivity or yield by using the formula.

Compound annual growth was calculated by using log–lin regression model

$$\text{Log } Y_t = \beta_1 + \beta_{2t} + u_t$$

Where,

Y_t = Y is the dependent variable and time is taken as independent variable

β_1 = intercept,

β_2 =slope coefficient

$$\text{CAGR} = \{EXP(\beta_2)-1\}*100\beta_2.$$

4. Results and discussions

Trends in area, production and productivity of cabbage in Meghalaya was depicted in table 3.0 Multiple cropping system was followed by the farmers in Meghalaya. Vegetables were grown either as main crop or subsidiary crops. Between 2005-06 and 2017-18 the area under cabbage cultivation in Meghalaya was increased from 1494 Ha to 1920 Ha and registered a growth of 28.51 per cent. The production of cabbage was increased from 30927 MT in 2005-06 to 42186 MT in 2015-16 and the productivity from 20.6 MT per hectare to 20.97 MT per hectare. The compound annual growth rate for area was 2.59 per cent, CAGR for production and productivity showed 3.01 and 0.4 per cents respectively. The peaks in productivity during 2008-09 might be due to the introduction of National Horticulture Mission in India during 2005-06. The trough observed in 2010-2011 might be shifting of the farmers towards the spice crops and mushroom cultivation *etc.*, again peak was observed in 2014-15 might be due to introduction of horticulture mission in Meghalaya during the year 2014-15. The area, production and productivity of cabbage in Meghalaya did not show much increase but it showed a slight increase. It may be due to some reasons like lack of knowledge on plant protection chemicals, lack of knowledge on technical know-how, water management and pest infestation *etc.* The above findings were similar to Jha *et al.*, 2019 and by Ghimirae *et al.*, 2017.

Table 4.0 Trends in area, production and productivity of cabbage in Meghalaya

Particulars	Area in Ha	Production in MT	Productivity In MT per ha
TE 2005-06	1494.00	30927.00	20.60
TE 2010-11	1719.33	37235.30	21.60
TE 2015-16	1920.00	42186.00	20.97
Mean	1716.15	37104.08	21.60
SD	173.38	4277.50	0.62
CV%	16.10	11.50	2.89
CAGR(%)	2.59	3.01	0.40
Co-Efficient	0.029***	0.025***	0.004***
P value	0.00	0.00	0.00

Note: *** represents p<0.01 respectively.

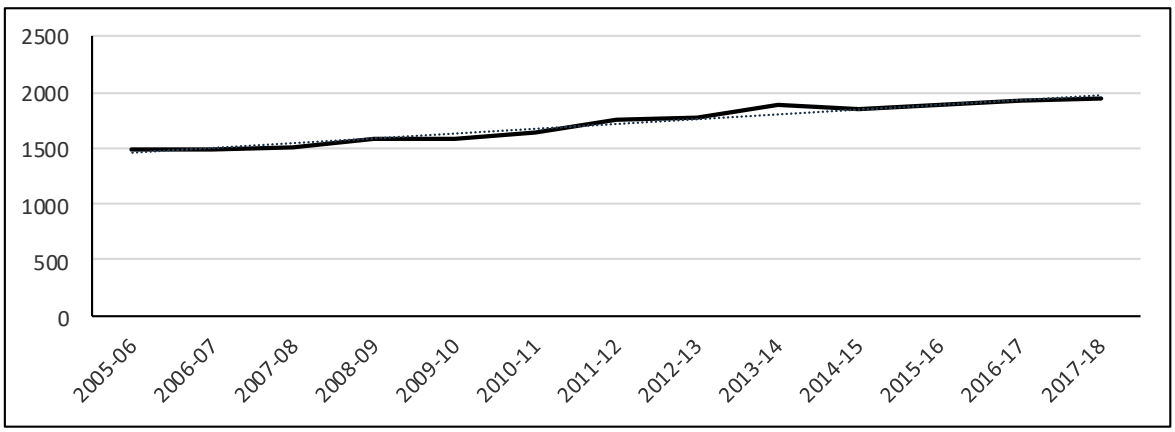

Fig:1.0 Trends in area of cabbage in Meghalaya

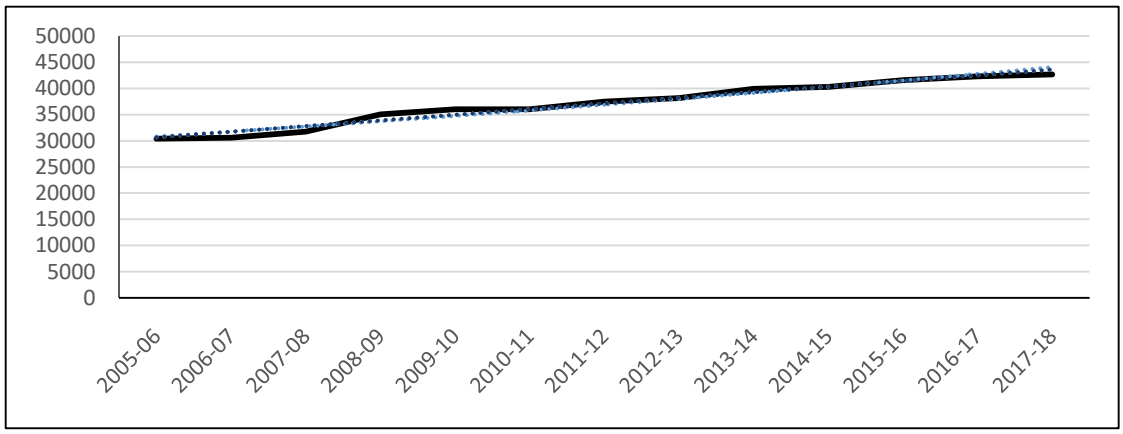

Fig 2.0 Trends in production of cabbage in Meghalaya

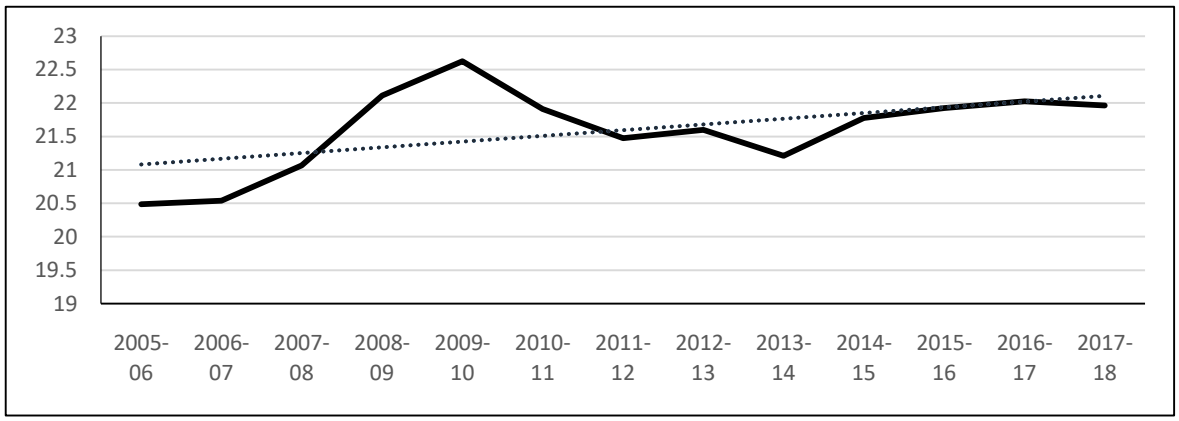

Fig 3.0 Trends in productivity of cabbage in Meghalaya

In Meghalaya vegetable cultivation was highly practised in the East Khasi Hills district. Table 5.0 clearly showed that the area cultivated under cabbage production has increased and registered a positive growth from 2005-06 to 2015-16. Between 2005-06 and 2015-16 the area cultivated under cabbage production had increased from 967 Ha to 1060 Ha. It was observed that the production has slightly increased from 24.21 Thousand MT to 27.37 thousand MT between TE 2005-06 to TE 2015-16. It was observed that the productivity has not registered significant positive growth. The productivity has increased from 24.21 MT per Ha to 27.5 MT per Ha between TE 2005-06 to TE 2015-16. The peaks in productivity during 2008-09 might be due to the introduction of National Horticulture Mission in India during 2005-06. The trough observed in 2010-2011 might be shifting of the farmers towards the spice crops and mushroom cultivation *etc.*

Table 5.0. Growth trends in area, production and productivity of cabbage in East Khasi Hills

Particulars	Area in Ha	Production In MT	Productivity in MT per ha
TE 2005-06	967.70	24215	25.06
TE 2010-11	1038.30	27973	26.90
TE 2015-16	1060.70	29185	27.50
Mean	1026.07	27379.8	26.70
STD	35.64	1909	0.97
CV%	3.46	6.97	3.60
CAGR%	0.83	1.6	0.84
Coefficient	0.008***	0.16***	0.008***
P value	0.00	0.00	0.00

Note: *** represents $p<0.01$ respectively.

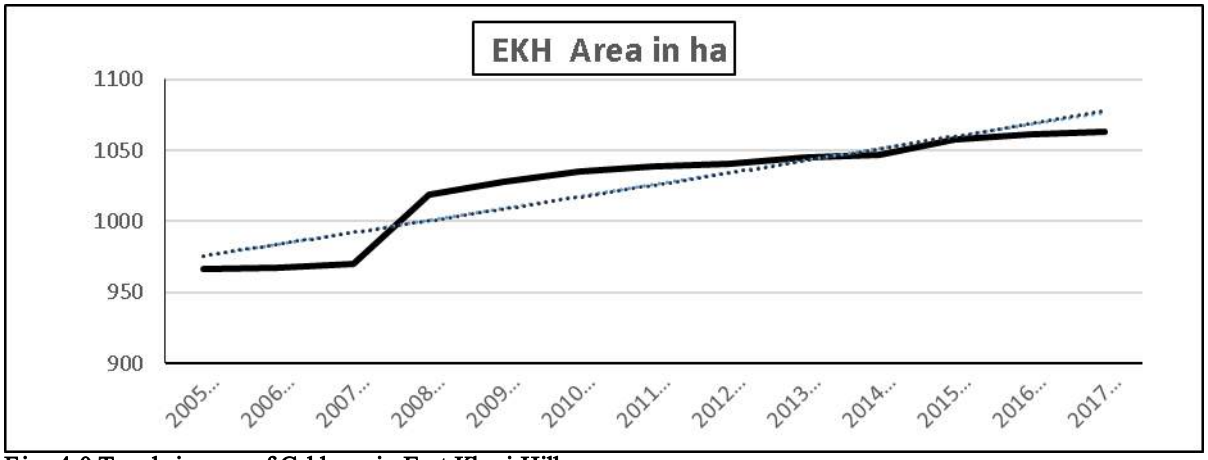

Fig: 4.0 Trends in area of Cabbage in East Khasi Hills

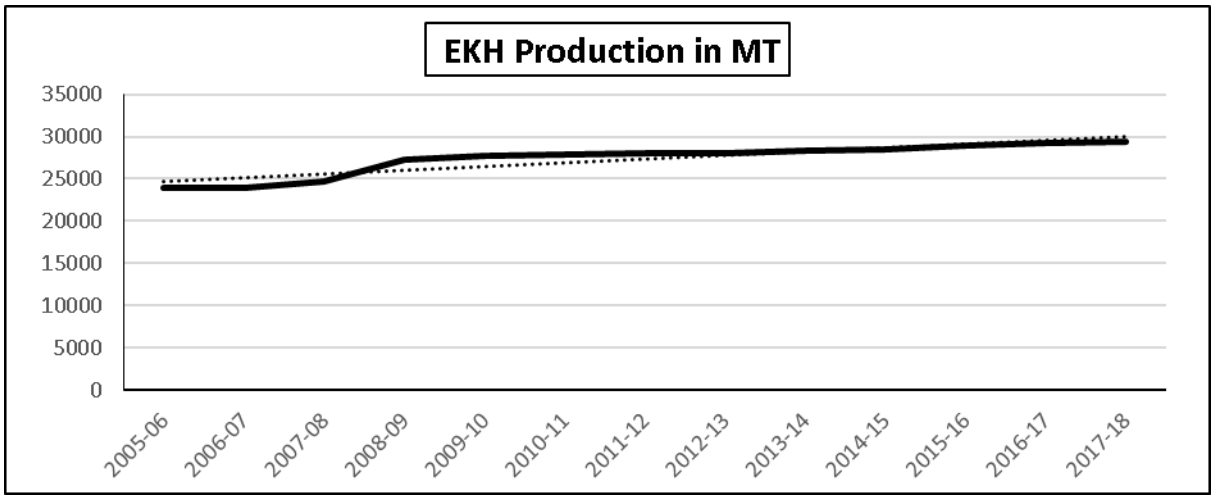

Fig: 5.0 Trends in Production of cabbage in East Khasi Hills

The CAGR of area, production and productivity of cabbage in various districts of Meghalaya were presented in table 6.0 it was evident that the compound annual growth rate for all the districts registered positive growth. The highest growth rate of the cultivated area was registered in Ri Bhoi (24.2%) followed by West Khasi (14%) and East Jaintia (3.8%). The highest growth rate for production was registered in Ri Bhoi (35.91%) followed by East Jaintia (4.4%) and North Garo (3.8%).However all the districts in Meghalaya registered positive growth but not significant. It might be due to the lack of awareness, lack of knowledge in technical know-how and lack of extension advisory *etc.* Similar results was found by Bidyasagar *et.al* (2017) and Nabi (2017)

Table 6.0 Compound Annual Growth Rate of Area, Production, Productivity of various districts in Meghalaya during 2005-06 to 2017-18.

Districts	Area in Ha	Production in MT	Productivity in MT/Ha
Ri Bhoi	24.2	35.91	9.40
West Khasi	14.00	1.90	0.74
East Jaintia	3.80	4.40	0.60
South Garo	3.30	1.40	1.40
West Garo	0.80	1.30	2.27
East Garo	1.20	1.25	1.23
South West Garo	2.24	2.50	0.24
West Jaintia	2.00	2.40	2.95

South West Khasi	0.30	0.30	0.25
North Garo	2.90	3.08	0.17

5. Conclusions

The compound annual growth rate (CAGR) was found positive for the all the districts of Meghalaya and the CAGR for area, production and productivity under Meghalaya was found to be 2.59, 3.01 and 0.4 per cents respectively. The CAGR for area, production and productivity in East Khasi hills were 0.83, 1.6 and 0.84 per cents respectively. The CAGR for area was found higher in Ri-Bhoi (24.20%) followed by East Jaintia (3.8%) and South Garo (3.3%). The CAGR for production was highest in Ri-Bhoi accounts (35.91%) followed by East Jaintia (4.40%) and North Garo (3.80%). The growth rate in productivity was highest in Ri-Bhoi (9.4%) followed by West-Jaintia (2.95) and West Garo (2.27%).The reasons for the low yield growth rate might be lack of latest agricultural technical know-how, pest infestation *etc.,*

6. Acknowledgement

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