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**AGRICULTURAL DEVELOPMENT AND SOURCES OF GROWTH OF OUTPUT IN
HIMACHAL PRADESH**

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ABSTRACT

The study is conducted to estimate growth rate of area, production and productivity and measure the contribution of different components to the growth rate of the major crops in Himachal Pradesh. The study is based on secondary sources of data covering the period from 1966-67 to 2006-07. The crops selected in the study are rice, wheat and maize. The growth rates are worked out for major crops by using exponential function. The contribution of area, yield and interaction to increase in production is worked out by using decomposition analysis. It is observed that growth rates of area, production and productivity of principal crops in Himachal Pradesh over the period are positive. The yield effect is the most important factor for an increase in production of rice, wheat and maize. The future strategy of agricultural development of the Himachal Pradesh will have to be centered on increasing productivity through the expansion of area under irrigation and HYVs.

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INTRODUCTION

Agricultural growth contributes to economic development is a conventional wisdom since it claims a larger share of national output and provides livelihood of majority of population in most developing countries. So, to expedite development process, agricultural sector needs to generate surpluses to facilitate the movement of both labours and capital to modern industrial sector. Even to satisfy the basic human needs agricultural growth must match population growth to avoid the Malthusian trap and stagnant development (Diao *et al.* 2007). Agriculture plays an important role in Economic development, such as provision of food to the nation, enlarging exports, transfer of manpower to non-agricultural sectors, contribution to capital formation and securing market for industrialization. Moreover, agriculture has strong, direct forward linkages to agricultural processing and backward linkages to input-supply industries (Johnston and Mellor, 1961). Agricultural development is an integral part of overall economic development. The Indian economy comprises of several important sectors, which contribute to total national product. But by far, agriculture is the main stay of Indian economy and prosperity of agriculture can significantly contribute to the

general prosperity of the nation. With a 24.2 per cent contribution (triennium ending 2001-02) to gross domestic product, agriculture still provides livelihood support to about two-thirds of country's population. The sector provides employment to 56.7 per cent of country's workforce and it is the single largest private sector occupation. Agriculture accounts for about 14.7 per cent of total export earning and provides raw material to several industries (GOI, 2003) Agriculture forms the backbone of Indian economy and despite large Industrialization in last 60 years, agriculture still occupies a place of pride. Agriculture makes other important contribution to nutrition, food security and macro-economic stability beyond the pro-poor growth (Timmer, 2002). Macroeconomic stability is especially sensitive to volatility in the agricultural sector (Timmer, 2005; Perry *et al.*, 2005). In turn, volatility in the agricultural sector tends to be relatively high because of climatic shocks that reduce domestic production and leads to unstable world prices of agricultural commodities. The implication is that these shocks in the agricultural sector, especially food crises, are often the major source of macroeconomic instability in the early stages of development (Barro and Sala-i-Martin, 1995; Dawe, 1996; Timmer, 1996, 2002). Agricultural growth combined with appropriate policies can mitigate the effects of these shocks, with benefits to the poorest and most vulnerable. Growth in agriculture contributes to rapid rises in agro-processing and processed food marketing, which not only provides new

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engines of growth but an opportunity to substitute for imports. The need for agricultural growth during the early stages of development has been examined in recent neoclassical literature. For example, Yang and Zhu (2004). Himachal Pradesh is remarked at twentieth place largest in terms of populations and seventeenth in respect of area. The state had the tenth highest per capita State Domestic Product among all the Indian states in the year 2011-12. Though Himachal Pradesh is one of an Horticulture state in the country but agriculture and allied activities are still predominant in the state. Agriculture continues to be the major source of income for most of the population. As per the population census 2011, 63.30 per cent population is dependent on agriculture for livelihood. However, contribution of agriculture sector in the state income is reducing over the period. The share of agriculture and allied activities in net state domestic product (SDP) declined steeply from 57.9 per cent in 1951-52 to 17 per cent in 2011-12 (GOH). The north as a whole has been able to preserve its share of agriculture in aggregate domestic product at about 26 to 27 per cent of all states during the last two decades. The situation in the state of Himachal Pradesh is consistent with the above stated fact.

However, the decline in the share of agriculture in aggregate domestic product is steeper when compared to the other Northern states. Agriculture is the mainstay of more than 75 per cent of the population in the Himachal Pradesh and hence it has strategic role to play in the economic development of the State. The net area sown in the state in 1966-1967 was about 535 thousand hectares forming about 18.41 percent of the total geographical area & it just increased to 21 percent in 2005-06 (2005). The average size of holding in the state is 1.16 hectares which cannot be considered economical by any standards particularly when fields are so small in size and scattered. Most of the farmers about 83.7 per cent belong to small and marginal category. The climate, Soil, rainfall and temperature in different areas of the state is quite different resulting in varying agro-climate practices, cropping pattern, time of sowing, harvesting etc. The state is further handicapped by the inadequacy of irrigational facilities and therefore the success of agriculture by and large is dependent upon rain which is sometimes erratic and not well-spread. Such factors have hindered the adoption of new farm technology resulting in lower yield rates as compared to other states.

Out of total geographical area of 5,567 thousand hectares, 11 per cent is cultivated land and 20 per cent of this cultivated land is under irrigation (2008) much below the low national average of 39 per cent (2004). In the state of Himachal Pradesh, most of the area is under foodgrains and it accounts for about 86 per cent of the gross cropped area. Out of this, about 82.5 per cent is accounted by cereals and the rest is under pulses. The other food crops such as sugarcane, spices, vegetables and fruits which are of commercial nature cover only 7.6 per cent of the cropped area and among non-food crops, oilseeds, tea, and fodder etc occupy only three per cent of the gross cropped area. Looking at the production and productivity trends, the production of food grains in the state of Himachal Pradesh increased from about 772 thousand tonnes in 1966-1967 to 1382 thousand tonnes in 2007-08 and during the same period the productivity of food grains increased from 1051 kg/ha to 1741 kg/ha.

Objectives

1. To study the growth rates of area, production and yield of major food crops in Himachal Pradesh, and
2. To assess the relative contribution of area and yield to change in the output of major crops.

Data and Methodology

The study is based on secondary sources of data obtained from published documents of Govt. of India, Ministry of Agriculture, Directorate of Economics and Statistics.

Estimation of growth in area, production and yield

For the purpose of the analysis the entire study period is split into three sub periods including Period I: 1966-67 to 1984-85; Period II: 1985-86 to 2007-08; and overall period : 1966-67 to 2007-08 and accordingly compound growth rate of area, production and productivity of major food crops in the state are estimated. The compound growth is measured following the procedure adopted by Green (2000).

$$Y = a b^t$$

$$C.G.R. (r) = [b-1] \times 100$$

Decomposition of Output Growth of Individual Crop

Decomposition Model suggested by Minhas and Vidhyanathan (1965) is used to measure relative contribution of area and yield to the change in production. Sharma (1977) redeveloped the model and several research workers used the model and studied growth performance of crops on state level (Narula and Vaidysagar, 1973; Singh and Sissodia, 1989; Bastine and Palanisami, 1994; Bhatnagar and Nandal, 1994 and Siju and Kombairaju, 2001). In the decomposition analysis the change in production is taken as the effect of three factors such as yield effect, area effect and interaction effect.

$$\Delta P = A_0 \Delta Y + Y_0 \Delta A + \Delta A \Delta Y$$

Change in production = Yield effect + area effect + interaction effect.

Thus, the total change in production can be decomposed into three effects viz. Yield effect, area effect and interaction effect due to change in yield and area.

RESULTS AND DISCUSSION

The results of the study are divided into two sections. Section I is devoted to the growth in area, production and productivity of selected crops in the state. Section II represents decomposition of individual crops.

Section-I

Area under Major Food Crops in Himachal Pradesh

Adoption of high-yielding varieties of wheat, rice and maize in the state of Himachal Pradesh has been almost complete by 1971. However, it is true that because of the difficult terrain modernization in agriculture cannot be with the same tempo and speed as for example is possible in the state like Punjab. Nevertheless, attempts are being made to improve upon the

situation and to add to the production and productivity of major food crops. Some structural changes are taking place in the farming systems especially in land use and cropping pattern. Changes in the cropping pattern have been taking place in Himachal Pradesh as elsewhere in the country. The change depends upon the crops involved and the multifarious stimuli like the changing economic, technological and institutional factors.

Rice

Rice is the staple food of hill people and occupies third position with regard to area under this crop.

Table 1.1. Area Sown Under Principal Crops in Himachal Pradesh

(000' hectare)				
Period	Rice	Wheat	Maize	Food grains
1966-75	96.5 (12.0)	311.1 (38.6)	253.7 (31.5)	806
1976-85	95.6 (11.2)	347.5 (40.6)	288.7 (33.8)	855
1986-95	85.7 (10.0)	374.5 (46.4)	310.0 (36.0)	860
1996-05	81.7 (9.9)	363.3 (44.2)	304.1 (37.0)	821
2006-07	79.2 (9.8)	362.2 (44.9)	293.0 (37.1)	806
2007-08	78.6 (9.6)	366.6 (45.0)	300.2 (36.8)	814

Source: Govt. of India, Ministry of Agriculture, Directorate of Economics and Statistics, Area, Production and Yield of Principal Crops, Various Issues.

Note: Figures in parenthesis are proportion of area under food crops to the gross cropped area under food grains.

Because of high water requirements of this crop, about 56 per cent of its area is irrigated- highest percentage in any crop in Himachal Pradesh. The area and proportionate share of important crops in Himachal Pradesh has been summarized in Table 1.1. The area under this crop decreased from 96.9 thousand ha in 1966-75 to 81.7 in 1996-05 and further decreased to 78.6 thousand ha in 2007-08. However, the area under this crop has marginally decreased from 12 per cent to 10 per cent of the gross cropped area under food grains. The decrease may be because of the reason that some farmers have shifted to other crops which require water in lesser quantity.

Wheat

From the area point of view, wheat comes on top among all the crops grown in the state. Area under this crop has increased from 311 thousand ha in 1966-75 to 363 thousand ha in 1996-05 and 366 thousand ha in 2007-08. In relative terms, the proportionate share of wheat has shown a marked increase from 38 per cent in 1966-75 to 44 percent in 1996-05. Out of 366 thousand ha area under wheat, only 16 per cent is irrigated and the rest of the area remains rain fed in the state.

Maize

Like rice, maize is another important crop of the state in kharif season. This crop is sown mostly under rain fed conditions and irrigation was reported on only 5 per cent of its area. In absolute numbers, the area increases from 253 thousand ha in 1966-75 to somewhere about 300 thousand ha in 1996-05 and in the recent times it had stagnated at the same level. Nevertheless, a significant increase has been recorded in relative area share from 31 per cent in 1966-75 to 37 per cent in 1996-05. This increase in area under maize may be due to the reason that it is easy to grow this crop as compared to other

crops and farmers have an easy time with this crop as compared with rice. Moreover, this crop is not as water intensive as others in the same crop group.

Production of Major Food Crops in Himachal Pradesh

Rice

Table 1.2 shows that from 1966-67 to 2007-08; no significant changes in the production of rice are seen. The production of this crop which was 105.8 thousand tonnes in 1966-75 increased to 117 thousand tonnes in 1996-2005 and further 121 thousand tonnes in 2007-08. During these years, the share of rice to total production of foodgrains decreased from 11 per cent to somewhere around 9 per cent.

Wheat

The production of wheat in the state which was 311 thousand tonnes in 1966-75 increased to 553 thousand tonnes in 1996-05 and later decreased to 504 thousand tonnes in 2007-08. The share of wheat in total production increases from 32.5 per cent to 40 per cent and then marginally decreases to 36 per cent over the same period.

Table 1.2. Production of Principal Crops in Himachal Pradesh

(000'tonnes)				
Period	Rice	Wheat	Maize	Foodgrains
1966-75	105.8 (11.1)	311.3 (32.5)	466.6 (48.8)	957.1
1976-85	106.3 (10.2)	361.4 (34.7)	492.7 (47.3)	1040.6
1986-95	101.0 (7.9)	519.0 (40.9)	596.5 (46.9)	1272.1
1996-05	117.0 (8.5)	553.2 (40.1)	650.7 (47.2)	1378.3
2006-07	123.5 (8.9)	501.6 (36.3)	695.4 (50.3)	1382.2
2007-08	121.5 (7.8)	504.4 (32.7)	862.6 (56.0)	1540.4

Source: Govt. of India, Ministry of Agriculture, Directorate of Economics and Statistics, Area, Production and Yield of Principal Crops, Various Issues.

Note: Figures in parenthesis are proportion of production of food crops to the total production of food grains.

Maize

Similarly, the production of maize in 1966-75 was 466 thousand tonnes which increased to 862 thousand tonnes in 2007-08 but during the same period the relative share of maize to the total food grains marginally increased from 49 per cent to 50 per cent.

Table 1.3. Productivity of Principal crops in Himachal Pradesh

(kg per hectare)				
Period	Rice	Wheat	Maize	Foodgrains
1966-75	1098	996	1717	1184
1976-85	1134	1038	1707	1216
1986-95	1182	1388	1921	1497
1996-05	1433	1522	2139	1677
2006-07	1559	1385	2326	1714
2007-08	1546	1376	2873	1890

Source: Govt. of India, Ministry of Agriculture, Directorate of Economics and Statistics, Area, Production and Yield of Principal Crops, Various Issues.

Productivity of Major Food Crops in Himachal Pradesh

Table 1.3 shows that over a period of time, the productivity or yield of all the three major crops viz. rice, wheat and maize have shown visible improvements. The productivity of rice which was 1089 kg/ha in 1966-75 increased to 1433 kg/ha in 1996-05 and further 1546 kg/ha in 2007-08. During the same

period, the productivity of wheat increases from 966 to 1522 kg/ha, whereas, the productivity of maize increases significantly from 1717 to 2139 kg/ha.

Growth Trend of Major Food Crops in Himachal Pradesh

Rice

The compound growth rates of production of important crops in Himachal Pradesh shows that during the period I, the growth of production of rice has shown a marginal rise of 0.02 per cent (Table 2), whereas growth of area and yield are at (-0.21) and 0.30 per cent respectively. Growth of production has been found to be highly elastic to area. The production of rice witnessed an annual growth rate of 1.02 per cent in period II, when the yield has increased at rate 1.62 per cent, and growth in area was negative (0.58 per cent). The production of rice recorded an annual rate of growth of just 0.37 per cent during the overall period. The area and yield have recorded the growth rates of (-0.62) and 0.97 per cent respectively, during the same period.

increased at rates of 0.52 and 1.44 per cent per annum respectively.

Maize

The production of maize witnessed an annual rate of growth of 0.30 per cent in period I. The area and yield registered a growth rate of 1.16 and 0.09 per cent respectively during the same period. The production of maize recorded an annual rate of growth of 1.41 per cent in period II. The area & yield witnessed a growth rate of -0.10 and 1.5 per cent respectively over the same period. However, the production of this crop recorded an annual rate of growth of 1.25 per cent during the overall period. The area & yield have increased at growth rates of 0.54 and 0.90 percent respectively. While the trends in area, production and productivity shows an increasing trend in most of the crops. But this increase is not substantial. Thus concrete efforts should be made in this direction so that these variables help in attaining self-sufficiency.

Table 2. Growth rates of Area, Production and yield of Important Food Crops in H.P.

Crop	(per cent per annum)								
	Period I (1966-67 to 1984-85)			Period II (1985-86 to 2007-08)			Overall Period (1966-67 to 2007-08)		
	Area	Prod	Yield	Area	Prod	Yield	Area	Prod	Yield
Rice	-0.21	0.02	0.30	-0.58	1.02	1.62	-0.62	0.37	0.97
Wheat	1.26	1.55	0.28	-0.19	0.58	0.77	0.52	1.97	1.44
Maize	1.16	0.30	0.09	-0.10	1.41	1.50	0.54	1.25	0.90
Food grains	0.65	0.95	0.31	-0.38	0.93	1.35	0.04	1.27	1.23

Source: Computed on the basis of data available at Govt. of India, Ministry of Agriculture, Directorate of Economics and Statistics, Area, Production and Yield of Principal Crops, Various Issues.

Table 3. Decomposition of Output Growth for Individual Crop

Crop	Effect	Period I		Period II		Overall Period	
		Actual	%	Actual	%	Actual	%
Rice	ΔP	39	100	17	100	22	100
	Yield	44	230	37	215	48	220
	Area	-5	-119	-14	-85	-18	-80
	Interaction	-0.4	-11	-5.1	-30	-8.8	-40
Wheat	ΔP	74	100	131	100	305	100
	Yield	8.6	12	150	115	203	67
	Area	64	85	-15	-11	56	18
	Interaction	2	3	-5	-4	44	15
Maize	ΔP	85	100	204	100	266	100
	Yield	1	1	207	101	151	57
	Area	83	99	-2	-1	85	32
	Interaction	1	0	-1	0	30	11
Food grains	ΔP	133	100	302	100	507	100
	Yield	34	25	408	135	456	89
	Area	96	72	-77	-25	34	7
	Interaction	4	3	-3	-10	18	4

Wheat

The growth rates of wheat production in Himachal Pradesh recorded an increase of 1.55 per cent per annum in period I. While the area and yield has increased at rates of 1.26 and 0.28 per cent respectively during the same period. These trend growth rates of area and yield add up to 1.4 per cent with a very low interaction effect. The production of wheat recorded an annual rate of growth of 0.58 per cent in period II. The area and yield have recorded the growth rates of (-0.19) and 0.77 per cent per annum respectively. During the overall period, the production of wheat has recorded an annual rate of growth of 1.97 per cent. During the same period, the area and yield have

Section-II

Decomposition Analysis of Major Food Crops in Himachal Pradesh

Rice

The analysis reveals that in the state of Himachal Pradesh, the contribution in the increased rice production is brought by the yield effect only, whereas, area and interaction effect are negative, during all the periods under study (Table 3). Moreover, the yield effect, accounting for 230 per cent, 215

per cent and 220 per cent during period I, II, and overall period respectively.

Wheat

In case of wheat, during the period I, all the components considered for this study and their interaction is positive in increasing the total production of this crop, however, area effect is the dominating factor, accounting for 64 per cent increase in wheat production. While as, during the period II, the source of increased production changes from area to yield, and in fact yield is the only contributing factor, which accounts for nearly 115 per cent in the increased production. During the overall period, all the components and their interaction is positive in increasing the production of this crop, but it is yield which played a dominant role and thus accounts for 67 per cent towards increased production.

Maize

For maize, during the period I, area is the only factor responsible for increase production of this crop, accounting for 99 per cent in the increased production. While as during period II, the situation completely turned around, yield rather than area became the dominant factor, accounting for 101 per cent in the increased production. During the overall period, all the components considered for this study and their interaction are positive in increasing the total production of this crop, however, yield effect is the dominating factor, accounting for 57 per cent towards increased production. In case of food grains, during the period I, all the factors considered for the study contributed positively but it is the area effect which acts as a dominant factor. Further, the decomposition analysis reveals that during the period II, yield is not only the determining factor but also the only positive component towards the increase in food grains production. While as during the overall period, all the components considered for this study and their interaction is positive as is the case during period I, but yield rather than area is the dominant factor in the increased production.

Conclusions and Policy Implications

From the foregoing discussion it emerges that the growth in area of major crops in the state reveals mixed trend. Area growth for rice except, wheat and maize is negative during the period I (1966-67 to 1984-85). During period II (1985-86 to 2007-08) area growth is negative for all the three crops. For the overall period (1966-67 to 2007-08) area growth for rice is negative where as for wheat and maize it is positive. The growth in production and productivity of all three crops is visible in all the three periods and is positive. The decomposition analysis shows that the yield effect mainly contributed in the increased production of rice during all the three periods. For wheat area effect is dominant in period I but during period II and overall period it is yield which dominated the production. The yield effect is dominant factor in increasing production of maize with the exception of period I, during which yield effect is negligible. For the food grains it is area which contributed immensely in period I but in period II and overall period yield effect is dominant. On the whole it is concluded that yield effect dominated the increased production during all the periods with the exception of period I, where for

wheat, maize and food grains production it is area which dominated the increased production. From the results it is concluded that the future scope for increasing output in the state through expansion of area is limited. As such efforts have to be directed towards further increasing the productivity of crops and change in crop pattern. The future strategy of agricultural development of the state has to be centered on the expansion of area under HYVs. That means the policy makers should not depend upon expansion of area for increasing agricultural production in the state. There is an urgent need to increase crop production, particularly the food grain production which will become inevitable in view of population growth and for that adoption of new technology in the form of HYVs and chemical fertilizers on large scale is necessary. The soil and climatic conditions in Himachal Pradesh are such that they contribute to an inferior crop pattern and relatively low yields in most of the crops. A major part of the state consists of the hilly region where rainfall is low and highly variable. Besides, the percentage of net area irrigated is low. It is quite clear that agriculture in the state cannot register progress unless irrigation is provided over much wider areas. Research efforts need to be intensified further to develop high yielding varieties of the crops suitable to the agro-climatic conditions of the region.

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