Agricultural Growth and Instability in Western Himalayan Region: An Analysis of Himachal Pradesh, India

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Abstract

Agriculture is the main occupation of around three quarters of the total rural population (which is approximately 90 per cent of the total population of the state) of Himachal Pradesh. Due to difficult geographical terrain and mountainous region the proportion of land available for cultivation is very small. Only about 35 per cent area is available for cultivation. Net sown area and total cropped area constitute about 10 per cent and 17.7 per cent of the total geographical area respectively. This makes agriculture quite a challenge in the state and yet some regions in the state have come up as models for agriculture in hilly areas. The current study looks into the instability in area, production and yield of major crops in three agro climatic regions in the state and other dynamics associated with it. Instability in agricultural production, for any reason, results in unpredictable behavior and decision making from the population engaged in primary sector which is passed on to the economy as a whole.

1. Introduction

Instability is one of the important decision parameters in development dynamics, more so in the context of agricultural production. Wide fluctuations in crop output not only affect prices and bring about sharp fluctuations in them but also results in wide variations in the disposable income of the farmers. The magnitude of fluctuations depends on the nature of production technology, its sensitivity to weather, economic environment, availability of material inputs and many other factors. High growth in production accompanied by low level of instability for any crop is desired for sustainable development of agriculture (Tripathi 2009).

Growth and instability in production, area, and yield for major crops is examined at regional level. To examine the extent of variability in the production, area, and yield the Cuddy-Della Valle Index is used (Cuddy and Della Valle 1978). The simple coefficient of variation overestimates the level of instability in time-series data characterized by long term trends whereas the Cuddy-Della Valle index corrects the coefficient of variation.
The instability in area, production and yield of major crops is measured in relative term using Cuddy-Della Valle Index (IX).

$$IX = CV\sqrt{1 - \text{R squared}}$$

Where;

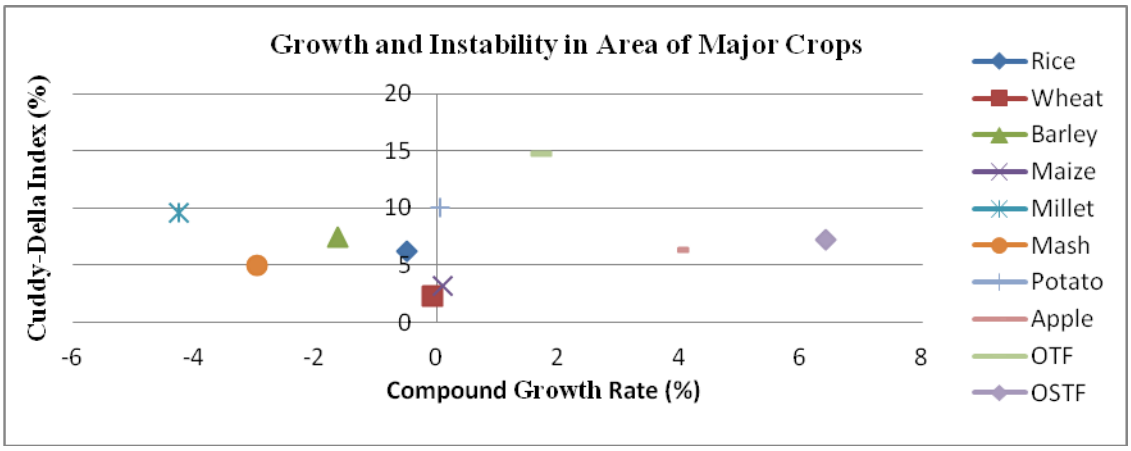
IX = Instability Index
CV = Coefficient of variation (in percent)
R squared = Coefficient of determination from a time-trend regression adjusted by the number of degrees of freedom.

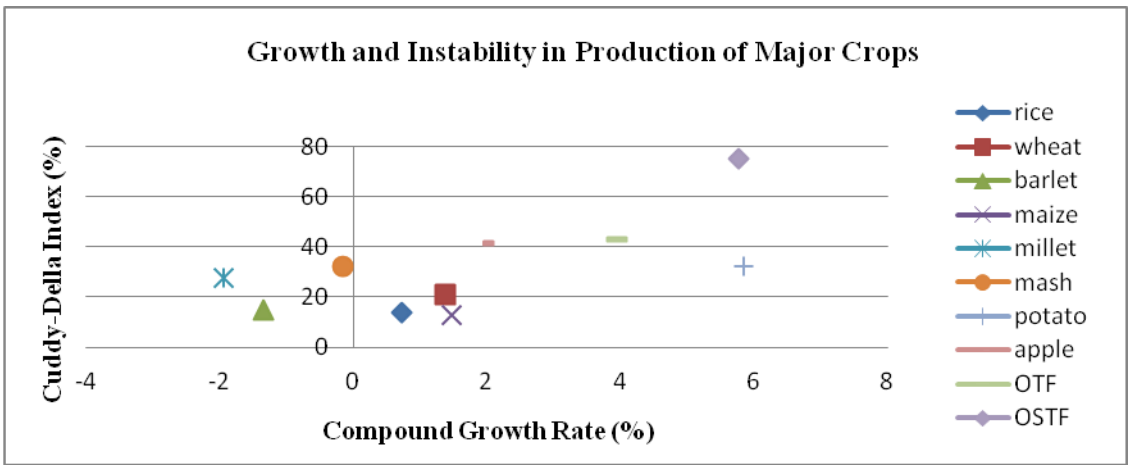
The simple coefficient of variation over estimates the level of instability in time-series data characterized by long term trends whereas the Cuddy-Della Valle index corrects the coefficient of variation. Out of the 18 crops grown in the state, 10 major crops are selected, covering more than 90% of the Gross Cropped Area (GCA) in the state.

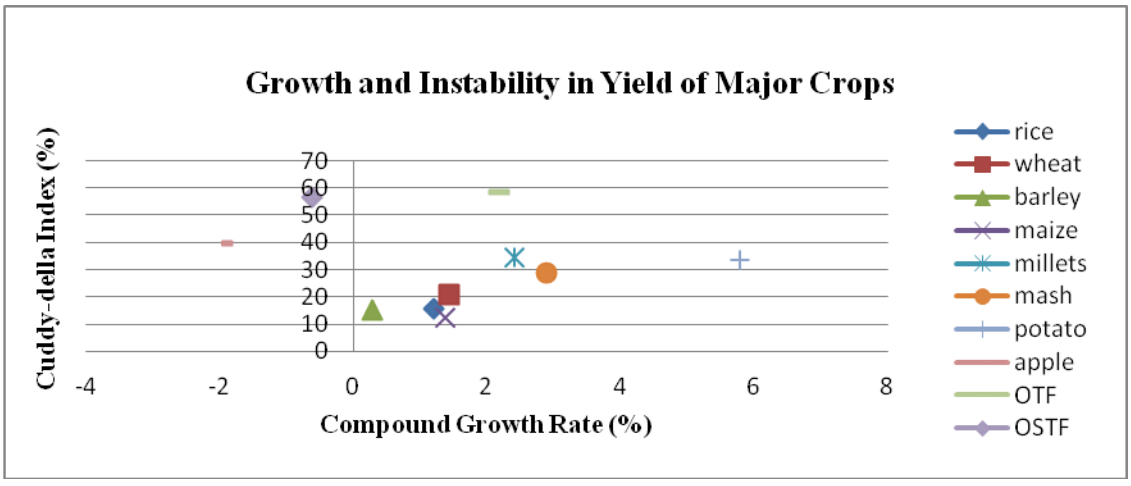
2. Growth and Instability in Area, Production, and Yield of Major Crops in Himachal Pradesh

To analyze the growth and instability of area, production and yield, major 10 crops have been taken into account, which covers more than 90% of GCA in the state. OSTF and OTF imply other sub temperate and other temperate fruits respectively. It is clear from figure 1 that growth rate of area under all cereals except maize are negative in the state, on the other hand area under all horticulture crops shows positive growth rate, among them the growth rate of OSTF is high (6.4%), followed by apple (3.9%). The instability index of area is low for all the major crops.

Figure1: Growth and Instability in Area, Production and Yield of Major Crops in Himachal Pradesh, 1980-81 to 2004-05







In production of major crops the growth rate of barley (-1.3%), millet (-1.9%) and mash (-0.15) is negative, instability index of barley is low (14.9%) as compared to millet (27.7%) and mash (32.1%). All the horticulture crops show positive growth rate in production with high instability index value. Potato shows high growth rate (5.8%) with the low instability index value (32.4%) as compare to other crops i.e. apple, OTF and OSTF which has growth rate of (1.9%), (3.9%) and (5.7%) with the instability index value of (41.4%), (43.3%) and (75.5%) respectively, which shows highly fluctuation in the production of these crops over a period of time.

The growth rate of yield of all the crops except apple and OSTF is showing positive estimates. The growth rate of yield of potato is highest (5.8%) with the high instability index value (33.6%). The growth rate of apple (-1.9%) and OSTF (-0.6) showing negative growth rate with instability index value (39.8%) and (56.4%) respectively showing the high instability. All other crops show positive growth rate with low and moderate instability index value in the state. In sum result show that, area under all cereals and pulses except maize is showing negative growth rate with low instability index value**.** Area under the horticulture crops showing positive growth rate with low instability. The growth rate of production of all horticulture crops is highly positive with high level of instability. Growth rate of yield of apple is negative with the high instability index value.

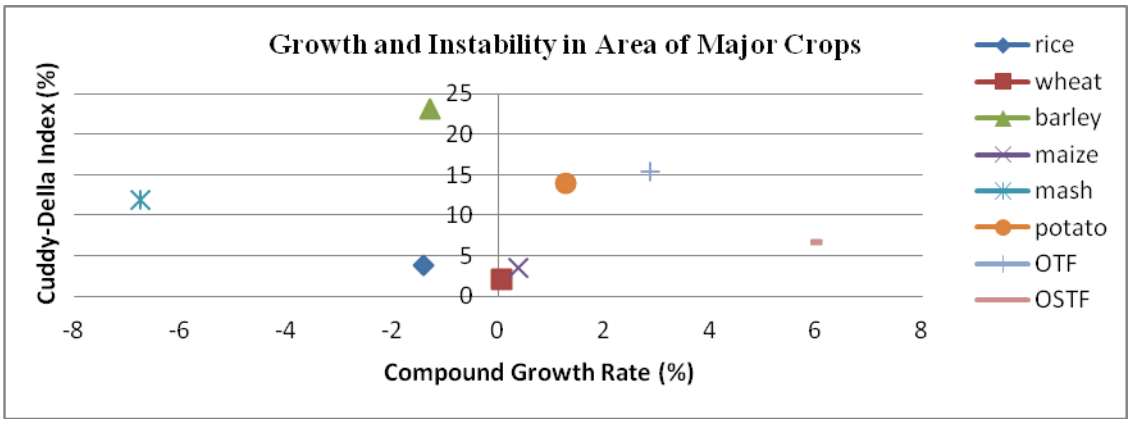
3. Region wise Growth and Instability in Area, Production, and Yield of Major Crops

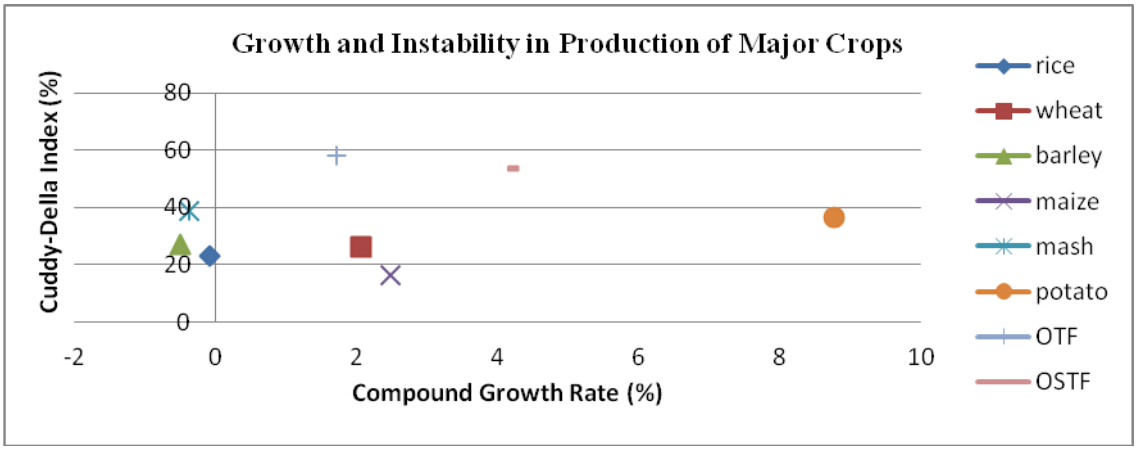
Himachal Pradesh has different agro-climatic condition in different region. The purpose of this section is to see the growth and instability in the different agro- climatic zone, which can be helpful for policy implication. The agro-climatic zone is divided into three zones by clubbing four districts (administrative units) in each zone, which has almost same climatic condition. The zones are divided as 'Lower Plains Region' consisting of four districts namely Una, Hamirpur, Bilaspur and Mandi, 'Middle Hill Region', including Shimla, Solan, Sirmour and Kangra and 'Upper Hill Region' which includes Chamba, Kullu, Kinnaur and Lahual & Spiti districts.

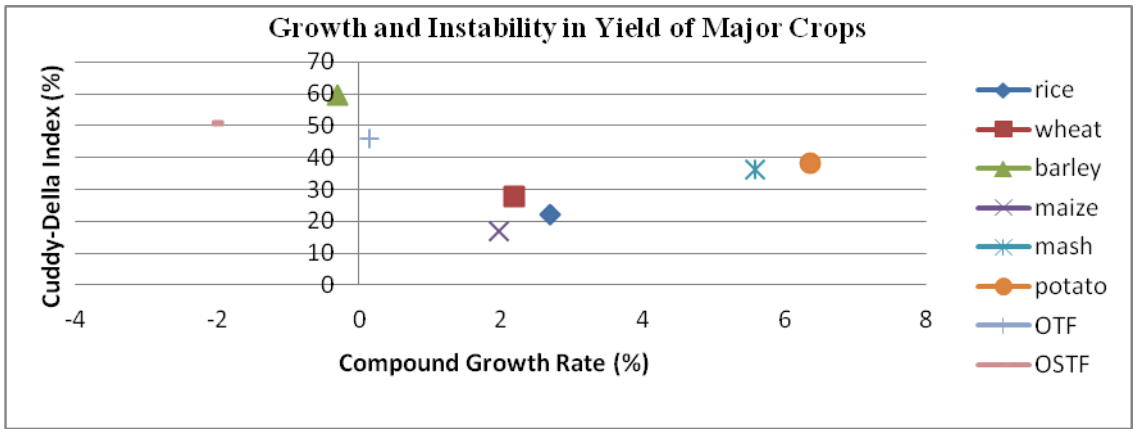
3.1 Lower Plains Region

In this region among the horticulture crops apple is not cultivated except in Mandi district but production is very low as compare to other districts. More than 80% cereals are produced in this region. It is clear from figure 2 that in this region area under horticulture crops are showing high growth rate with low instability. Maize and wheat showing low growth rate with low instability, all other crops are showing negative growth rate with low instability. Growth rate of production of potato (8.7%) and OSTF (4.2%) shows high growth rate with high instability value (36.3%) and (53.4%) respectively. On the other hand OTF is showing low growth rate (1.7%) with high instability, wheat (2.1%) and maize (2.8%) shows high growth rate, with wheat shows moderate instability (26.1%) and maize low instability (16.3%). All other crops are showing negative growth rate with high and moderate instability. Growth rate of yield of mash (5.6%), potato (6.4%), rice (2.7%) and wheat (2.2%) shows high with rice and wheat shows moderate and potato and mash high instability. All other crops are showing low and negative growth rate with high instability.

Figure2: Growth and Instability in Area, Production and Yield of Major Crops in Lower Plain Region-1980-81 to 2004-05







3.2 Middle Hill Region

This region in Himachal Pradesh is suitable climatic conditions for the production of all horticultural crops making it a leading producer in the state. Apple is dominant among horticultural crops in this region.

Figure3: Growth and Instability in Area, Production and Yield of Major Crops in Middle Hill Region, 1980-81 to 2004-05

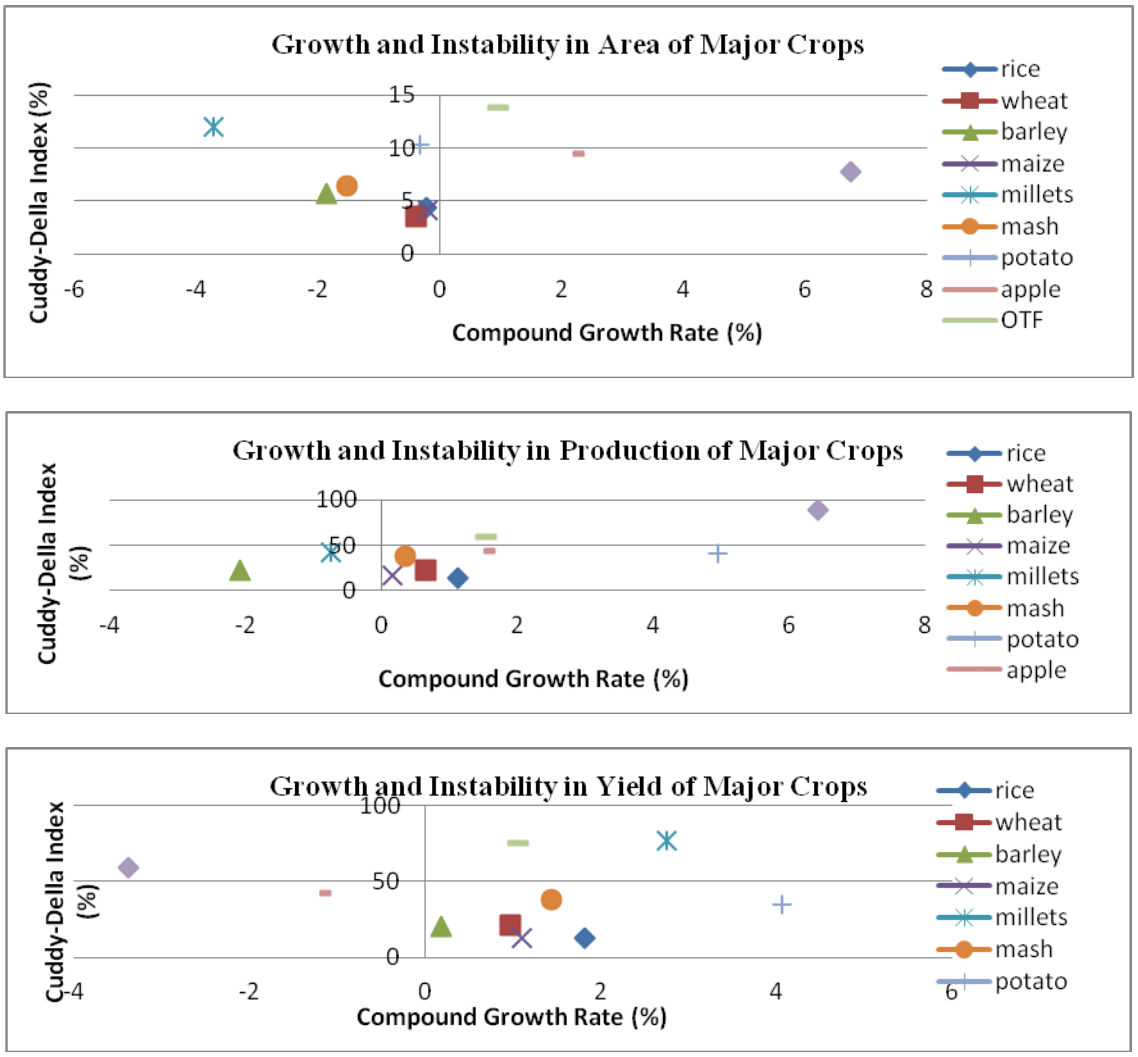


Figure 3 shows that in this region area under apple, OTF and OSTF are showing positive growth rate and low instability except potato for which growth is negative. All other crops shows negative growth rate with low instability. Growth rate of production of potato (5.0%) and OSTF (6.4%) shows high growth rate with high instability value (41.1%) and (89.0%) respectively. Apple (1.5%) and OTF (1.5%) shows low growth rate with high instability index value (43.2%) and (59.6%) respectively.

Rice (1.2%), wheat (0.6%), maize (0.2%) and mash (0.3%) shows low growth rate with rice (13.4%) and maize (16.2%) low instability and all other crops has high instability index value. Millets (-0.7%) and barley (-2.1%) shows negative growth rate with high instability.

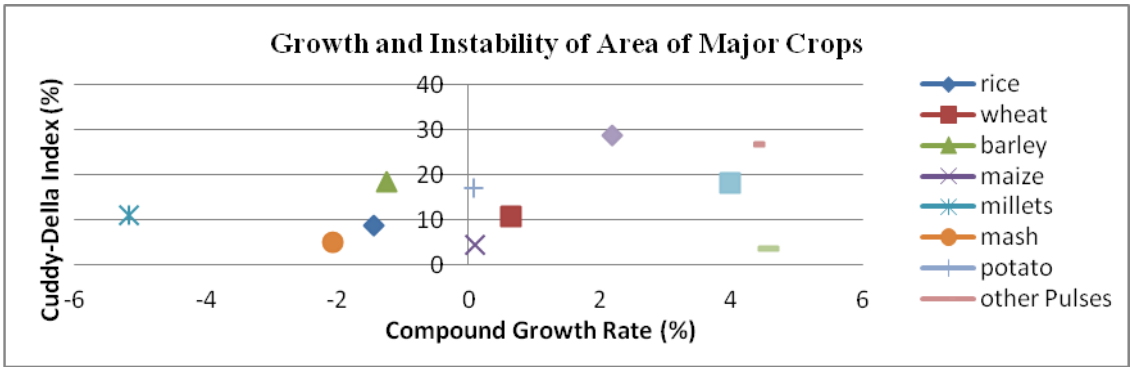
Growth rate of yield of potato (4.0%) and millets (2.8%) showing high with high instability (34.4%) and (76.7%) respectively. Apple (-1.2%) and OSTF (-3.4%) showing negative growth rate with high instability index value (42.1%) and (59.5%) respectively. All other crops in this region are showing low growth rate with low instability except mash and OTF which showing high instability.

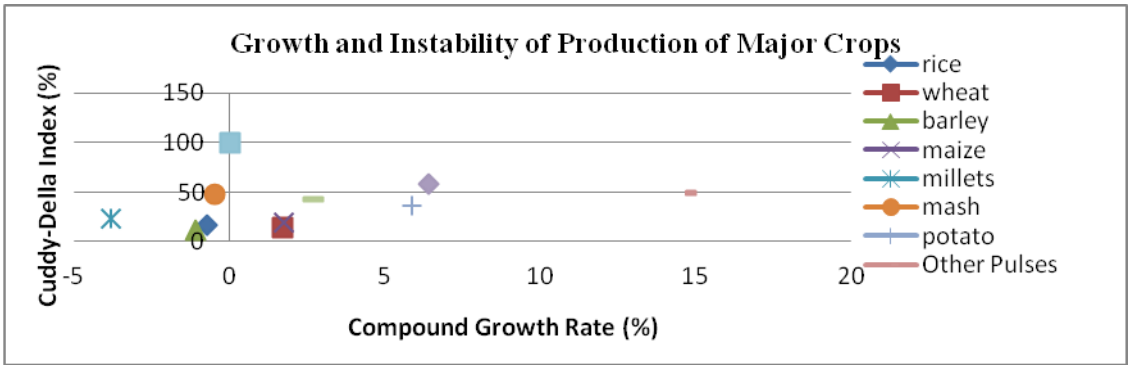
3.3 Upper Hill Region

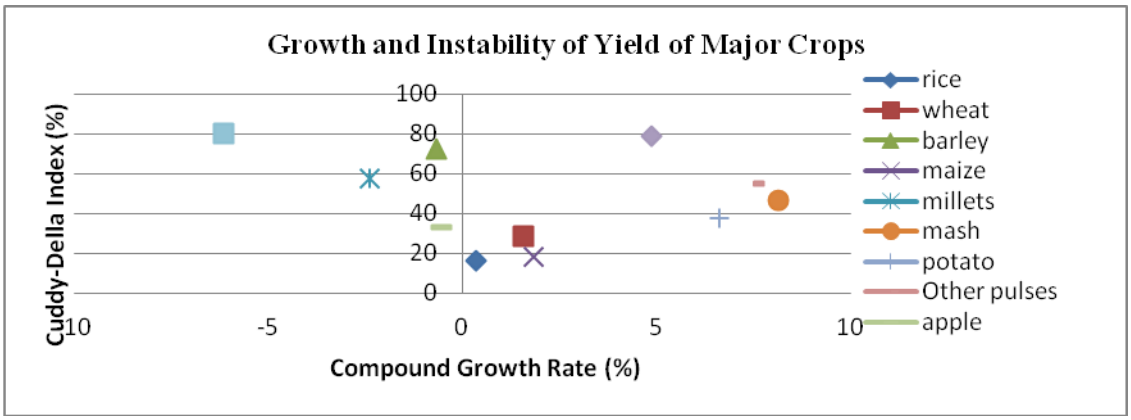
Climatic condition in this region is quite different with Lahual & Spiti has cold desert area and Kinnaur and some part of Chamba district has harsh cold climatic conditions. It is clear from figure 4 that in this region area under all horticultural crops namely apple (4.6%), OTF (2.2%) and OSTF (3.9%) shows high growth rate with low instability. Potato in this region shows low growth rate (0.1%) with low instability (17.3%), mash, millets, barley and rice are showing negative growth rate with low instability.

Wheat (0.7%) and maize (0.1%) shows low growth rate with low instability. Other Pulses (4.4%) in this region is showing high growth rate with moderate instability. Growth rate of production of all the horticultural crops, except OSTF, is high with high instability. Growth rate of other pulses is highest (14.7) among the all other crops with high instability index value (48.7%), maize (1.7%) and wheat (1.7%) showing low growth rate with low instability, all others are showing negative growth rate with low instability except mash and OSTF which is showing high instability.

Figure4: Growth and Instability in Area, Production and Yield of Major Crops in Upper Hill Region, 1980-1 to 2004-05







Growth rate of yield of mash (8.1%), potato (6.5%), other pulses (7.5%) and OTF (4.8%) is high with high instability. Apple (-0.5%), OSTF (-6.1%), millets (-2.4%) and barley (-0.7%) shows negative growth rate with apple and OTF showing low instability index value and millets and barley showing high instability. All other cereals are showing low growth rate with low instability.

4. Major Findings at District Level and across the Region

All districts show high growth rate with low instability in area under horticulture crops except Solan, which shows a negative growth rate with low instability. All districts reveal negative growth rate of area under coarse cereals with low instability.

Majority of districts are showing high growth rate of production of horticulture crops with high instability. District Mandi, Sirmaur, Solan, Bilapur, Chamba and Hamirpur showing negative growth rate with high instability, except potato which shows high growth rate with high instability in all these districts. Hamirpur, Bilaspur, Una and Solan shows high growth rate of wheat and rice with high instability in wheat in Hamirpur and Bilaspur, all other districts show low instability in both rice and wheat in terms of productivity. In Lahaul, Mandi, Shimla, Sirmaur and Una district, the growth rate of productivity of maize is high with moderate instability except Lahaul which shows high instability. Region wise results show the entire region has high growth rate with low instability in area under horticulture crops except middle hill region where potato shows negative growth rate. Most of the horticulture crops in all regions shows high growth rate with high instability in terms of production. Growth rates of yield of rice and wheat are high with low instability in lower plain region as compared to others. Most dominant horticulture crops, namely apple and OTF show negative growth rate of yield with high instability in middle region and low instability in the upper region.

The study shows high instability in the production of high valued commercial crops in the state. The production of such crops which include many fruits and vegetables has a direct bearing on income, employment and living standard of the vast rural population in the state. Government need to take initiatives such as minimum support price and insurance scheme for the off season vegetables and fruits to ensure low instability and enhancement and security of rural income and productivity.

References

Chakrabarti, S. 2004, A Note on The Impact of Crop Diversification and Land Conservation in India, Economic and Political Weekly, Vol.44, No.24, pp.5607-10.

Chand, R. 1996, Diversification through High Value Crops In Western Himalyan Region: Evidence from Himachal Pradesh, Indian Journal of Agricultural Economics, Vol. 41, No. 4, pp 652-63.

Deshpande, R.S. 2007, Crop Diversification and Agriculture Labor in India, Indian Journal of Labour Economics, Vol. 50, No. 4, pp.597-610.

Gopalapa, D.V. 1996, Crop Diversification and Income level In Andhrapradesh, Indian Journal of Agriculture Economics, Vol. 51, No. 3, pp.381-87.

Joshi, P.K. 2004, Agriculture Diversification in South Asia: Patterns, Determinants and Policy Implications, Economic and Political Weekly, Vol.34, No.24, pp.2457-67.

Kumar, V. 2007a, Development Disparities in Himachal Pradesh 1991-2001-A District Level Analaysis, ArthaVijana, Vol.49, No.1, pp. 53-57.

Kumar, V. 2007, Development Disparities in Himachal Pradesh 1991-2001- A District Level Analysis, ArthaVijana, Vol.50, No.1, p 46.

Negi, G.C. 1984, Agriculture Growth in Himachal Pradesh, Agriculture Situation in India, Vol.39, No.9, pp. 683-88.

Sharma, H. R. 2007, Crop diversification in Himachal Pradesh: Extent, Impact, Determinants and Challenges, Indian Journal of Agricultural Economics, Vol. 50, No. 4, pp 689-702.

Sharma, H. R. 2011, Crop diversification in Himachal Pradesh: Patterns, Determinants and Challenges, Indian Journal of Agricultural Economics, Vol. 66, No. 1, pp 97-114.

Sharma, H.R. 2005, Agricultural Development and Crop Diversification in Himachal Pradesh, Indian Journal of Agricultural Economics, Vol. 60, No. 1, pp. 71-93.

Sharma, K.D., Lal H. 2005, Tribal Development and Agriculture Transformation in North- Western Himalyan Region: A Case Study of Himachal Pradesh, Agriculture Situation in India, Vol.61, No.10, p 693.

Sharma, K.D., Saini, A.S. 2003, Globalisation and Its Impact on Mountain Agriculture: A Case Study of Himachal Pradesh, Agriculture Situation in India, Vol.59, No.11, p 693.

Sharma, H.R., Kumar, V., Kumar, A. 2003, Horticulture in Himachal Pradesh Emerging Threats from Globalisation, Technological and Climatic Changes, Man and Development, March, 2003,pp 21-33

Vaidya, C.S., Sikka, B.K. 1985, Growth Rate and Cropping Pattern Change in Agriculture in Himachal Pradesh, Agriculture Situation in India, Vol.39, No.11, p 841.

Vaidyanathan, A. 2000, India's Agricultural Development Policy, Economic and Political Weekly, Vol. 35, No. 20, May 13-19, pp. 1735-1741.

Vyas, V.S. 1996, Diversification in Agriculture: Concept, Rational and Approaches, Indian Journal of Agricultural Economics, Vol.51, No.4, pp.636-43.