Economic Affairs, Vol. 62, No. 2, pp. 225-232, June 2017
DOI: 10.5958/0976-4666.2017.00004.3

Present Scenario of Agricultural Sector of Manipur

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ABSTRACT

The present study based on secondary data reveals that the net sown area, gross cropped area and cropping intensity have increased over the period of T.E. 1986-87 to T.E. 2012-13, despite of deceleration in gross irrigated area. Land holding pattern have remained more or less unchanged over the entire period and characterised by the domination of marginal and small farmers. Food grains continue to dominate the cropping pattern, but its share has declined by 15.56% and the high valued fruits, vegetables and spices have consolidated position by increasing share to the tune of 14.78% of the gross cropped area. Per ha Consumption of nitrogenous and phosphatic fertilizers has reduced and the use of potassic fertilizers has been more than doubled during this period. All the major crops have registered significantly positive growth rates with varying magnitudes in area, production and productivity, but associated with moderate to high instability. Area effect is the primary source of output growth for food grains crops and total vegetables except rice whereas yield is the major contributor to the production increase of total fruits and total spices. Development of region specific crop varieties and production techniques and extensive training programmes along with improvement in irrigation, communication and marketing facilities are urgently needed to accelerate the growth with more stability in agricultural sector of the state.

Keywords: Compound growth rate, cropping pattern, instability, decomposition

Manipur, one of the eight sisters of the north eastern region of India, is a hill grit state situated at the lower tip of the sub Himalayan range. Resembling most of the northern states of India, the economy of state primarily depends on agriculture and allied activities. Though the total land under agriculture is only 6.74% of the total geographical area, it provides livelihood of more than 52% of the total population of the state. Rice, being the staple food crop, accounts about 95% of the total food grains productions and covers about 72% of the total cropped area of the state. Besides rice, other cereals such as maize, wheat etc. and pulses along with various kinds of fruits and vegetables are also grown in both valley and hilly region. Here it is to be noted that permanent cultivation is practised in all four districts comprising valley regions whereas terrace cultivation is followed in some parts of hills composed of five districts but *jhumming* or shifting cultivation is widely adopted in most of the hill districts. As agriculture is the mainstay of the economy of the state, sufficient growth in this primary sector is inevitable to boost the economic development. Growth in overall economy depends on the development of the agriculture sector (Schultz, 1964). So, it can be assumed that the growth in farm sector is a necessary pre-condition for economic development. Growth in the agricultural sector could be a catalyst for national output growth via its effect on rural incomes and provisions of resources for transformation into industrialised economy (Eicher and Staatz, 1984; Datta and Ravallion, 1998). So, the present study is taken with the aim of assessing the existing situation of Manipur's agriculture in terms of change in cropping pattern, land holding pattern along with growth of area, production and productivity of major crops.

Database and Methodology

Secondary data relevant to the study is collected from various sources, like Economic Survey,

Statistical Abstracts, Handbooks published by the Directorate of Economics and Statistics, Department of Agriculture, Government of Manipur, and many other books, journals published by different organizations is also consulted covering period 1980-81 to 2013-14. Compound Annual Growth Rates (CAGR) of area, production and productivity is computed by using the exponential growth rate function of following form:

$$Y_t = ab^t, \text{ or, } \log y_t = \log a + t \log b$$

Where, y_t = area/production/yield of crop, a = constant, b = regression coefficient, and t = time period in years.

The CAGR (r) is worked out as, r = (antilog of 'b' – 1) × 100,

In order to measure the instability associated with the rate of increase in area, production and productivity of major crops, Adjusted Instability Index proposed by Cuddy-Della Valle (1978) is used.

$$\text{Adjusted Instability Index} = C.V.\sqrt{1-\bar{R}^2}$$

Where, $C.V = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$, and $\bar{R}^2$= Adjusted coefficient of multiple determination.

The decomposition technique adopted to estimate the contribution of area yield and interaction to enhancement in production of major crops is given as:

$$\Delta P = (Y_n - Y_o)A_o + (A_n - A_o)Y_o + \Delta A \Delta Y$$

Where, ΔP = change in production, A_o and A_n are area in base and current year; Y_o and Y_n denote yield in base and current year and ΔA and ΔY presents change in area and yield respectively. The contributions of productivity, area and interaction of both is estimated by applying the formula AoΔY/ΔP, YoΔA/ΔP and ΔAΔY/ΔP respectively.

RESULTS AND DISCUSSION

Agriculture of Manipur has witnessed structural, socio-economic and technological transformation to meet the requirements of the emerging trend over the years which have prominently reflected in the land use pattern, land holding pattern, use of modern inputs, though *'jhum'* cultivation continues to dominates the farming practices among the farmers of the hilly regions. At the outset, we will examine the change in some key parameters at three points of time with a view to throw some light on the advancement of agriculture of the state over time. Table 1 reveals that over the entire period study period, net sown area has increased by 42.86% to meet the growing demand for food for ever rising population of the state. On the other hand, the increment in total cropped area is accounted to be 58.82%, but the rise in second period is almost eight times greater than that of the first period. The state has experienced a marginal set back of 8.21% in cropping intensity in T.E. 1996-97, but the increase of 34.15% in period T.E. 1996-97 to T.E. 2012-13 has helped the state to register a 23.13% increment in the same over the entire period.

Though, the grossed irrigated area has reduced by only 6.14%, but the reduction in area as a percentage of grossed cropped and net sown area is found to be 39.74% and 30.45% respectively over the entire study period and the deceleration in the above mentioned three measures are higher in second period T.E. 1996-97 to T.E. 2012-13, compared to the first period covering T.E. 1986-87 to T.E. 1996-97. This dismal performance in irrigation front may be attributed to the failure of some irrigation projects (Deb and Datta Ray, 2006). It is important to note that in spite of decrease in area under irrigation in all three measures, the gross cropped area as well as cropping intensity has gone up which may be due to desperate effort of the farmers to produce more food by cultivating land more than once. This change in availability of irrigation water has directly impacted the consumption of chemical fertilizers in the state.

So, with fall in area under irrigation by 6.14%, the consumption of nitrogenous and phosphatic fertilizers have come down by 13.16% and 10.84% respectively, whereas application of potassic fertilizer has moved up by 114.59% over the entire study period. The poor performance of the state in terms of per ha consumption of chemical fertilizers may be largely attributes to the shrinkage in area under irrigation as crops response toward fossil fuel based chemical fertilizers depend on irrigation water which is the core concept of green revolution occurred in mid-60's in India.

Table 2 discerns that over the entire study period, with the increase in the number of marginal farmers by a magnitude of 1.67%, area operated by them have also increased by 1.75%, whereas the number

Table 1: Percentage change in important indicators related to agriculture of Manipur in three sub-periods (Triennium ending 1986-87, 1996-97 and 2012-13) (Area in '000 ha)

Parameters	T.E. 1986-87	T.E. 1996-97	T.E. 2012-13	% from T.E. 1986-87 to T.E. 1996-97	%from T.E. 1996-97 to T.E. 2012-13	% from T.E. 1986-87 to T.E. 2012-13
Net area Sown	140.00	167.00	200.00	19.29	19.76	42.857
Gross cropped area	187.00	199.00	297.00	6.42	49.25	58.824
Cropping intensity (%)	134.00	123.00	165.00	-8.21	34.15	23.134
Gross irrigated area	74.8	75	70.21	0.27	-6.39	-6.138
Irrigated area as a per cent of Gross cropped area	39.93	37.96	24.07	-4.94	-36.60	-39.74
Irrigated area as a per cent of net sown area	53.43	47.08	37.16	-11.89	-21.06	-30.45
Per hectare N fertilizer consumption (kg/ha)	20.23	49.30	17.57	143.70	-64.37	-13.16
Per hectare P fertilizer consumption (kg/ha)	4.38	5.36	3.90	22.44	-27.18	-10.84
Per hectare K fertilizer consumption (kg/ha)	0.66	1.47	1.42	121.43	-3.09	114.59

Table 2: Change in the number with operational holding of farmers belonging to different farm size groups over period 1990-90 to 2010-11

Size class	1990-91		2000-01		2010-11	
	No. of operation holding	Area operated (ha)	No. of operation holding	Area operated (ha)	No. of operation holding	Area operated (ha)
Marginal	68598	3782	75405	40145	76735	40200
(≤1ha)	(48.28)	(21.61)	(50.50)	(23.33)	(50.95)	(23.36)
Small	49062	67135	48730	62750	48850	62755
(1-2ha)	(34.53)	(38.37)	(32.63)	(36.46)	(32.43)	(36.47)
Semi-medium	21452	54892	22363	55175	22235	55250
(2-4ha)	(15.10)	(31.37)	(14.98)	(32.06)	(14.76)	(32.11)
Medium	2916	14611	2790	13560	2760	13415
(4-10ha)	(2.05)	(8.35)	(1.87)	(7.88)	(1.83)	(7.80)
Large	43	523	40	455	40	440
(≥10ha)	(0.03)	(0.30)	(0.03)	(0.26)	(0.03)	(0.26)
All classes	142071	174981	149328	172085	150620	172060

Figure in parentheses denote the percentage of all classes

of small farmers along with operational area have come down by 2.1 and 1.9% respectively. So, the combined share of marginal and small farmers in the number of operational holding is increased by 0.57% with marginal decrease in operational area by 0.15% and the cumulative number of medium and semi-medium groups of farmers have reduced marginally by 0.56% whereas area operated by them have marginally gone up by 0.18%. The agriculture sector is dominated by small holders, more than three-fourth of the land holdings in the north-eastern region are less than or equal to 2 ha in size (Birthal *et al.*, 2006).

So, the agrarian institution of Manipur is dominated by marginal and small farmers which are consistent with the country as a whole with only exception in case of semi-medium farm size group of farmers. This group occupies second highest position in terms of operational area (32.11%) after small farmers (36.47%). Historically domination of small

and marginal farmers is a special characteristic of the agrarian structure in some Asian countries including India. The agrarian institute of Africa and Latin America is characterised by the concentration of land in the hand of few landlords, whereas in Asian countries like China, Japan and India, the problem rooted in overcrowding of people on small piece of land arising out of rapid population growth resulting reduction of per capita availability of land to 0.29, 0.07 and 0.20 ha respectively (Forland, 1974).

In addition to that, enactment of law of abolition of Zamindari system, massive land reform and breaking up of joint family system are responsible for fragmentation of holding. After examining the agrarian institution, we will now concentrate on change in cropping pattern in the state at three points of time, namely, T.E. 1982-83,T.E. 2002-03 and T.E. 2011-12 (Table 3). Over the entire study period, area under food grains measured as a percentage of Gross Cropped Area (GCA) has come down from 85.31% to 72.94% i.e. a reduction of staggering 12.37%. This may be attributed to the setback in area under rice and maize (total cereals) by the magnitude of 14.41 and 1.16% respectively. The gain in area by pulses to the tune of 3.20% have compensated to some extent the drastic fall in area under total cereals to check further reduction in area under food grains. Oilseeds, sugarcane and cotton have become marginalised by experiencing downfall in area of 1.36, 0.88 and 0.16% respectively. Fruits, vegetables, flowers and plantation crops constituting other category have strengthen position in the cropping pattern of the state by claiming 26.05% of the GCA which is an increment of 14.78% over base period.

In short, the acceleration in the area share of cash crops including high valued horticultural crops and deceleration in area under food grains can be considered as an indicator of agricultural development of the state i.e. the state agriculture is passing through a transformation phase from subsistence level to commercialisation, but rate of progress is slow. The land possessed by the small and marginal peasants significantly related to the extent of diversification of crops in India during 1968-69 to 1998-99 (Chand and Chuahan, 2002). Besides this, faster income growth and growing urbanisation have shifted the consumption pattern towards high value crops (Ravi and Roy, 2006).

Now, we will study the performance of major crops in terms of growth rate in area, production and productivity coupled with the associated instability over the period 1980-81 to 2013-14. Table 4 discerns that food grains has registered an output growth rate of 1.83% with 16.96% variability in which the contribution of area and yield are accounted to be 0.75% and 1.07% and the associated instability are observed only to be 15.40 and 14.64% respectively, which is marginally lower than all India average measuring 1.94% estimated over the same period (Kumar and Sehgal, 2014). Difficult terrain, prevalence of traditional crop cultivation system (jhumming), uncertainty in rainfall, lack of irrigation facilities, inadequate infrastructural facilities, extreme variation in agro-climatic conditions are assumed to be mainly responsible for high variability in food grains production in the state. The inaccessible are, lack of proper communication, geographical isolation, lack of infrastructural facilities as well as the dearth of trained manpower have resulted into low agricultural productivity of the region in addition to shifting cultivation resulting heavy soil and land degradation, unavailability and spread of HYV seeds, low consumption of chemical fertilizers, poor crop management practices (Singh and Munde, 2008).

Among the major constituent of food grains, pulses production has grown up at the rate of 21.96% with the help of impressive rise in area of 16.62% and productivity growth of 5.34%. This performance of the state is highly commendable considering the present crisis of pulses in the country when prices is escalating day by day due to widening gap in demand supply in the domestic market. The state shows outstanding performance in all respects, by leaving far behind the all India average in this regard. The combined effect of area and yield growth accounting 0.52 and 0.73% respectively has helped the country to achieve an output growth of 1.72% (Singh *et al.,* 2015).

But the corresponding high variability ranging from 20.71 (yield) to 37.94% (production) raises concern over the long term sustainability of these spectacular acceleration rate. The country as a whole experienced increasing instability in yield of pulses in recent period (Srivastava, *et al.*, 2010). Total cereals have witnessed an output acceleration

Table 3: Change in cropping pattern of Manipur in three sub-periods (Triennium ending 1982-83, 2002-03 and 2011-12)

Crops	Percentage of GCA			Percentage change		
	T.E. 1982-83	T.E. 2002-03	T.E. 2011-12	From T.E. 1982-83 to T.E. 2002-03	From T.E. 2002-03 to T.E. 2011-12	From T.E. 1982-83 to T.E. 2011-12
Rice	79.39	74.14	64.99	5.25	9.15	14.41
Maize	3.16	2.08	2.00	1.08	0.08	1.16
Total cereals	82.55	76.22	66.99	6.33	9.23	15.57
Pulses	2.76	3.38	5.96	-0.62	-2.58	-3.20
Food grains	85.31	79.60	72.94	5.71	6.66	12.37
Oilseeds	2.12	0.97	0.76	1.15	0.21	1.36
Sugarcane	1.05	0.27	0.17	0.78	0.10	0.88
Cotton	0.24	0.02	0.08	0.22	-0.06	0.16
Other misc. crops	11.27	19.14	26.05	-7.87	-6.91	-14.78

Table 4: Compound growth rates with associated instability of area, production and productivity of major crops grown in Manipur for period 1980-81 to 2013-14

Crops	Area		Productivity		Production	
	CGR %	Instability Index	CGR %	Instability Index	CGR %	Instability Index
Rice	0.54***	15.52	1.39*	10.61	1.93*	19.85
Maize	5.82*	51.67	-0.51^{NS}	24.74	5.28*	39.49
Total Cereals	0.37***	13.78	1.31*	13.74	1.69*	17.08
Total Pulses[a]	16.62*	21.24	5.34*	20.71	21.96^{NS}	37.94
Total foodgrains	0.75*	15.40	1.07*	14.64	1.83*	16.96
Total oilseeds	10.28*	58.55	1.90*	16.35	12.18*	64.35
Cabbage[b]	16.76*	13.75	-1.88**	9.35	14.88*	17.06
Pea[b]	18.04*	14.91	5.79*	8.00	23.83^{NS}	19.01
Total Vegetables[b]	13.45*	9.43	3.53*	6.20	16.98^{NS}	13.57
Pineapple[b]	2.11*	3.37	2.93*	7.97	5.04^{NS}	10.63
Banana[b]	14.68*	12.91	5.54*	8.89	20.86*	15.23
Total Fruits[b]	6.88*	3.64	5.27*	8.50	12.15^{NS}	7.95
Ginger[b]	7.56*	8.62	1.86*	6.09	9.42^{NS}	7.27
Chilli[b]	1.80*	2.13	8.55*	10.90	10.43*	9.47
Total Spices[b]	3.16*	9.55	7.27*	10.09	10.43*	8.16

*Note: ***, **, * and ^{NS} indicate significant at 10, 5 and 1% level and non-significant respectively and [a]and [b] cover only the study period from 2000-01 to 2013-14 and 2001-02 to 2013-14 respectively.*

of 1.69% with variability 17.08% in which the share of area and yield are estimated to be 0.37 and 1.31% with corresponding fluctuation 13.78 and13.74%. Production of rice, the most dominant cereal crop in the state, has increased at the rate of 1.93% with 19.85% variability mainly due to higher growth in yield at the rate of 1.39% and marginal increment in area at the magnitude of 0.54% and the corresponding variation are 10.61 and 15.52% respectively i.e. increase in productivity is more stable in comparison to area. The outstanding rise in area under maize accounting 5.82% with high fluctuation rate of 51.67% in association with marginal deceleration in yield at the rate of 0.51% are instrumental in output growth of 5.28% with high year to year variation of 39.49%. Declining trend in productivity of maize is also observed in other states of India due to low input use under non-irrigated condition. Gujarat, Madhya Pradesh and Bihar have witness negative growth in yield

Table 5: Decomposition of output growth of major crops of Manipur

Crops	Area effect	Yield effect	Interaction effect
Rice	15.28	71.70	13.02
Maize	62.27	11.45	26.28
Total Cereals	44.87	43.58	11.56
Total Pulses	62.93	4.39	32.69
Total foodgrains	60.55	27.86	11.59
Total oilseeds	52.38	6.06	41.57
Cabbage	101.03	-0.19	-0.84
Pea	51.64	8.41	39.94
Total Vegetables	62.21	9.79	28.00
Pineapple	33.26	49.11	17.64
Banana	51.48	12.02	36.50
Total Fruits	5.46	75.95	18.59
Ginger	82.06	7.02	10.92
Chilli	13.60	67.86	18.53
Total Spices	2.79	83.43	13.78

with high, medium and low instability respectively (Kumar *et al.*, 2014). Low yield are due to lack of availability and adoption of improved varieties, inputs and cultivation practices (Chakraborty, 2006; Rai, *et al*., 2008).

Production of oilseeds, the important commercial crops, has gained momentum recently with the introduction of technology mission on oilseeds to increase production through dissemination of new crop production technology, better supply of inputs, post-harvest technologies etc. As a result, the area under oilseeds, mainly rape-mustard, groundnut, soybean, sunflower, have expanded at the rate of 10.28% with high instability of 58.55%. But moderate rate of increment in yield measuring 1.90% with relatively lower variability of 16.35% has helped the state to achieve an output growth rate of 12.18% with very high rate of year to year fluctuation (64.35%).

The state has achieved spectacular growth in production of various kinds of vegetables by registering an acceleration rate of 16. 98% due to combined effect of area and yield rate increment of 13.45 and 3.53% respectively. The corresponding year to year fluctuations are estimated to be 13.57, 9.43 and 6.20% i.e. within the minimum range of instability. Among the major vegetable crops, area under cabbage and pea has grown up by 16.76 and 18.04% with instability index 13.75 and 14.91% respectively. But negative growth of 1.88% in productivity has pulled down output growth to 14.88% in case of cabbage whereas impressive rate of rise in yield of pea has impacted the production to register an outstanding rate of increase to the tune of 23.83%, but at the cost of stability. The area under total fruits has increased at the rate of 6.88% with negligible instability of 3.64% in which the share of banana and pineapple area estimated to be 14.68 and 2.11% respectively. Expansion in area in associated with yield increase at the rate 5.27% with instability 8.50% has helped the state to record an output growth of 12.15% with variability of 7.95% in case of total fruits.

During the same period, production of banana and pineapple has increased by 20.86 and 5.04% with corresponding fluctuation of 15.23 and 10.63% respectively. Growth in yield of banana (5.54%) is observed to be higher compared to pineapple (2.93%) but the values of instability index are more or less same. The compound growth rate of total fruits during period 1998-99 to 2009-10 was found 1.38% in Arunachal Pradesh, 1.89% in Assam, 9.47% in Manipur, 3.90% in Meghalaya, 7.62% in Mizoram and negative growth of 0.44% in Nagaland, 13.33% in Sikkim and 2.09% in Tripura (Gogoi and Borah, 2013).

This surge in production of vegetables and fruits in the state can be attributed to the increase in literacy rate, income and growing health

consciousness which has created a demand for these crops in the local markets and farmers are also devoting more and more land for cultivation of these crops on commercial basis to increase family income and also harnessing the immense potentiality of high valued horticultural crops in this region because of congenial climate, rainfall, soil variability, topography and attitude (Baruah, 1986). For rejuvenating rural economy, both the state and central government have launch various programmes by providing technological and financial support to which the farmers are also responding positively.

The state has also made remarkable progress in production of spices by registering a growth rate of 10.43% in which the contribution of area and yield are estimated to be 3.16% and 7.27% respectively. The values of instability index are accounted to be 8.16, 9.55 and 10.09% in the same order indicating lower variation in the growth rates. Among the large number of spices crops grown in the state, ginger and *chilli*, the two most important spices, have recorded an output growth rate of 9.42 and 10.43% with corresponding variability of 7.27 and 9.47% respectively. Although, rate of expansion in area (7.56%) is the major contributor to production in case of ginger, it is the yield which claims 8.55% of increment in *chilli* output. Variability associated with the growth rates varies from as low as 2.13% (area under *chilli*) to as high as 10.90% (productivity of *chilli*). So, lower level of fluctuation in all parameters for both crops is very important from the view point of long term sustainability. The instability indices for area, production and productivity for major spices in the NE region were positive with maximum of 8.84% and thereby indicating less riskiness for growing spices in the region (Sharma, 2015).

Decomposition analysis presented in Table-5 indicates that the rise in total food grains production depends primarily on expansion of area under maize, total cereals and total pulses and yield increment in case of rice. Production growth of total oilseeds is not exception to that general pattern i.e. area increase is the major source. Though area is the primary source of vegetable production, yield increment plays vital role in augmenting production of fruits and spices with the exception of banana and ginger. Comparatively less contribution of yield to the production rise of major crops may be attributed to primarily to traditional system of crop cultivation (*jhuming*) with minimum input use along with other constraints such as non-availability of HYV seeds, irrigation water, poor infrastructure facilities, erratic distribution of rainfall etc. A large number of limiting factors come in the way of achieving higher productivity in North-Eastern region such as erratic distribution and long spell of rainfall followed by alternate cycles of flood and drought, extensive *jhum* cultivation, continuity with traditional agro-techniques, land-man ratio, lack of mechanisation, lack of availability and improper delivery system of critical agricultural inputs like seeds, fertilizers, plant protection chemicals etc. (Ashokvardhan, 2004). Low productivity is due to many limitation viz., prevalence of shifting cultivation, hilly terrain, unpredictable climate changes, low levels of modern input use, poor infrastructure etc. (Karmakar, 2008; Barah, 2006).

CONCLUSION

The sluggish growth in food grains production coupled with moderate level of variability and that too depending largely on the expansion in area with marginal contribution of yield is a subject of great concern for the policy makers. On the other hand, the state has made tremendous progress in production of horticultural crops, particularly, in production of vegetables, fruits and spices with more stability compared to food grains and oilseeds. The outstanding improvement in production of high valued horticultural crops, though mainly through expansion in area in cases of vegetables, and in case of fruits, it is due to rate of rise in both area and yield whereas acceleration in spices production is primarily due to increase in yield growth.

But the state has failed to exploit the full potential of these crops offered by the divergent agro-climatic conditions due some inherent constraints. Research on development of region specific crop varieties and cultivation practices including modernisation of *jhumming* system and extensive technology dissemination programmes along with improvement in irrigation, communication, marketing, processing facilities are urgently needed to uplift the living standard of the farmers. To enhance production of horticultural crops and improve nutritional security and income, Government of India has launched Horticulture Mission and other schemes such as

Technology Mission for integrated development of horticulture in 2001-02 to address issues related to production and productivity, marketing and processing of horticultural crops in North-Eastern states, now renamed as Horticulture Mission for North-Eastern and Himalayan States which are expected to bring about a positive change in the economy of the state.

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