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SPATIAL PATTERN OF CROP COMBINATION IN KOLHAPUR DISTRICT (MAHARASHTRA)

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Introduction

India is an essentially agricultural country (Tiwari, 2003). In developing country like India, crops are generally grown in combinations. The study of crop combination regions constitutes an important aspect of agricultural geography and it provides a good basis for agricultural regionalization. For a comprehensive and better understanding of the agricultural mosaic of an agro climatic region, the study of crop combination is of greater significance. Even for the planning and development of agriculture a systematic study of crop combination has engaged the attention of geographers and agricultural land use planners (Hussain, M. 2002). The present study of crop combination analysis is related to the Kolhapur district, which is a part of Deccan plateau. Kolhapur district is one of the agriculturally most developed districts of the country (Hussain, M. 2002).

Study Region

Kolhapur district is located in the most Southern part of Maharashtra. It is located in between $17^{\circ}17'$ and $19^{\circ}43'$ North latitude and $73^{\circ}40'$ and $74^{\circ}42'$ East longitude. It covers an area about 7685 sq.km. and it is 2.5% to the total area of the Maharashtra. The population of the Kolhapur district, according to 2001 census, is 35,23,162 persons (Fig.1)

KOLHAPUR DISTRICT LOCATION MAP

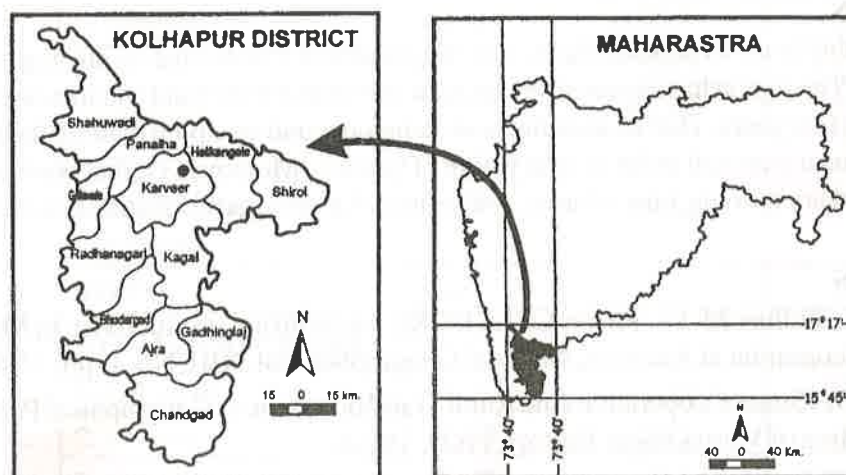


Fig. 1

Physiography and Climate

The study region is a part of Deccan plateau. General slope of the study region is towards East and South East. The general altitude of the district is 1000 metres to the west and it is 600 metres to the east. The district has two main physiographic divisions i.e. western hilly region and eastern plain region. Western hilly region consists of Panhala, Shahuwadi, Gaganbawada, Radhanagari, Bhudargarh, Ajara and Chandgarh tahsils. The eastern plain region includes tahsils like Shirol, Hatkanangle, Karveer and Kagal. The district has well developed drainage pattern. The rivers like Warna, Panchganga, Dudhaganga, Vedaganga, Hiranyakeshi and their tributaries and distributaries play an important role in the development of agriculture in the study region.

The Kolhapur district has temperate climate. It receives rainfall mainly from South West monsoon and intensity of the rainfall decreases from West to East. The mean temperature of the district lies between 14°C and 16°C in winter months i.e. in December and January. It exceeds more than 38°C in summer especially in April.

The Kolhapur district has three broad zones of soils. The Western zone is covered with laterite soil; the central part has fertile brownish black well drained soil while the eastern zone is covered with alluvial soil to deep black soil. The study region has well-developed irrigation facilities. All tahsils, except Gadhinglaj, Ajara, Bhudergad and Hatkanangle, have more than 40% irrigated area. The tahsil Karveer has the highest percentage of irrigated area.

Objectives

1. To delineate crop combination regions of Kolhapur district.
2. To analyze the spatial pattern of crop combinations.

Hypothesis

The crop combination of the study region is the direct result of rainfall, soil and irrigation facilities prevail there.

Data Source and Methodology

Present research work is based on the secondary data. Data is collected from the following sources.

1. District Census Handbook of Kolhapur District 1991.
2. Agricultural Department of Kolhapur District Council.
3. Socio-Economic Review and District Statistical Abstracts of Kolhapur.

Here an attempt has been made to study tahsil wise crop combinations by maximum positive deviation method of Rafiullah. It is analysed with the help of map. Rafiullah (1956), based on weaver's method, developed a new deviation method in his work 'A New Approach to the Functional Classification of Towns' (Hussain, M. 2002). The technique devised by Rafiullah may be expressed as follows :

$$d = \sqrt{\frac{\sum d^2 p - \sum d^2 n}{N^2}}$$

Where,

- d = is the deviation between actual crop percentage and the appropriate crop percentage in theoretical distribution.
 p = is the positive difference.
 n = is the negative difference.
 N = is the number of the crops in the crop combination.

Tahsil is selected as a basic unit of investigation. 2003-2004 year is selected for the delineation of crop combination. In the present study eleven crops are selected for delineation of crop combination.

Analysis of Spatial Pattern of Crop Combination (2003-2004)

It has been noted from the table 2 that out of the twelve tahsils of the district, seven tahsils come under the category of monoculture. From the remained tahsils, three tahsils have two crop combinations and two tahsil have three crop combinations. These crop combinations are also shown in Fig. 2 (Table. 1, Table. 2)

The details of crop combination in Kolhapur district by maximum positive deviation method of Rafiullah is analysed as under.

A. Monoculture :

i. Rice

Rice as a monoculture observed in the four tahsils of the district Kolhapur. These are - Gaganbavada, Panhala, Kagal and Ajara and they cover an area about 39.21%, 36.45%, 25.36% and 33.97%, of the total sown area of that respective tahsil respectively. The variance of the Rice as a monoculture is 183.6 in Panhala, 116.42 in Gaganbavada, 607.12 in Kagal and Ajara has variance. 256.96.

The tahsils Panhala, Gaganbavada and Ajara have the highest rainfall intensity. Whereas the Kagal tahsil has low rainfall intensity as compared to the tehsils such as - Panhala, Gaganbavada and Ajara and has well developed irrigation facilities and fertile soil. This is the cause that Rice is the monoculture in these tahsils.

ii. Soyabean

Hatkanangale tahsil of the district Kolhapur has the monoculture system. Soyabean is the monoculture crop of the tahsil Hatkanangale. Soyabean covers an area about 37.72% of the total cultivated area of the tahsil Hatkanangale. The index value of Soyabean as a monoculture is 150.79.

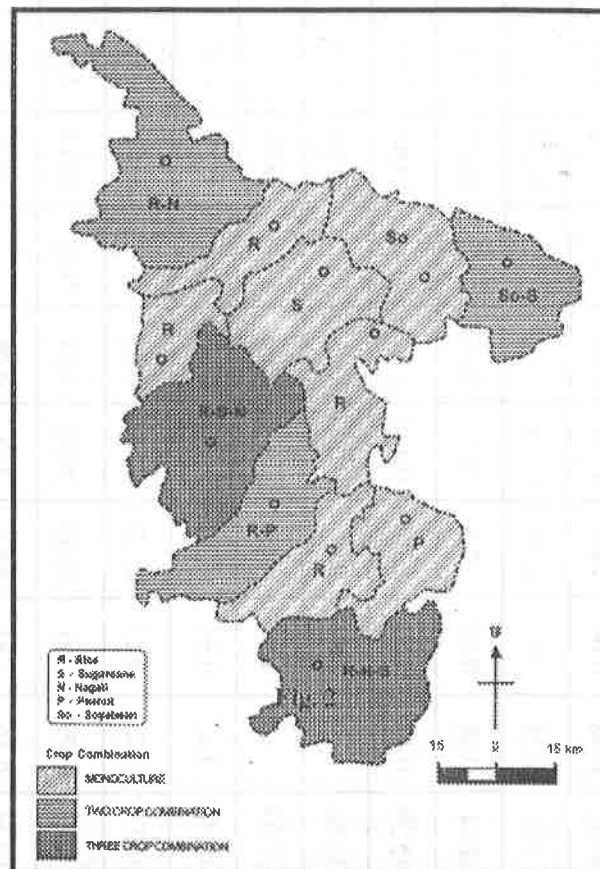
Soyabean requires comparatively less rainfall, black soil is well suited for the cultivation of Soyabean. In this tahsil amount of rainfall ranges between 100 cm and 70 cm. Tahsil has also medium and deep black soils. This is the reason that tahsil has the monoculture like soyabean.

Table 1
Tahsilwise Distribution of various crops in Kolhapur District (2003-3004)

Sr. No.	Crops Tahsil	Rice	Jawar	Nagali	Maize	Other cereals	Peanut	Soya-bean	Other oil seeds	Cotton	Sugar cane	Pulses	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14
2.	Hatkanangale	5.06	5.62	0.01	0.43	0.04	23.2	37.72	0.04	--	22.74	4.24	100
3.	Shirol	1.1	--	--	0.31	--	0.24	51.24	--	--	45.21	1.9	100
4.	Panhala	36.45	4.37	4.94	0.38	0.57	13.3	5.7	0.45	--	30.23	3.6	100
5	Shahuwadi	49.17	0.29	15.28	0.12	6.73	8.09	0.12	1.82	--	14.45	3.93	100
6	Radhanagari	42.35	0.19	12.66	--	1.82	9.69	0.07	2.3	--	27.84	3.08	100
7	Gagan Bawada	39.21	--	17.33	--	1.92	1.0	--	1.46	--	39.08	--	100
8	Karveer	25.36	2.23	0.29	1.4	0.55	18.23	11.84	0.06	--	32.8	4.02	100
9	Kagal	25.36	1.64	0.07	1.2	0.23	23.28	21.8	0.28	--	22.11	4.03	100
10	Gadhinglaj	16.48	2.56	0.69	1.09	1.6	33.73	26.34	0.27	0.22	12.14	4.88	100
11	Bhudergarh	50.17	0.19	12.16	0.19	1.51	16.6	0.38	0.96	--	14.1	3.74	100
12	Ajara	33.97	1.15	15.44	1.55	2.7	18.92	3.09	2.31	--	13.15	7.72	100
13	Chandgarh	42.64	--	18.03	1.43	1.72	13.74	0.14	0.77	--	16.95	4.58	100
14	Kolhapur District as a whole	27.47	2.0	6.16	0.78	1.34	17.48	16.82	0.7	0.03	23.12	4.1	100

Source : Computed by the Authors. (2006)

**SPATIAL PATTERN OF CROP COMBINATION
IN KOLHAPUR DISTRICTS (2003-2004)**



iii. Sugarcane

Sugarcane as a monoculture is observed in the Karveer taluk. Sugarcane accounts 32.8% of the total cropped area of the taluk. The variance is 294.84.

The taluk Karveer receives moderate and fairly regular rainfall. The taluk has well-developed irrigation facilities due to presence of river Panchganga. This taluk has also has well developed fertile soil. This favourable geographical conditions help in the sugarcane growing.

iv. Peanut

The taluk Gadhinglaj also comes under monoculture and peanut is the monoculture crop. It covers a 33.73% area of the total sown area. 264.71 is the variance of crop peanut for the taluk Gadhinglaj.

The taluk Gadhinglaj has the brownish black well drained soil. Its local name is "*Halki Kali Mati*", which is useful for the peanut cultivation. This is the major cause for the dominance of peanut as a monoculture in the taluk Gadhinglaj.

Table No. 2
Tahsil wise crop combination in Kolhapur District (2003-2004)

Sr. No.	Tahsil	Index value of crop combination	Crop Combination category	Crops in combination
1	2	3	4	5
1.	Hatkanangale	150.79	One	Soyabean
2.	Shirol	274.24	Two	Soyabean-Sugarcane
3.	Panhala	183.6	One	Rice
4.	Shahuwadi	122.42	Two	Rice-Nagali
5.	Radhanagari	85.07	Three	Rice-Sugarcane-Nagali
6.	G. Bawada	116.42	One	Rice
7.	Karveer	294.84	One	Sugarcane
8.	Kagal	607.12	One	Rice
9.	Gadhinglaj	264.71	One	Peanut
10.	Bhudargerh	140.74	Two	Rice-Peanut
11.	Ajara	256.96	One	Rice
12.	Chandgarh	74.96	Three	Rice-Nagali-Sugarcane

Source : Computed by the Authors (2006).

B. Two Crop Combination

i. Soyabean - Sugarcane

The tahsil Shirol has two crop combinations. Soyabean and Sugarcane are the two major dominant crops of the tahsil Shirol. They cover 51.24% and 45.21% of the total cropped area of the tahsil Shirol respectively. The variance is 274.24.

The reason for the cultivation of Soyabean and Sugarcane as the major crops in the tahsil is that in the western part of the tahsil medium deep soil is present. In the eastern part of the tahsil coarse shallow soil of laterite origin is the dominant soil. The fertility of the soil is increased by floods from the rivers like Krishna and Panchaganga. The tahsil has also well-developed irrigation facilities.

ii. Rice-Peanut

The rice and peanut are the two major crops grown in the tahsil Bhudargerh. The rice and peanut account 50.17% and 16.6% of the total cropped area of the tahsil Bhudargerh, respectively. 140.74 is the variance for two crop combination in the tahsil Bhudargerh.

The tahsil have soils like deep black in the middle portion; medium deep soil in the western and north western portion; and coarse shallow soil in the eastern portion. The average rainfall of the tahsil Bhudargherh, is 250 to 300 cm. This condition favors for Rice and Peanut cultivation in the tahsil.

iii. Rice-Nagali

The tahsil Shahuwadi has two crop combinations. Rice is first ranking and Nagali is the second ranking crop of the tahsil Shahuwadi and they cover an area about 49.17% and 15.28% respectively. The variance of the crop combination is 122.42.

In the tahsil Shahuwadi average annual rainfall ranges between 150 cm to 250 cm and in most western part it is more than 350 cm. In the river valley portion of the tahsil fertile soil is prevalent and in the hilly region medium deep soil and coarse shallow soil is present. The geographical condition is favorable for the cultivation of rice mainly and also for the cultivation of Nagali.

C. Three Crop Combination

i. Rice-Sugarcane-Nagali

The three crop combination is observed in the tahsil Radhanagari. The tahsil Radhanagari is well-suited for three crop combination viz. Rice, Sugarcane and Nagali. The crops Rice, Sugarcane and Nagali are the first, second and third ranking crops and they cover an area about 42.35%, 39.08% and 17.33% respectively. The variance of the combination is 85.07.

The tahsil has rainfall ranging between 150 cm. and 250 cm. and sometimes it is more than this. The tahsil has the shallow coarse soil in the hilly region, which is best suitable for Nagali. In the river valleys of the tahsil fertile soil is present which is most useful for the cultivation of Rice and Sugarcane. Tahsil has also well developed irrigation facilities. All these conditions are useful for the dominance of Rice, Sugarcane and Nagali.

ii. Rice-Nagali-Sugarcane

Like Radhanagari, Chandargarh tahsil has also three crop combination. Chandargarh has Rice as first ranking crop (42.64%), Nagali as second ranking crop (18.03%) and sugarcane as a third ranking crop (16.95%). 74.96 is the variance of combination for the tahsil Chandargarh.

There is abundance rainfall in the tahsil Chandargarh. It ranges between 200 cm and 300 cm and in some portion of the tahsil, especially western portion, it is more than this. Most part of the tahsil is hilly where laterite soil and shallow coarse soils are present. These types of soils are favorable for the cultivation of Rice and Nagali. Tahsil Chandargarh has also well developed fertile soil in the river valley region which favors for the cultivation of Rice and Sugarcane.

Conclusion

The crop combination in study region is the direct impact of the rainfall, soils and irrigation facilities prevalent there. In Panhala, Gaganbavada, Kagal and Ajara tahsils rice as a monoculture crop is present. This is due to the high amount of rainfall. Peanut as a monoculture crop of the tahsil Gadhinglaj and this is the impact of "Halki Kali Mati" present there. The tahsil Hatkanangale has the soybean as a monoculture crop. It is caused by the decrease in the amount and intensity of

rainfall. Due to the presence of fertile soil, well developed irrigation facilities and moderate rainfall, Karveer tahsil has sugarcane as a dominant and monoculture crop.

Shahuwadi, Bhudargarh and Shirol tahsils have the two crop combination. Tahsil Shirol has the soyabean-sugarcane combination. This is caused due to the low amount and intensity of rainfall and presence of fertile soil and irrigation facilities. Shahuwadi and Bhudargarh tahsils have Rice-Nagali combination and Rice-Peanut combination respectively, which is also an impact of highest amount of rainfall and shallow coarse and laterite type of soil present there.

In the tahsil Radhanagari, Rice-Sugarcane-Nagali combination is present whereas, Rice-Nagali-Sugarcane combination has been observed in the Chandgad tahsil. This is also an impact of high amount of rainfall and good quality soil.

It has been concluded that more than 50% tahsils, i.e. in the seven have rice as a first ranking crop. Other important crops include sugarcane, Nagali and peanut. Soyabean is the first ranking crop in the eastern part of the study region (viz in Hatkanangale and Shirol tahsils) where amount and intensity of the rainfall is low.

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