Original Research Article

Performance of Production and Prices of Major Crops in Meghalaya: A Trend Analysis

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ABSTRACT

Aims: The study was carried out to examine the growth performance of the major crops, *i.e.,* rice, potato, pineapple, ginger, rapeseed and mustard and pea, for the last decade (2010–2019) during 2021–22.
Study design: The Compound Annual Growth Rate (CAGR), Seasonal Variability Index (SVI) and coefficient of variation were used to examine the objectives of the study.
Methodology: The study was based on secondary data collected from various official sources of the Government of Meghalaya.
Results: The result of the study showed that positive growth accounted for area, production and productivity of selected crops, but high growth was recorded in production than area and productivity due to an increase in the area during the preceding years with high fluctuations in market arrivals and their prices. The positive relationship between market arrivals and prices for several months of the year could be beneficial for growers, whereas the negative relationship might be a loss for growers.
Conclusion: The study recommended that there is a need to increase the area of production to increase production and narrow the fluctuation in price of the same crops in the state.

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Keywords: Growth performance, Trend Analysis, Meghalaya, Seasonal variability index.

1. INTRODUCTION

The state of Meghalaya is one of the seven sister's states of India, where agriculture is occupied as a major source of income earned by more than 81 per cent of the population [7]. The state of Meghalaya falls under the Eastern-Himalayan agro-climatic zone, which permits numerous temperate and sub-tropical crops to grow. The state offers scope for the cultivation of a wide range of agricultural crops because of its highly diversified topography, altitude and climatic conditions. The climatic conditions of Meghalaya allow the temperature to range from 20 C to 360 C at 300 to 2000 meters of altitude above the mean sea level by Marbaniang et al. [8] and SFAC [12]. The state of Meghalaya receives maximum rainfall per year throughout the continent, which helps in the production of agriculture without irrigation. In the state, the majority of farmers are landless, with merely 24 per cent of the total population having their own land for cultivation.

Since a significant proportion of the total farmers are engaged in agriculture, they produce merely to fulfill homestead consumption, which leads to imports from other states to meet the requirements of the non-farming

population. Among market-oriented producers, the majority of them sold their produce even after harvesting at a low price due to a lower quantity of produce, a lack of bargaining power, and unorganized bargaining power. Problems can be mitigated through SHGs. Farmers are encouraged to cultivate the crops so that the volume of production can be increased, thereby strengthening the marketing of agro-products through the active participation of various agencies. On the other hand, farmers faced difficulties in marketing due to wide price fluctuations, which can be mitigated by facilitating warehouses in the state.

The market arrivals fluctuated season by season due to the seasonal nature of crops. The secondary data of the government of Meghalaya has been used in this analysis collected from GoM. [4]. The time series data of ten years of area, production and productivity has been analyzed. The market, particularly Lewduh (Shillong), has been selected for the collection of market arrivals and prices. In this market, most of the arrivals have arrived at the time of harvesting and prices have become low as compared to off-season. The wholesale price has been taken into consideration in the analysis of this study. In the off-season for different crops, market arrivals are low because most of the farmers have sold their produce in nearby local markets. To do agricultural development, it is necessary to know the present status of agriculture in Meghalaya. Particularly, the growth rate of major crops in the context of area, production, productivity, situation, and relationship between market arrivals and their prices have been analyzed in this study. The study has been carried out under the following objectives: (i) to estimate the growth rate of area, production and productivity; (ii) to analyze the relationship between market arrivals and prices.

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Author Should really understand the conceptualization of some key words as Production, Productivity, Price spread, Price Margin, and Market Arrival. Using them correctly will strengthen this work.

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Introduction should capture what you set to achieve in the work.

2. METHODOLOGY

The study was conducted in the state of Meghalaya to determine the trend of area, productivity and productivity of selected major crops and examine the relationship between market arrivals and their prices over the past decade (2010–2019). One crop with the largest area, such as rice among cereals, potatoes among vegetables, pineapple among fruits, ginger among spices, rapeseed and mustard among oilseed crops, and pea among pulse crops, was selected for the study. Secondary data were used for the study, collected from various official sources like the Department of Agriculture of the Government of Meghalaya and the State Agricultural Marketing Board [11] of the Government of Meghalaya, for the analysis of the results of the research objectives. The statistical data of market Lewduh (Shillong) were implemented in the analysis of trends in price and market arrivals of selected crops. The compound annual growth rate (CAGR) per cent was estimated to analyze the growth rate of area, production, productivity, market arrivals and price of selected crops by Gupta and Kapoor [5]. In order to examine the growth performance of selected crops, the compound annual growth rate (CAGR) was applied by using the following formula:

$$Y = ab^t$$

Where, Y = dependent variable, a = intercept term, b = slope coefficient and t = time variable

CAGR (%) = (Antilog b-1) ×100

Coefficient of variation (%) = $\frac{\text{Standard deviation}}{\text{Mean}}$ X 100

Seasonal variability index was estimated by using following steps:

In first step, data collected from secondary sources were arranged in months and years. In second step, average Xi, (i = 1,2,3,……..,12) for the i^{th} month for all the years. Average of the monthly averages were calculated using formula, i.e.,

$$\bar{x} = \frac{1}{12}\sum_{i=1}^{12} \bar{x}i.$$

Seasonal indices of months were calculated by expressing monthly averages as percentage of $\bar{x}$. Thus, monthly seasonal indices of ith months were calculated as follows: Gupta and Kapoor [6]

$$\text{Seasonal index} = \left(\frac{\bar{x}i}{\bar{x}}\right) \times 100; i = 1,2,3, \ldots.12.$$

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3. RESULTS AND DISCUSSION

The compound annual growth rate (%) of selected crops was positive, which denotes an increasing growth trend presented in Table 1. The maximum growth in area recorded for pea was 6.04 per cent followed by rapeseed and mustard, pineapple, potato, ginger and rice at 2.25 per cent, 1.68 per cent, 0.78 per cent, 0.61 per cent and 0.22 per cent, respectively. The positive growth rate of selected crops was also reported by De et al. [1]; Singh et al. [13] in their study. The production pattern of various selected crops accounted for a positive trend over the decade, as pea production attained a maximum growth rate of about 8.67 per cent, followed by rapeseed and mustard at 5.67 per cent, pineapple at 3.72 per cent, rice at 3.07 per cent, ginger at 1.51 per cent and potato at 1.36 per cent. Even though the productivity of all selected crops was found to be increasing in trend over the year, the pea crop achieved extreme growth in productivity of 2.47 per cent, followed by rapeseed and mustard, pineapple (2.05 %), ginger, potato and rice (2.00 %), (0.93 %), (0.68 %) and (0.46 %), respectively. The findings of the study were found to be in positive support, as reported by Roy et al. [10]; Mittal [9].

Table 1. Growth rate of area, production and productivity of major crops (2010-11 to 2019-20)

Crops	Area (ha)	Production (MT)	Productivity (kg/ha)
Rice	0.22	3.07*	0.46
Potato	0.78	1.36	0.68*
Pineapple	1.68***	3.72**	2.00**
Ginger	0.61	1.51	0.93
Rapeseed and Mustard	2.25**	5.67***	2.05*
Pea	6.04**	8.67**	2.47**

Source: Author's computation
*Note: ***, ** and * are indicates the level of significance at 1%, 5% and 10%, respectively.*

The trend line of area, production and productivity of rice is presented in Figure 1 for the period from 2010 to 2019. The area and productivity of rice showed a flatter increment, while production showed a greater increment as compared to area and productivity. This may be due to the increase in area and productivity of rice.

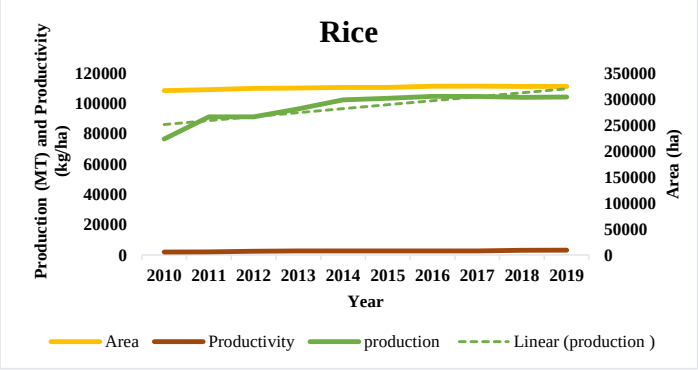

Fig. 1. Trend of the area, production and productivity of rice (2010 to 2019)

The growth trend of potato presented in Figure 2 showed a positive trend in area and productivity of potato; the growth rate of potato was recorded to be lower but still positive, reflecting a flatter trend in the last decade. The reason for the increasing trend in production was the increase in area and productivity of potatoes in the state.

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There is an inseperable nexus between production and marketing. Let's see that analysis.

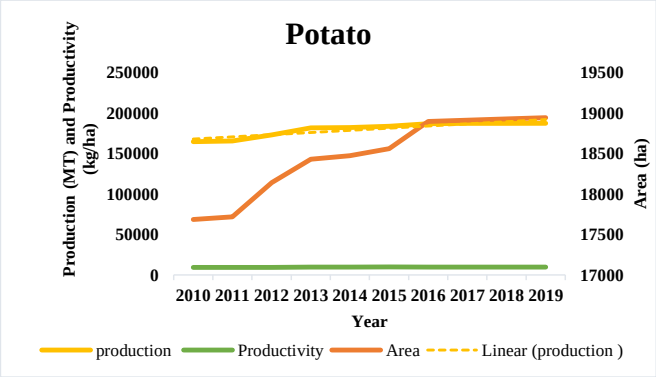

Fig. 2. Trend of the area, production and productivity of potato (2010 to 2019)

The graphical presentation of trend line of area, production and productivity of pineapple during the preceding year from 2010 to 2019 has been presented in Figure 3. The pineapple is the traditional crop in Meghalaya. The area and production of pineapple showed flatter increment, whereas, productivity showed more increasing trend than area and production due to the reason of effective management of production program after implementation of effective policy by government in context of pineapple.

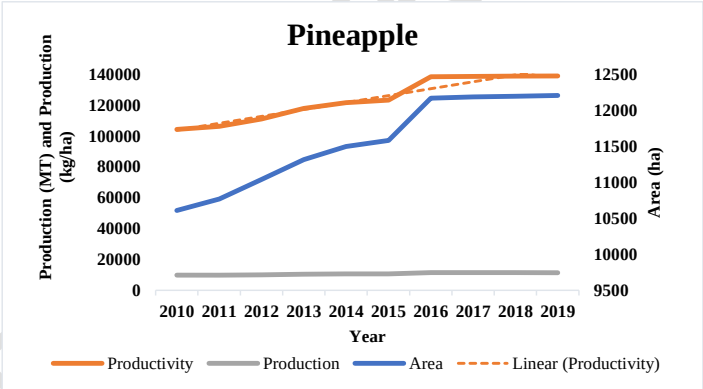

Fig 3. Trend of the area, production and productivity of pineapple (2010 to 2019)

The graphical representation of area, production and productivity of ginger during the preceding year from 2010 to 2019 mentioned in Figure 4. The area and productivity line of ginger were reflected flatter increment, whereas, production line of ginger reflected more increment as compare to area and productivity due to increase in area and productivity of ginger in the study area.

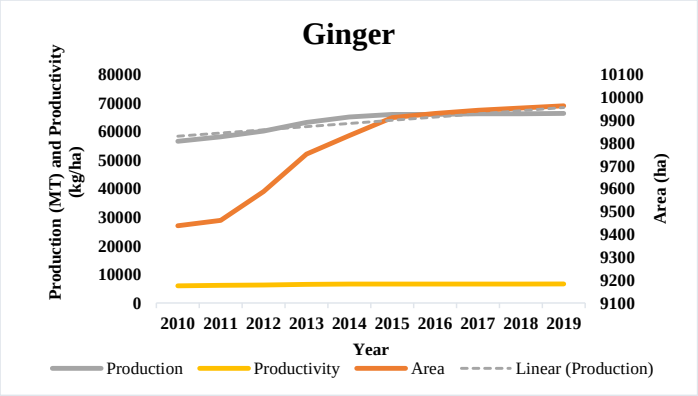

Fig 4. Trend of the area, production and productivity of ginger (2010 to 2019)

The area and production were shown disaster change as compare to productivity during the year from 2011 to 2012. The trend line of area, production and productivity of mustard during the period from 2010 to 2019 presented in Fig. 5. It may be due to getting more incentives from government policy by farmers particularly in mustard crop. After that they are showing flatter increment.

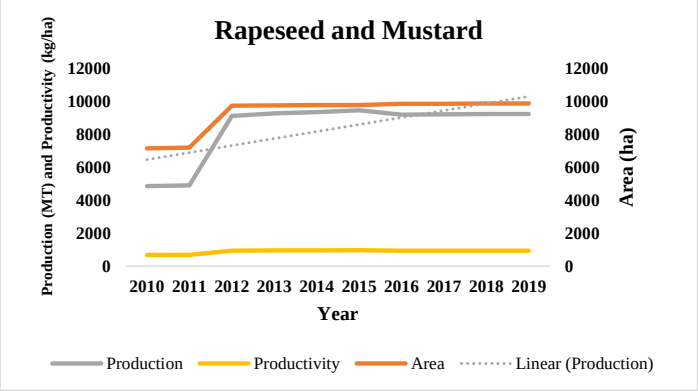

Fig 5. Trend of the area, production and productivity of rapeseed and mustard (2010 to 2019)

Trend lines showed flatter increment from year 2010 to 2011 but shown disaster change during year 2011 to 2012. The trend lines of area, production and productivity of ginger during the period from 2010 to 2019 presented in Fig. 6. Production showed more increment as compare to area and productivity after that reflected flatter increment.

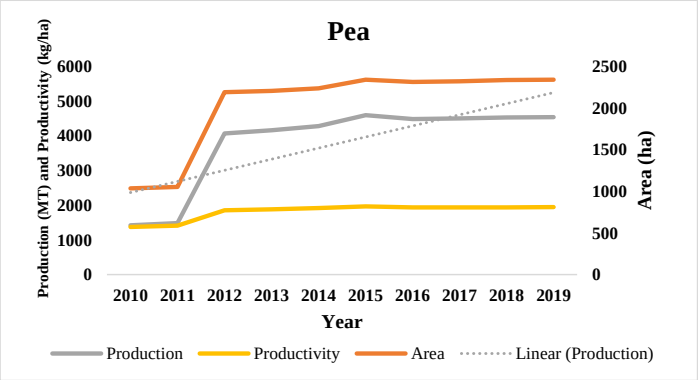

Fig 6. Trend of the area, production and productivity of pea (2010 to 2019)

The seasonal variability index of market arrival presented in Table 2. The arrival index of various crops calculated based on average of the market arrivals to examine the fluctuations of market arrivals from the mean. Value of arrival index greater than 100 indicates market arrivals was greater than the average. But if arrival index much lesser than 100 indicates value of market arrival lesser than the average. Maximum fluctuations of arrival recorded for rice in the month of May, potato in July, pineapple in August, ginger in September, rapeseed and mustard in November and pea in the month of September.

Table 2. Seasonal variability index of market arrivals of major in Meghalaya (2010 to 2019)

Month	Arrival index					
	Rice	Potato	Pineapple	Ginger	Rapeseed and Mustard	Pea
JAN	71.86	4.38	18.18	79.26	96.18	79.88
FEB	101.96	8.79	16.43	66.44	111.56	66.96
MAR	101.37	13.23	14.10	83.20	93.30	83.85
APR	68.83	9.10	6.62	77.78	83.41	78.39
MAY	150.88	35.51	14.03	91.79	105.75	92.51
JUN	90.51	148.71	144.03	91.49	79.22	92.21
JUL	117.30	193.06	296.77	100.35	100.36	99.48
AUG	150.43	180.61	376.69	116.09	87.912	117.00
SEP	91.10	154.50	147.44	141.70	98.01	142.81
OCT	90.64	166.18	42.71	116.54	116.37	117.45
NOV	94.81	185.88	22.95	135.33	130.66	136.39
DEC	70.28	137.92	14.32	92.29	97.22	93.01

Source: Author's calculation.

The seasonal variability of index of the prices presented in Table 3 indicated the fluctuations of the price index of selected crops in different months. Maximum fluctuation recorded in the month of December for rice, September for potato, December for pineapple, May for ginger, September for rapeseed and mustard and December for pea. The result was found in line with the findings of Gayathri [2].

Table 3. Seasonal variability index of prices of major in Meghalaya (2010 to 2019)

	Price index

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Author(s) should put to notice that, it is difficult to trace and track the price of perishables.

Perishables are subject to price fluctuation even in a day. It can change 2-3 times a day.

Month	Rice	Potato	Pineapple	Ginger	Rapeseed and Mustard	Pea
JAN	98.74	81.86	88.16	60.26	102.07	86.82
FEB	97.03	78.93	91.33	74.99	86.59	93.58
MAR	99.85	90.75	113.77	102.96	88.91	91.53
APR	97.31	96.09	112.45	104.95	83.02	98.01
MAY	101.02	94.40	105.55	128.69	100.62	98.37
JUN	98.38	105.30	93.54	113.23	88.03	102.01
JUL	98.33	111.17	93.20	104.20	90.12	107.95
AUG	97.95	110.30	90.68	102.52	107.63	104.97
SEP	98.210	117.34	94.30	89.19	149.15	108.05
OCT	102.71	111.51	96.13	100.91	115.32	97.76
NOV	103.23	110.09	102.79	123.93	98.04	102.04
DEC	107.19	92.21	118.04	94.11	90.45	108.84

The annual variability and CAGR of mean arrivals of selected crops presented in Table 4 showed that maximum fluctuations were recorded for rice in 2020, for potato in 2013, for pineapple in 2019, for ginger in 2017, for rapeseed and mustard in 2011 and for pea in 2010. CAGR was found to be maximum for potato (6.89%), followed by pineapple (5.24%), pea (4.70%), rice (4.27%), rapeseed and mustard (2.25%) and ginger (1.89%). It can be concluded that increased major agri-production leads to self-sufficiency for the state. Vasavada in 2021 [14] also reported positive growth rates for major agricultural products in his findings.

Table 4. Annual variability and CAGR (%) of mean arrivals of various major crops in Meghalaya

Year	Rice		Potato		Pineapple		Ginger		Rapeseed and Mustard		Pea	
	Mean Arrivals	CV (%)	Mean Arrivals	CV (%)	Mean Arrivals	CV (%)	Mean Arrivals	CV (%)	Mean Arrivals	CV (%)	Mean Arrivals	CV (%)
2010-11	309.08	73.94	2101.58	78.27	166.00	145.03	479.00	42.21	149.00	20.60	231.58	53.31
2011-12	262.58	36.66	1289.08	90.35	174.41	114.77	503.50	45.70	189.33	50.31	397.66	37.81
2012-13	190.83	52.76	1267.25	90.02	175.58	122.64	484.00	44.95	213.08	27.08	399.00	51.71
2013-14	176.75	38.27	1171.83	96.30	309.91	112.11	401.83	36.46	203.00	24.87	401.83	36.46
2014-15	137.75	30.13	2217.50	78.61	399.00	124.08	481.83	38.53	156.50	28.70	481.83	38.53
2015-16	137.66	11.19	1970.08	81.05	269.75	147.50	462.50	19.70	178.83	22.49	418.00	32.49
2016-17	184.66	14.30	1926.08	75.03	230.25	153.06	597.50	18.62	196.25	18.73	584.16	20.16
2017-18	231.25	95.64	1588.41	76.86	254.50	153.96	626.33	88.44	168.58	17.49	459.66	34.07
2018-19	220.91	21.04	2155.08	75.94	272.08	141.04	359.58	22.19	249.16	27.58	359.58	22.19
2019-20	358.16	102.86	2149.08	81.88	342.08	160.68	407.33	28.54	243.91	18.98	507.33	26.46
CAGR(%)	4.27*		6.89***		5.24*		1.89		2.25*		4.70*	

Source: GoM. [3].
*Note: *** and * are indicates the level of significance at 1% and 10%, respectively.*

Most agricultural crops are seasonal in nature; the bulk of produce reaches the market in peak arrival season at the same time the price goes down, reducing the profit share of farmers. The relationship between market arrivals and the prices of major crops in different months is presented in Table 5. The positive relationship between arrivals and their prices benefits, whereas the inverse relation gets a loss for famers. In the case of ginger, a positive relationship recorded for each month indicated that the marketing of ginger was beneficial throughout the year for producers. In the case of other selected crops, both positive and inverse relationships observed indicate benefits during positive relationships and losses during inverse relationships.

Table 5. Relationship between market arrivals and prices of major crops in Meghalaya

Month	Coefficient of correlation between market arrivals and prices					
	Rice	Potato	Pineapple	Ginger	Rapeseed and Mustard	Pea
JAN	0.30	0.03	0.43	0.03	0.50	-0.48
FEB	-0.43	-0.35	0.22	0.23	0.80*	-0.39
MAR	-0.58	-0.58	-0.40	0.54	0.44	0.35
APR	0.82*	0.07	-0.51	0.70*	-0.13	0.09
MAY	0.44	0.29	-0.21	0.01	0.48	-0.12
JUN	-0.37	0.15	-0.24	0.91*	0.67*	-0.45
JUL	-0.48	0.47	0.81*	0.22	0.72*	-0.02
AUG	0.02	0.40	0.78*	0.82*	0.97*	0.73
SEP	-0.13	0.35	-0.35	0.82*	0.82*	0.57
OCT	-0.15	-0.28	0.18	0.85*	0.86*	-0.08
NOV	0.26	0.12	-0.28	0.76*	0.52	-0.23
DEC	-0.26	-0.07	-0.14	0.89*	0.92*	0.17

Source: Author's calculation;
*Note: * indicates the level of significance at 10 per cent.*

4. CONCLUSION

The findings of the study showed a positive growth rate in area, production and productivity experienced by all selected crops. The implemented agricultural policies have a positive influence and have positively impacted the agrarian economy of this state, but there should be an awareness program for scientific cultivation, establishing processing units, constructing scientific storage units, and providing efficient market avenues to augment the overall production and productivity. In Meghalaya, there is even a need for credit facilities at a subsidy rate of interest, which would encourage farmers to increase the area of production. Moreover, there is a need to enhance productivity, which would ultimately help in an increase in domestic production and result in increased profit from foreign exchange as the state shares the international boundary with Bangladesh.

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