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Assessment of Crop Production Dynamics in Mizoram

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ABSTRACT

Background: Mizo have been agriculturists from the beginning of the 18th century. They know only the form of farming known as shifting cultivation which forms the major activity of the Mizo economic life even today. Jhuming locally known as 'Tlangramloneih' is the only occupation and has a close link to their culture and tradition. It is the way of life and almost all the activities of the Mizo's revolve around it.

Methods: The data in Mizoram with respect to area, production and yield of major agricultural crops, fruits and vegetables were based on secondary data. Decade wise analysis of growth rate, instability index and decomposition analysis were done to study the crop production dynamics in the state.

Result: Results revealed that during overall period, the growth rate in area, production and yield was negative for field crops except for sugarcane which was positive. For fruits and vegetables, the growth rate in area and production were positive for cabbage, birdeye chilli and banana whereas yield showed negative growth in all the studied fruits and vegetables. In general, the area effect was higher than the yield and interaction effect for all food grains and fruits and vegetables leading to the suggestion that steps should be taken to improve their productivity.

Key words: Compound growth rate, Decomposition, Food grains, Fruits, Instability inde, Vegetables.

INTRODUCTION

The hill slopes in Mizoram are much steeper as compared to other hill states in the North East, thereby causing constraints to cultivation of crops (Grogan *et al.,* 2012; Laltanpuii, 2018). Agriculture is the mainstay of the people of Mizoram. More than 70 per cent of the population was still engaged in agriculture for their livelihood. The most important farming system of each village community in Mizoram in order to sustain their lives was through Jhumming or shifting cultivation and about 32 per cent of cultivated areas was under this cultivation. Most of the settlements lie in the remote forest areas therefore rural areas lag behind in terms of infrastructural development. Accessibility by any means of transportation in the rural areas is less. These hindrances have led to rural backwardness, low income and food insufficiency (Sati 2015; Sati and Rinawma 2014; Singh *et al.,* 2013). Rice is the main food staple of Mizoram which grows mainly under shifting cultivation and wet rice cultivation. It meets 33% of the state requirement. Meanwhile, area under shifting cultivation decreased by 58% and subsequently, its production declined (ICAR, 2009). A number of agricultural development programmes have been implemented in the State in an attempt to attain self-sufficiency in food grains and other requirements of day-to-day life connected with agricultural practices (Laltanpuii, 2018). Also the state is endowed with wide agro-climatic conditions and sufficient genetic diversity which provide virtuous scope for horticultural based farming system to replace non-productive and destructive Jhum practices by adopting soil conservation measures, *in situ* moisture conservation, vermicomposting and nutrient management, crop diversification, use of high yielding varieties, proper crop rotation and orchard management and high-tech horticulture. Most suitable horticultural crops are mandarin, banana, passion fruit, pineapple, areca nut, ginger, turmeric, bird's eye chilli *etc.* (Singh *et al.,* 2013).

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MATERIALS AND METHODS

The secondary data with respect to area, production and productivity were collected from Statistical Abstract of Mizoram, Handbook of Mizoram, www.indiastat.com and www.rbi.org on area, production and yield during the three decades from 1989-90 to 2018-19 of major agricultural crops. The data was worked out by using compound annual growth rate, the magnitude of instability for each crop on area, production and yield through Coefficient of Variation and also the percentage contribution of area, yield and their interaction towards the production of food grains, vegetables and fruits the technique of decomposition has been adopted used (Kalamkar *et al.,* 2002; Roy *et al.,* 2015).

RESULTS AND DISCUSSION

Field crops

The compound growth rate and instability index under area, production and yield of major field crops such as rice, maize, pulses, oilseeds and sugarcane during the studied periods have been shown in Table 1.

Rice

The compound growth rate in area was positive in first decade only but for the overall period it was negative. In case of production, it was positive and significant in first and third period but for the overall period it was negative. The growth rate for yield of rice was found positive and significant only in the first period and third decades. The instability of area was less in the first period and second period due to introduction of modern technologies in the state. The production and yield have high instability over the study period especially in the second period mainly due to lack of assured irrigation facilities. The state cannot meet out food requirements of the people so, it highly depends on imports from other states.

Maize

The compound growth rate under area was observed positive and significant during the first and second decades but for the second and overall periods was negative and non-significant. The growth of production was also positive and significant only in the first period but has shown a negative trend for the overall period and yield has shown positive growth in first and third period and significant. The instability of area, production and yield has low instability in the first period and started increasing from the second period since maize is widely grown in the state.

Pulses

The compound growth rate for area was positive and significant in the first and second period and negative and non-significant in third and overall period. In case of production only in the first period it was found to be positive but non-significant and for all the periods it was negative and non-significant and in yield the growth was positive only in the third period but non-significant. The instability in area was less during the third period due to high yielding varieties and improved technology for pulses cultivation were introduced. In case of production less instability also observed in the third period as paddy fields which are used to remain fallow after harvesting of rice were being utilised for growing of pulses whereas, the yield instability has increased over the study period.

Oil seeds

The compound growth rate in area and production was found negative except in the first period and significant in area for all the periods wherein production it was significant in the second period. The growth in yield was positive in the first period with significant and third period was non-significant. The instability of area found to be low in the first period. Production and yield were less instable in the third period

Table 1: Compound growth rate and instability index of area, production and yield of major agricultural crops in mizoram during the three decades 1989-90 to 2018-19. (per cent per annum)

Crops	CAGR			Instability index		
	Area	Production	Yield	Area	Production	Yield
			Period I (1989-90 to 1998-99)			
Rice	3.60***	7.32***	3.84***	4.55	7.40	5.02
Maize	2.75***	6.29***	3.44***	4.02	6.35	7.88
Pulses	2.58*	1.78	-0.83	13.80	18.12	9.87
Oilseeds	3.61**	6.52**	2.61**	8.39	18.99	12.27
Sugarcane	10.52***	5.87	-4.20	17.14	29.64	35.51
			Period II (1999-00 to 2008-09)			
Rice	0.20	-14.51**	-14.66**	5.55	34.50	32.46
Maize	5.38**	-11.67	-16.17*	19.29	44.08	35.59
Pulses	5.50*	-3.29	-8.33**	25.44	33.52	22.17
Oilseeds	-9.61***	-13.62**	-4.42	15.47	29.89	32.27
Sugarcane	4.53	0.49	-3.86	41.03	69.71	135.82
			Period III (2009-10 to 2018-19)			
Rice	-0.50	4.43**	4.96**	24.29	16.45	16.44
Maize	-3.54**	-1.11	2.56**	14.64	19.07	8.57
Pulses	-0.84	-0.80	0.06	9.11	17.92	12.31
Oilseeds	-2.37*	-1.62	0.62	13.76	17.92	5.91
Sugarcane	1.38**	28.24***	26.55***	4.65	47.33	45.89
			Overall period (1989-90 to 2018-19)			
Rice	-2.34***	-2.45**	-0.08	20.14	35.37	26.60
Maize	-0.45	-0.77*	-1.33	28.75	43.25	26.74
Pulses	-0.48	-1.71**	-1.24**	20.62	26.72	21.83
Oilseeds	-5.24***	-4.92***	0.33	22.77	35.52	22.96
Sugarcane	3.02***	6.87***	3.71**	29.28	98.05	91.56

Note: *,**,*** indicate the significance of CAGR at 1, 5 and 10 per cent level of significance.

due to cultivation of oil palm plantation as it supports livelihood for farmers more than the cereals crop.

Sugarcane

The compound growth rate of area was found positive and significant except in the second period. In terms of production, it was positive for the overall study period. For yield of sugarcane was negative and non-significant in the first and second period. The instability of area was less instability in the third period as compared to other crops but for production and yield it increased.

Fruits and vegetables

The compound growth rate and instability index under area, production and yield of some fruits and vegetables such as cabbage, birdeye chilly, banana and orange during the studied periods have been shown in Table 2.

Cabbage

The compound growth rate for area and production has found positive and significant under the study period, while in yield there was negative growth in the overall period but non-significant. The instability of area, production and yield has greatly declined as the government intentions was to produce off season vegetable crops round the year for which high yielding varieties seeds suitable for the cultivation were distributed to the farmers and made it available in the market at reasonable prices.

Birdeye chilly

The compound growth rate in area was positive for over the periods but non-significant in the first period, the growth of production was positive except in the second period. The growth rate of yield was positive and significant only in the first period. The instability of area and yield was highly declined in the second period due to improved hybrids varieties seed are procured by the government from outside states to enhance the vegetable production whereas in terms of production it declined in all the periods.

Banana

The compound growth rate of area and production was registered as positive and significant over the study while growth under yield was negative and significant in the overall period. The instability of area, production and yield was less in state due as the agro-climatic conditions highly suitable for the cultivations of banana and majorly grown for local consumption and has good demand in the markets.

Orange

The compound growth rate of area was found positive for the study period, but non-significant in the second period, the production and yield growth were negative in second and overall period but non-significant in production. The instability of area and production has increased widely due to negligence and poor management by the farmers in terms of pruning, removal of dead branches, application of plant protection measures *etc*. in the orchards.

Contribution of area, yield and their interaction

With the help of additive decomposition model, the percentage contribution of area, yield and their interaction on production of food grains, vegetables and fruits has been analysed in the Table 3 and 4. Data present in Table 3 revealed that the effect of area, yield and their interaction to the production of food grains during the five decades and divided into periods *viz*. 1970-71 to 1979-80 (Period I), 1980-81 to 1989-90 (Period II), 1990-91 to 1999-00 (Period III), 2000-01 to 2009-10 (Period IV), 2010-11 to 2019-20 (Period V) and 1980-81 to 2019-20 (overall period). The area effect contributing to food grains production was

Table 2: Compound growth rate and instability index of area, production and yield of vegetables and fruits in mizoram during 1999-00 to 2018-19. (per cent per annum)

Crops	CAGR			Instability index		
	Area	Production	Yield	Area	Production	Yield
			Period I (1999-00 to 2008-09)			
Cabbage	37.47***	41.68***	3.08*	114.68	82.24	20.94
Birdeye chilly	10.88	35.35*	25.05***	172.78	217.01	26.00
Banana	13.76***	14.35***	0.51	40.76	26.92	28.96
Orange	2.71*	-8.80**	-11.22**	16.44	28.33	32.68
			Period II (2009-10 to 2018-19)			
Cabbage	5.47***	8.76***	3.12**	5.43	11.25	9.18
Birdeye chilly	3.16***	-4.01	-15.57**	5.85	126.91	74.76
Banana	2.23***	4.23***	6.89	4.09	9.47	27.34
Orange	3.15	4.26	1.74**	50.54	54.16	8.18
			Overall period (1999-00 to 2018-19)			
Cabbage	29.28***	28.61***	-0.50	34.24	30.82	20.86
Birdeye chilly	25.58***	30.10***	-0.01	46.56	113.17	93.38
Banana	10.10***	7.95***	-2.45*	15.50	19.60	33.43
Orange	4.24**	-0.23	-4.43**	49.17	46.49	36.89

Note: *,**,*** indicate the significance of CAGR at 1, 5 and 10 per cent level of significance.

Table 3: Contribution of area, yield and their interaction in the production of food grains in mizoram during 1970-71 to 2019-20.

Particulars	Variable	Period I (1970-80)	Period II (1980-90)	Period III (1990-00)	Period IV (2000-10)	Period V (2010-20)	Overall (1970-20)
Food grains	ΔP	6 (100)	34 (100)	24.5 (100)	-61.7 (100)	9.56 (100)	60.46 (100)
	Y_0ΔA	12.63 (210.52)	28.74 (84.53)	-3.81 (-15.58)	-2.64 (4.29)	-10.07 (-105.42)	29.61 (48.97)
	A_0ΔY	-3.70 (-61.70)	2.88 (8.49)	29.71 (121.26)	-60.34 (97.79)	23.12 (241.86)	10.82 (17.89)
	ΔAΔY	-2.92 (-48.76)	2.37 (6.97)	-1.39 (-5.68)	1.28 (-2.08)	-3.48 (-36.43)	20.02 (33.12)

The values in the parentheses are percentage share of column total, production in thousand tonnes, area in thousand hectare and yield in kg/ha.

Table 4: Contribution of area, yield and their interaction of vegetables and fruits in Mizoram during three decades 1990-91 to 2019-20.

Particular	Factor	Period I (1990-91 to 1999-00)	Period II (2000-01 to 2009-10)	Period III (2010-11 to 2019-20)	Overall period (1990-91 to 2019-20)
Vegetables	ΔP	50.14 (100)	141.9 (100)	66.22 (100)	175.42 (100)
	Y_0ΔA	18.60 (37.09)	29.61 (20.85)	125.33 (189.26)	103.17 (58.81)
	A_0ΔY	7.98 (15.91)	62.54 (44.05)	-28.35 (-42.81)	4.15 (2.37)
	ΔAΔY	23.56 (46.98)	49.82 (35.09)	-30.76 (-46.45)	68.09 (38.81)
Fruits	ΔP	12.30 (100)	318.79 (100)	134.32 (100)	316.91 (100)
	Y_0ΔA	17.50 (142.27)	55.92 (17.54)	280.80 (209.06)	192.50 (60.74)
	A_0ΔY	-3.20 (-26.01)	36.86 (11.56)	-62.78 (-46.74)	15.79 (4.98)
	ΔAΔY	-2.00 (-16.26)	226.01 (70.89)	-83.70 (-62.32)	108.61 (34.27)

The values in the parentheses are percentage share of column total, production in thousand tonnes, area in thousand hectare and yield in kg/ha.

offsetting the yield and interaction effect in almost the periods except in the third and fifth it has negative contributions. At this period the yield effect has offsetting both the area and interaction effect and contributed more to the production.

Data present in Table 4 reveals the effect of area, yield and their interaction to the production of vegetables and fruits during the three decades and divided into periods *viz.* 1990-91 to 1999-00 (Period I), 2000-01 to 2009-10 (Period II), 2010-11 to 2019-20 (Period III) and 1990-91 to 2019-20 (overall period). In case of vegetables the interaction effect has more contribution to the production than the area and yield effect during the first and second period. But, in the third and overall period the area effect was offsetting the interaction and yield effect. In case of fruits, the area effect has offset the yield and interaction effect over the study period except in the second period where the interaction effect has higher contribution to the production.

CONCLUSION

The result reveals the growth rate of area and production except in sugarcane showed positive and significant growth and yield of oilseeds and sugarcane was positive but significant only in sugarcane. The instability of area and production has increased for all the crops. The growth rate of vegetables and fruits for area was all positive and significant, under production orange has negative growth except in the second period, in terms of yield all the are observed to be negative in the overall period but significant in banana and orange. The instability was found to be declined in in area and production under cabbage, birdeye chilly and banana, in all the periods whereas yield of cabbage has declined its instability and under orange it declined during the second period. The contribution of area effect was more in terms of food grains and fruits whereas the interaction effect has found to be higher in terms of vegetables.

Conflict of interest

No conflict of interest among all the authors.

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