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**CHANGES IN CROP COMBINATIONS IN LATUR DISTRICT 1993-94
TO 2013-14**

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DOI- 10.5281/zenodo.7053339

Introduction :

The study of spatio-temporal transformations in crop combinations is very useful for future agricultural planning. Crop combinations study should be useful for agricultural market development, for the development of agro-based industries. The study of crop combinations study is also useful to find out the crop combinations regions and planners can plan properly for sustainable agricultural development. Many agricultural geographers, economists studied the crop combination regions of different part of the world. Many agricultural geographers like Weaver (1954)¹, Sing Jasbir & Dhillon S.S. (2006)², Majid Hussain (2007)³, Scott (1957)⁴, Barrau J. (1961)⁵, Coppock (1960)⁶, Jonasson (1968)⁷, Fafiullah (1956)⁸, Morgan & Munton (1969)⁹, Doi (1959)¹⁰, Thomas (1963)¹¹ used their methods for the calculations of crop combinations for different regions of the world.

Significance of the crop combination study :

1. Crop combinations study always useful for the development of agriculture in a particular region. It is also useful for sustainable development.
2. With the study of crop combination regions, agricultural area can be divided in agricultural region which are very useful for administrators and planners.
3. The study of crop combination is very important for rotation of crops and to increase per hectare yield.

Study Area :

Latur district is one of the most important district in Marathwada region of Maharashtra state. Latur district lies between 18°05' north to 19°15' north latitudes and 73°25' east to 77°25' east longitudes. Latur district covered an area of 7371.9 sq.kms. and with five towns and 945 villages. Latur district is very important for agriculture.

Physiography :

There is very close relation between relief and agriculture. In the world or in

our country agriculture is developed as per relief. The topography of Latur district is made by plateau region. In the basins of Manjra, Terna and Manad there is some plane area and nearly 70% of the area is covered by plateau region. Physiography is one of the dominate parameter of physical environment and its impact on pattern and density or agriculture is immense. Physiographical Latur district is divided into three major divisions. There are hilly region, plateau region and plane region.

Soils :

Very deep black, deep black and shallow black soil is found in Latur district. Most of the area is made by plateau and rivers banks made by deep alluvial soils. Manjra and Terna basins covered most of the part of Latur district.

Climate :

The annual average rainfall is between 789 to 864 millimeters. The average rainfall is less than 800 millimeters. Summer is very hot and dry winter is cool and dry and rainy season is humid in total Latur district. The

agricultural activities are very related to climatic conditions.

Objectives of the study :

Following are the main objectives of the study.

1. To study the crop combinations of different talukas of Latur district for the period 1993-94.
2. To study the crop combinations of different talukas of latur district for the period 2013-14.
3. To study the changes taken place in crop combination in different talukas of Latur district during the period 1993-94 to 2013-14.

Methodology :

Weavers method has been applied for the calculations of crop combination regions of different talukas of Latur district. Minimum deviation method of crop combination of weaver has been applied for the calculation of crop combination. Talukawise crop combination is calculated and it is shown by the choropleth maps. The changes in crop combination for the period 1993-94 to 2013-14 have been plotted in different talukas of Latur district.

Data has been collected from secondary sources. Secondary data collected from office of the Agricultural commissioners, Govt. of Maharashtra Pune and Socio-Economic Reviews and District Statistical Abstracts of Latur district region for the year 1993-94 and 2013-14.

Results & Discussion :

The geographical investigation and agricultural which purports to select various crops of agricultural elements to be studied collectively in an area may be formed as combination analysis. The combination analysis was originally introduced into geographical research by

Weaver John C. (1954) in his outstanding study of crop combinations in Mid-western limited states. Singh Jasbir and Dhillon S.S. (2006) In addition, the technique can also be applied to identify and locate areas sharing a significant proportion of single agricultural elements or crop at higher rank, such as the significant rice or producing areas of India. As such, it can be termed as regional distribution analysis. The principle of combination analysis thus promises to be an important tool of statistical studies in various fields of geography, particularly in agricultural geography.

"The study of crop combination regions constitutes important aspects of agricultural geography as it provides a good basis for agricultural regionalization." (Majid Hussain 2007)

In recent years the concept of crop combination has engaged the attention of geographers and agricultural land use planners. The studies made so far in this field range in approach from topical to regional and vary in extent from small areas of minor political units to be entire country.

Here in this study very suitable crop combination method of Weaver has been applied for different takulas of Latur district for the period 1993-94 to 2013-14.

As per the calculations of Weaver's method in 1993-94, 14 crop combinations have been recorded and 2013-14 there were 9 crop combinations have been observed in total Latur district. Out of the 14 crop combination in 1993-94 the crop cotton, mug, vegetables, fruits and fibre not observed in 2013-14 and soyabean, sugarcane, kardi and udid crops newly recorded in the combination. The rank of jowar, maize and gram has been constant in both the period.

Table No. 1: Change in Number of Crops in the Combination
In Latur district.

Name of Talukas	Weaver's method			
	1993-94		2013-14	
	No. of crops	Name of the Crops	No. of crops	Name of the Crops
Latur	16	Jowar, Sunflower, Tur, Udid, Sugarcane, Mug,	7	Soyabean jowar sugarcane gram udid tur and wheat

		Wheat, Gram, Rice, Sesame, Kardi, Groundnut, Linseed, Other Oilseeds, Fruits & Vegetables		
Renapur	15	Jowar, Sunflower, Tur, Udid Sugarcane, Wheat, Mug, Gram, Sesame, Kardi, Rice, Groundnut, Bajra, Condiments & Spices, Other Fiber	8	Soyabean jowar sugarcane mug gram udid tur and wheat
Ahmedpur	12	Jowar Sunflower Tur Udid Sugarcane Mug Wheat Gram Sesame Kardi Rice Other Oilseeds	9	Soyabean jowar maize sugarcane mug gram udid tur and wheat
Jalkot	15	Jowar Sunflower Tur Udid Sugarcane Mug Wheat Gram Sesame Groundnut Kardi Rice Other Oilseeds Linseed Other fiber	9	Soyabean jowar sugarcane maize mug gram udid tur and wheat
Chakur	15	Jowar Sunflower Tur Udid Sugarcane Mug Wheat Gram Linseed Sesame Rice Kardi Other Oilseeds Other Fiber Groundnut	8	Soyabean jowar sugarcane kardi sunflower gram udid and wheat
Shirur Anantpal	12	Jowar Sunflower Udid Gram Tur Kardi Mug Groundnut Rice Maize Wheat Sugarcane	10	Soyabean jowar sugarcane kardi sunflower maize gram udid tur and wheat
Ausa	13	Jowar Sunflower Udid Gram Tur Kardi Mug Groundnut Rice Wheat Bajar Sugarcane Other Oilseeds	10	Soyabean jowar sugarcane kardi sunflower maize gram udid tur and wheat
Nilanga	15	Jowar Sunflower Udid Gram Tur Kardi Mug Groundnut Wheat Rice Bajar Sugarcane Sesame Other Oilseeds Linseed	10	Soyabean jowar sugarcane kardi sunflower maize gram udid tur and wheat
Deoni	13	Jowar Sunflower Udid Gram Tur Kardi Groundnut Mug Wheat Rice Bajar Sugarcane Sesame	10	Soyabean jowar sugarcane kardi sunflower maize gram udid tur and wheat
Udgir	12	Jowar Sunflower Udid Gram Tur Kardi Groundnut Mug Wheat Rice Bajar Sugarcane	10	Soyabean jowar sugarcane kardi sunflower maize gram udid tur and wheat
Total	14	Jowar, Cotton, Bajra,	9	Soyabean jowar sugarcane

District	Tur, Udid, Mug, Wheat, Gram, Sunflower, Sugarcane, Maize, vegetables, fruits, fiber	kardi sunflower maize gram udid and wheat
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Table No. 1 indicates that the transformations in number of crop combinations in different talukas of Latur district. Out of the 14 crop combination in 1993-94 the crop cotton, mug, vegetables, fruits and fiber not observed in 2013-14 and soyabean, sugarcane, kardi and udid crops newly recorded in the combination. The rank of jowar, maize and gram has been constant in both the period.

Sixteen crops combination has observed in Latur taluka during 1993-94 to 2013-14 periods. During the period 2013-14 seven crops combination has observed. There are soybean, jowar, sugarcane, gram, tur, udid and wheat

Fifteen crops combination has observed in Renapur during 1993-94 to 2013-14 periods. During the period 2013-14 eight crops combination has observed. These are soybean, jowar, sugarcane, tur, gram, wheat, udid and mug.

Twelve crops combination has observed in Ahmedpur during 1993-94 to 2013-14 periods. During the period 2013-14 nine crops combination has observed. There are soybean, Jowar, sugarcane, tur, gram, wheat, udid, mug and maize

Fifteen crops combination has observed in Jalkot during 1993-94 to 2013-14 periods. During the period 2013-14 nine crops combination has observed. These are soybean, jowar, sugarcane, gram, tur, Wheat, udid, mug and maize

Fifteen crops combination has observed in Chakur during 1993-94 to 2013-14 periods. During the period 2013-14 eight crops combination has observed. These are soybean, jowar, sugarcane, gram, tur, wheat, udid and maize

Twelve crops combination has observed in Shirur Anatpal during 1993-94 to 2013-14 periods. During the period 2013-14 ten crops combination has observed. These are soybean, gram, jowar, tur, sugarcane, udid, wheat, mug, kardi and sunflower.

Thirteen crops combination has observed in Ausa during 1993-94 to 2013-14

periods. During the period 2013-14 ten crops combination has observed. These are soybean, gram, jowar, tur, sugarcane, udid, wheat, mug, kardi and sunflower.

Fifteen crops combination has observed in Nilanga during 1993-94 to 2013-14 periods. During the period 2013-14 ten crops combination has observed. These are soybean, gram, jowar, tur, sugarcane, udid, wheat, mug, sunflower and kardi

Thirteen crops combination has observed in Deoni during 1993-94 to 2013-14 periods. During the period 2013-14 ten crops combination has observed. These are soybean, gram, jowar, tur, sugarcane, udid, wheat, mug, sunflower and kardi.

Twelve crops combination has observed in Udgir during 1993-94 to 2013-14 periods. During the period 2013-14 ten crops combination has observed. These are soybean, gram, jowar, tur, sugarcane, udid, wheat, mug, kardi and sunflower.

Conclusions :

Spatio-temporal transformations in crop combinations as per the weaver's method have been observed in different talukas of Latur district. In total Latur district slight transformations were recorded in crop combinations of both the period. The crop combinations were decreased from 14 to 9 crops during the period 1993-94 to 2013-14. Major changes were observed in Latur taluka. There were 16 crops in the combination in 1993-94 and after twenty years there were 7 crops combinations were observed. In Ahmedpur crop combinations were changed from 12 to 9 crops. In Renapur 15 crops to 8 crops combinations were recorded. Crop combination is transforming in total Latur district.

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