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Levels of Horticulture Development Using Z- Transformation Analysis in Kashmir Valley, Jammu & Kashmir

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ABSTRACT

Horticulture plays a significant role in the economy of Kashmir valley.Since past two decades,due to increasing demand and other geographical factors, the agricultural cropping pattern of the valley has shown a tremendous shift from cereal to non-cereal crops,especially toward horticultural crops.Horticulture sector in the valley is economically viable, as there is high profit margin of investment in this sector. The gap between Revenue from the sale of output and costs per unit of land in this sector is high. This paper attempts to show the levels of horticulture development in terms of two parameters i.e. area under major horticultural crops and production of major horticultural crops for the year 2017-2018. Z-Score technique has been employed in order to show the levels of horticultural development. The levels of development have been calculated for both parameter,area under horticultural crops and production of horticultural crops. All the 10 districts of Kashmir valley have been categorized into 3 categoriesi.e. high, medium and low on the basis of mean composite Z-Score.The results show that the district of Kulgam,Pulwama,Ganderbal and Budgam fall in high level category for both parameters. The district of Srinagar and Bandipora show low level of development on the basis of Z-Score analysis.

1. Introduction

The Valley of Kashmir being located in mid-latitudes and having high altitude grows temperate fruits. Numerous varieties of apples, apricots, almonds, peaches, cherries, plums, pears, walnuts, melons, grapes and Loquats are grown in the valley. The farmers of the valley are concentrating on the cultivation of fruits and are constantly involved in transformation of land to orchards. It has been observed that several wastelands, pastures and forest areas have been transformed to fruit cultivation. Most of the apple orchards of the valley lie at the altitudes of 1,700 to 2,600 m above the sea level. Deep and heavy loam soils are well suited for apple cultivation as these soils have high surface area to retain moisture for a considerable period of time. Pears and peach also grow well in cool and humid climate of the Kashmir Valley. Peach is generally not preferred by the farmers because of its perishable nature. However, Peach and pear orchards are well distributed in the districts of Kashmir Division. Apricot requires moderately high (about 25°C) temperature. The hilly Tracts of Kashmir between 2,500 – 3,000 m above sea level are well suited for the cultivation of apricot. Economic incentives are given to the farmers by the various departments of the state to develop fruit cultivation inKandi and hilly areas of the valley. Subsidies to the extent of 50 per cent for fruit cultivation are provided to the farmers by the state government for the development of horticulture. Consequently, more than 2400 hectares have been covered under the various subsidy schemes. The area under fruits like apple, walnut, litchi, pear, cherry and apricot has increased considerably since 1980, while the area of almond, loquat and peach is contiguously shrinking. The main problems of fruit cultivation sustenance are the marketing, lack of credit, traditional methods of cultivation, Lack of diffusion of high density plants. The packing and transportation costs are also significantly high. Moreover, apple cultivators are facing tough competition in the national market from the apple growers of Himachal Pradesh and Uttrakhand.Due to this reason the comparative returns are low. The good varieties of apple are highly vulnerable to pests. The farmers have to spray treatments of pest control to apple plants for four to six times in a year. The high cost pesticides reduce the profit margin of apple cultivation. There is a dare need to develop pest resistant varieties of plants, so that prospects of fruit cultivation can be improved in Kashmir valley.

2. Objectives

1. To Determine the Levels of Horticulture Development in Kashmir Valley.

3. Materials and Methods

The present study is completely based on secondary sources of data. The data has been collected from Directorate of Horticulture, Government of Jammu & Kashmir.The collected data has been organised, tabulated and analysed. The results deduced from the statistical analysis of the data have been used for the classification of levels. The results have been plotted on maps generated in ARC-GIS 10.5. For the determination of levels of horticulture development, the parameters of Area under major horticultural crops and production of major horticultural crops for the year 2017-2018 have been selected.These include, apple, pear, apricot, peach, plum, cherry, walnut, Almond. Z-Score technique has been employed in order to determine the levels of horticultural development. The actual figures of the data have been transformed into Z-Scores by using Z-Transformation.

$$Z_i = \frac{X_i - \bar{X}_k}{\sigma_k}$$

Where,Z_i= Standard Z-Score score of ith observation.
X_i= Actual value of the ith observation.
$\bar{X}_k$= Mean of the kth Series.
σ_k= Standard deviation of the kth series.

The calculated Z-Scores have been summed up to composite Z-Scores (CZS) and then divided by number of Series(N), corresponding to respective districts. The CZS is expressed as:

CZS = $\sum Z_{ik}$
Where,
CZS = Composite Z-Score.
Z_{ik}= Standard Z-Score of ith observation in kth series.

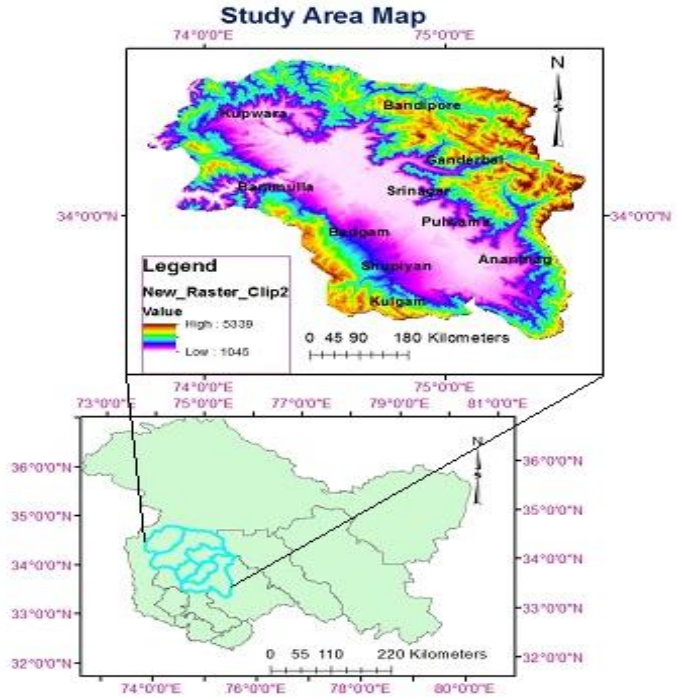
MCZS = $\frac{\sum Z_{ik}}{N}$
Where,
MCZS = Mean Composite Z-Score.
$\sum Z_{ik}$= Composite Z-Score.

N = Number of series. In this study, it depicts the number of selected horticultural crops.

The Mean Composite Z-Scores (MCZS) have been then classified into three categories i.e. high, medium and low, which shows the levels of horticultural development.

4. Study Area

Fig. 4.1: Study area map of Kashmir valley



Source: Generated from DEM in ARC-GIS 10.5.

The valley of Kashmir is located in the Jammu & Kashmir state of India. The valley extends from 34^0 43″ to 35^0 22″ North Latitudes and 73^0 52″ to 75^0 42″ East Longitudes.The valley of Kashmir is an intermontane valley which is encompassed by Greater Himalayan Range in east and north-east and Pir-panjal Range of Middle Himalayas in south and south-west.The valley of Kashmir is drained by river Jhelum and its tributaries .The general direction of flow of the river is south-east to north-west.Sub-Mediterranean type of climate is found in the valley.The valley receives maximum precipitation in winter season.Kashmir valley is dominated by alpine type of vegetation.Mountain,Alluvial and Karewa types of soils are widely distributed in the valley.These soils are well suited for the cultivation of wide range of cereal and non-cereal crops.The total geographical area of the valley is 15948 Square Kms and is divided into 10 administrative units(districts).The total population of the valley is 69076229(census 2011).The average density of Population is 450.06 persons per Square Km(census 2011).

5. Results and Discussion

TheStatistical analysis of levels of area and production of major horticulture crops of Kashmir valley shows wide spatial variation of horticultural crop distribution across all the districts of theKashmir Valley.Area and production of major horticultural crops of the Kashmir valley for the year 2017-2018 have been taken into consideration. All the districts of the valley have been categorised into three categories,High **(Above +0.25)**, Medium**(+0.25 to -0.25)**, Low**(Below -0.25)** in terms of both area and production of major horticulture crops of the valley.The comparison between area and Production Levels shows a slight variation. In terms of area, Kupwara district falls in low category and in terms of production it falls in high category on the basis of Z-Score.The levels of horticulture development for both parameters and respective Z-Scores of all the districts have been put in table 2 and table 4 respectively.

5.1. Levels of Horticulture Development in Terms of Area under Major Horticultural Crops on The basis of Z-Score 2017-2018.

Table 5.1: Area (Hectares) Under Major Horticultural Crops in Kashmir Valley **2017-2018**

S.No.	Districts	Area (Hectares) Under Major Horticultural Crops in Kashmir Valley for year 2017-2018							
		Apple	Pear	Apricot	Peach	Plum	Cherry	Walnut	Almond
1	**Srinagar**	1659	287	35	77	139	333	153	323
2	**Ganderbal**	7111	385	86	190	232	1055	5267	5
3	**Budgam**	12953	1686	23	0	531	8	2915	1259
4	**Baramulla**	25231	660	121	56	0	212	3139	258
5	**Bandipora**	4892	112	18	23	15	71	595	2
6	**Kupwara**	19137	478	58	41	46	113	8795	13
7	**Anantnag**	18235	547	152	135	110	125	11949	21
8	**Kulgam**	19148	850	198	197	210	142	5446	56
9	**Shupiyan**	21663	396	44	25	36	608	3280	15
10	**Pulwama**	15387	1083	106	67	148	60	5406	3631

Source: Directorate of Horticulture, Government of Jammu & Kashmir.

1. **High level of horticulture development in terms of Area:-** The Z-Score range of this category of horticulture development is **+0.25 and above**. Kulgam (0.54), Pulwama (0.42), Ganderbal (0.33) and Budgam (0.26) districts of Kashmir Valley fall under this category of horticulture development. The total number of districts under this category is 4. These districts have high level of horticulture development in terms of area under major horticultural crops.

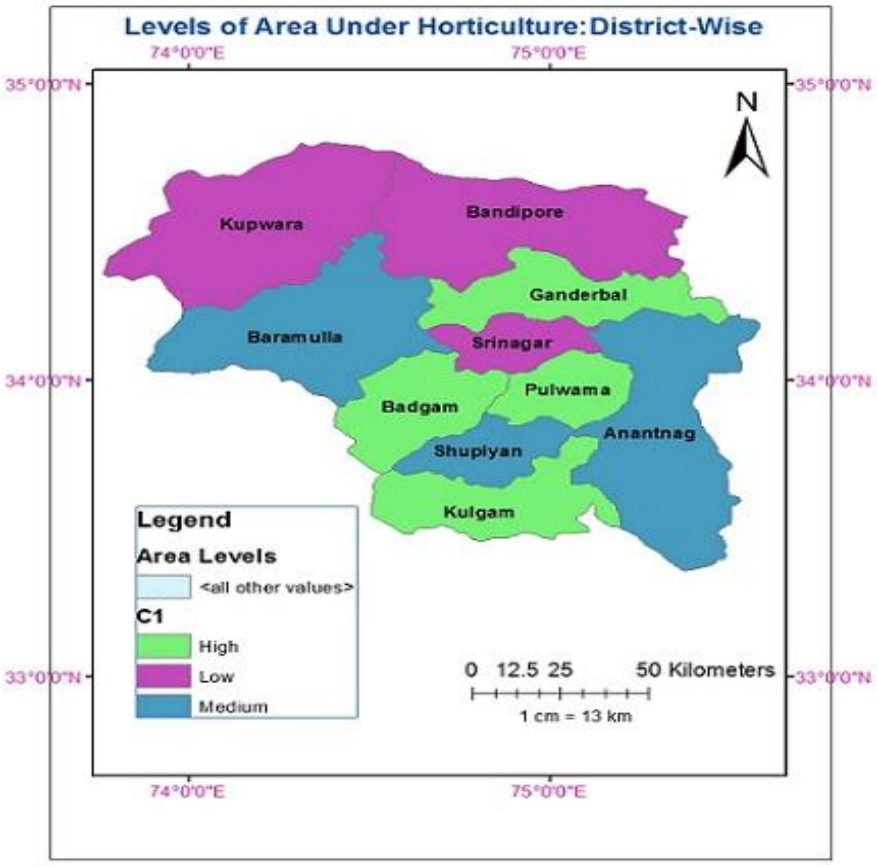
2. **Medium level of horticulture development in terms of Area:-**The Z-Score range of this category of horticulture development varies between **+0.25 to -0.25**. Anantnag (0.15), Baramulla (0.02), Shupiyan (-0.17) districts fall under this category. The total number of districts falling under this category is 3. These districts have medium level of horticulture development in terms of area under major horticultural crops based on Z- Score.

3. **Low level of horticulture development in terms of Area:-**The districts like Kupwara (-0.31), Srinagar (-0.46), Bandipora (-0.84) falls under this category of horticultural development. The Z-Score of this category ranges from **-0.25 and below.** The total number of districts falling under this category is 3.

Table 5.2: Levels of Horticulture Development in Terms of Area in Kashmir Valley **2017-2018**

Range	Category	Name of the District (MCZS)	Number
Above +0.25	**High**	Kulgam (0.54), Pulwama (0.42), Ganderbal(0.33), Budgam (0.26)	**4**
+0.25 to - 0.25	**Medium**	Anantnag (0.15), Baramulla (0.02), Shupiyan (-0.17)	**3**
Below - 0.25	**Low**	Kupwara (-0.31), Srinagar (-0.46), Bandipora (-0.84)	**3**

Fig.5.1: Represents the levels of horticulture development in terms of area under major horticultural crops in Kashmir valley **2017-2018**



Source: Generated in ARC-GIS 10.5

5.2. Levels of Horticulture Development in Terms of Production of Major Horticultural Crops on The basis of Z-Score 2017-2018.

Table 5.3: Production (Metric Tonnes) of Major Horticultural Crops in Kashmir Valley **2017– 2018**

S.No.	Districts	Production (Metric Tonnes) of Major Horticultural Crops in Kashmir Valley 2017 – 2018							
		Apple	Pear	Apricot	Peach	Plum	Cherry	Walnut	Almond
1	**Srinagar**	18708	1883	35	214	338	1324	512	2579
2	**Ganderbal**	87576	5023	721	274	1700	3411	15690	28
3	**Budgam**	121612	19514	430	0	2644	22	9039	5010
4	**Baramulla**	403766	9699	410	394	0	1371	9844	553
5	**Bandipora**	68205	1557	135	161	108	36	1787	6
6	**Kupwara**	286628	5736	546	387	435	1130	43985	65
7	**Anantnag**	221633	2107	421	314	273	230	44916	29
8	**Kulgam**	223893	77953	801	749	862	472	21879	249
9	**Shupiyan**	288809	3302	175	119	115	2930	17567	70
10	**Pulwama**	136389	8016	566	331	1049	311	25068	4511

*Source: Directorate of Horticulture, Government of Jammu & Kashmir***.**

1. **High level of horticulture development in terms of Production:-** The Z-Score range of this category of horticulture development is **+0.25 and above**. Kulgam (0.47), Budgam (0.39) Pulwama (0.30), Kupwara (0.29), and Ganderbal (0.28)districts of Kashmir Valley fall under this category of horticulture development. The total number of districts under this category is 5. These districts have high level of horticulture development in terms of production of major horticultural crops. The high level of horticulture development in these districts is attributed to suitable climatic conditions, soil suitability or high proportion of area under horticultural crops. Because, it is total production data and will be affected by total land under horticulture.

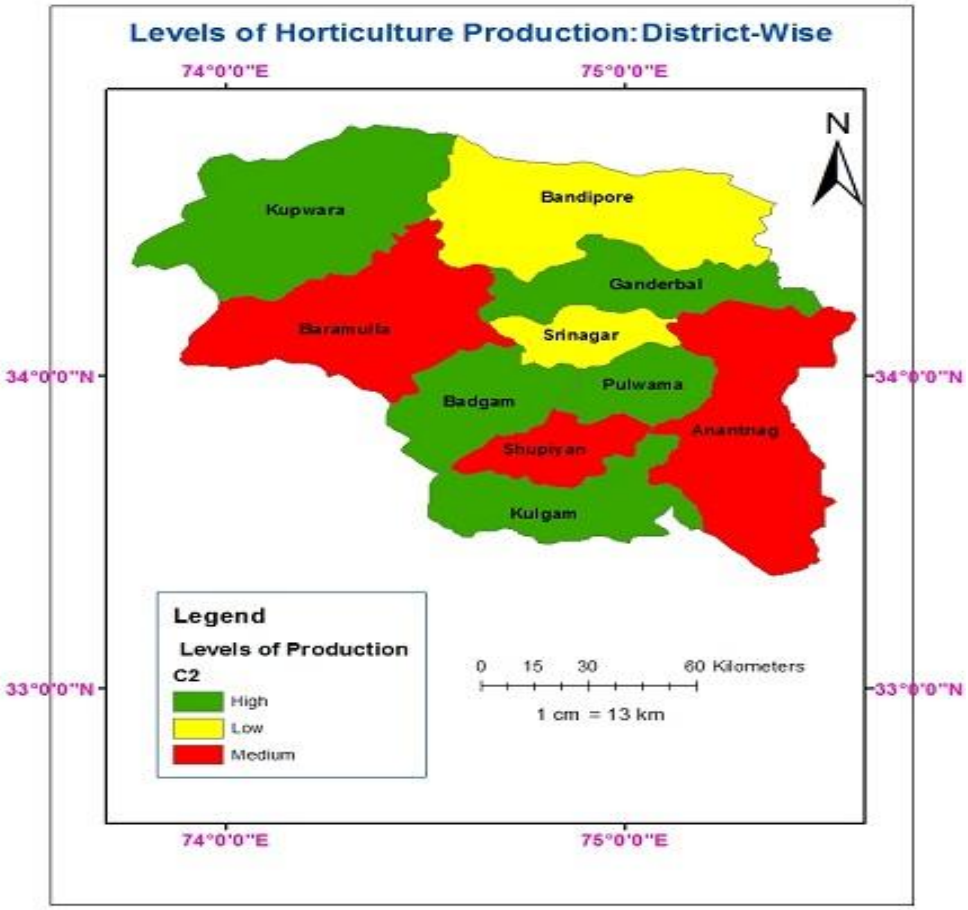
2. **Medium level of horticulture development in terms of Production:-** The Z-Score range of this category of horticulture development varies between **+0.25 to -0.25**. Baramulla (0.22), Anantnag (-0.09), Shupiyan (-0.15) districts fall under this category. The total number of districts under this category is 3. These districts have medium level of horticulture development in terms of production of major horticultural crops based on Z- Score.

3. **Low level of horticulture development in terms of Production:-**The districts like Srinagar (-0.66), Bandipora (-0.94) falls under this category of horticultural development. The Z-Score of this category ranges from **-0.25 and below.** The total number of districts falling under this category is 2.The low level of horticulture development in terms of production of these districts may be attributed to unfavourable climatic conditions, high water table, un-suitable soils and high proportion of urbanized area or less land under horticultural crops.

Table 5.4: Levels of Horticulture Development in Terms of Production in Kashmir Valley 2017-2018

Range	Category	Name of the District (MCZS)	Number
Above +0.25	High	Kulgam (0.47), Budgam (0.09), Pulwama (0.30), Kupwara (0.92), Ganderbal (0.28)	5
+0.25 to - 0.25	Medium	Baramulla (0.22), Anantnag (-0.09), Shupiyan (-0.15)	3
Below - 0.25	Low	Srinagar (-0.66), Bandipora (-0.94)	2

Fig.5.2: Represents the levels of horticulture development in terms of production of major horticultural crops in Kashmir valley **2017-2018.**



Source: Generated in Arc-GIS 10.5

6. Conclusion and Suggestions

The study reveals that there is a significant variation in horticultural development across the Kashmir valley. The districts of Kulgam, Pulwama, Ganderbal and Budgam depict high level of horticulture development. While, The districts of Srinagar and Bandipora show low-level of horticulture development on the basis of Z-Score. This regional variation of horticulture development is attributed to climatic, hydrological, pedological and anthropogenic factors. The districts having high Z-Score are well suited for the development of horticulture. While the districts having low Z-Score have some inherent limitation for the development of this sector. Some of the limitations of these districts can be solved by appropriate planning strategies. The present study does not reveal the overall horticulture developmental variation.Because,only two of the parameters have been selected for analysis.The study

shows the level of development only in terms of total area and total production.The districts of Shupiyan and Baramulla have highest productivity per unit of land.But, because of low proportion of land under horticulture and the error inherent with Z-Score analysis that these districts fall under medium category.

Horticultural sector is one of the important economically viable sectors of Kashmir valley, as the gap between costs incurred and revenue generated per unit of land is high.The sector earns abnormal profits (above the equilibrium level of production). It has backward and forward linkages to different industries of the valley. Therefore, generates huge employment to the labour force of the valley. Taking these factors into consideration, the government of Jammu &Kashmir should actively involve in the equitable development of horticulture in the valley. There should be the development of regional market centers across different districts, so that farmers from all the regions do not face the problem of marketing their horticultural products, cold storage facilities should be disseminated equally to different regions, more and more incentives should be given to farmers in addition to the minimum support price policy of the government, there should be the development of local fruit processing centers in horticulture hotspot areas of the valley, so that additional employment can be generated and the fruit products can be sent directly to international marketing order to fetch high price and multiplier process of income generation can be accelerated.

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