GEO-EYE

RESEARCH ARTICLE

⌕ OPEN ACCESS

Assessment of Crop Combination in Ramanagara District

R Pavithra[1], R Shiva Kumar[2], P Surendra[3]

1 *Student, Department of Geography & Geoinformatics, Bangalore University, Bengaluru, Karnataka*
2 *Guest Faculty, Department of Geography & Geoinformatics, Bangalore University, Bengaluru, Karnataka*
3 *Assistant Professor, Department of Geography & Geoinformatics, Bangalore University, Bengaluru, Karnataka*

Abstract

The studies of crop combination regions constitute an important aspect of agricultural geography as it provides a good basis for agricultural regeneration. Through different regions may have different climate and soil conditions and objectives of the study are to find out the crop combination regions of Ramanagara District. The important objectives are to study the principal crops and ranking of crops in Ramanagara District to find out the Weavers and Reffullahs crop combination regions in Ramanagara District. The data collected were processed and analyzed by using districts statistics the results are cartographically represented Weavers (1954), Doi's crop combinational analysis and Rafiullah's (1956) maximum deviation method of crop combination analysis. Were applied and crop combination regions of Ramanagara District is brought out through using MapInfo, GIS software modules. The analysis shows that there is no diversification of cropping pattern in most if the districts of Ramanagara District expect the centre and south part of the state. The crop like ragi, mulberry, coconuts and pulses constituted as two and tree crops region in Ramanagara District.

Keywords: Crops ranking; Crop combination

Introduction

The study of crop combination regions constitutes an important aspect of agricultural geography as it provides a good basis for agricultural regionalization. The crops are generally grown in combinations and it is rarely that a particular crop occupies a position of total isolation the crops in a given areal unit at a given point of time. The distribution maps of individual crops are interesting and useful for planners, but it is even more important to view the integrated assemblage of the various crops grown in an areal unit. Agriculture is one of the most primary and oldest occupations of Ramanagara district and is the main source of livelihood in Ramanagara district and it is a main source of income. Major crops produce in district are, Ragi, Paddy, Maiza, Tur, Groundnut and Sugarcane, Horticulture is also famous in Ramanagara district.

Study Area

Ramanagara district is located in the southern part of Karnataka,

it is situated on the north by Bengaluru rural and Tumakuru district of Karnataka state, on the East Bengaluru urban district, on the south east Tamilnadu state, on the south Chamarajanagara district, on the south west Mandya district of the Karnataka state. It is located between 12° 24' and 13° 09' North latitude and 77° 06' and 77° 34' East longitude. It has a geographical area of 3576sq km, which accounts for 1.85% of the geographical area of the state and has 27ᵗʰ place in the state, its average elevation is 800 meters above the mean sea level. There are 4 taluks namely RamanagaraChannapatnaKanakapura in the district.
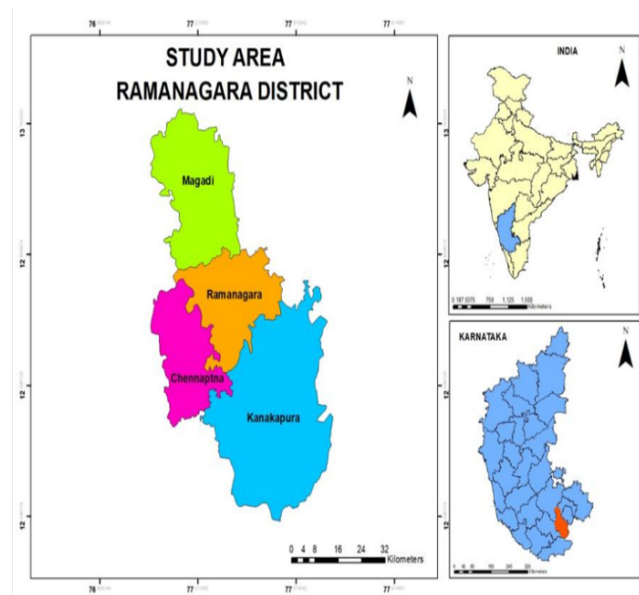

Fig. 1. The Study area of Ramanagara District

Objectives

- To study the principal crops and ranking of crops in Ramanagara District.
- To find out the Weaver's, Doi's and Refullah's method crop combination regions in Ramanagara District.

Data Base

The present study is based on secondary data collect from department of agriculture, Ramanagara district. District statistical office, Socio-economic review of Ramanagara district.

Methodology

The data regarding the location southern part of Ramanagara collected from topographic maps. The data on agricultural land use, principal crops soils climate, vegetation, drainage and population of Ramanagara district. Were gathered from

the statistical department and from agricultural department located in Ramanagara district and also from state websites. The data collected were processed and analyzed by using simple statistics the results are cartographically represented Weavers (1954) crop combinational analysis and Rafiullah's (1956) maximum deviation method of crop combination analysis. Were applied and crop combination regions of Ramanagara district is brought out through using MapInfo, GIS software modules.

Ranking of Crops

For the purpose of analyzing the crop combination ranking of crop on the basis of total cropped area where used it identify the ranking of crops which are dominates in one or more taluks of the districts. There are 9 crops occupies maximum percentage of total cropped area. Other crops are grown in combination with major crops. The first rank crop may vary from 100% to 40%. The 9 ranking crops are (i) Paddy (ii) Mize (iii) Ragi (iv) Pulses (v) Fruits (vi) Vegetables (vii) Oil seeds (viii) coconuts (ix) Mulberry. These crops have 9 macro crop combination regions. The following Figure 2 gives Ramanagara district - area under principle crops (in % and Rank) 2018-19

Sl.No	Taluk's Name	Paddy	Maize	Ragi	Pulses	Fruits	Vegetables	Oil Seeds	Coconuts	Mulberry	Total
1	Channapatna	886	1815	5321	1953	1953	322	339	22844	4365	39798
2	Kanakapura	1547	565	19446	4188	4188	308	1153	7457	11227	50079
3	Magadi	341	320	17919	2055	2055	440	83	4622	300	28135
4	Ramanagara	400	626	7622	1839	1839	165	50	5325	3381	21247

Fig. 2. Ramanagara district - area under principle crops (in hectares) 2018 - 19

Sl.No	Taluk's Name	Paddy	Maize	Ragi	Pulses	Fruits	Vegetables	Oil Seeds	Coconuts	Mulberry
1	Channapatna	2.2	4.6	13.3	4.9	5	0.8	0.8	57.4	11
	Rank	VII	VI	II	V	IV	VIII	IX	I	III
2	Kanakapura	3.2	1.1	38.9	8.4	8	0.6	2.3	15	22.5
	Rank	VI	VIII	I	IV	V	IX	VII	III	II
3	Magadi	1.3	1.1	63.7	7.4	7	1.6	0.3	16.5	1.1
	Rank	VI	VII	I	III	IV	V	IX	II	VIII
4	Ramanagara	1.9	2.9	35.8	8.6	9	0.7	0.2	25	15.9
	Rank	VII	VI	I	V	IV	VIII	IX	II	III

Fig. 3. Ramanagara district - area under principle crops (in % and Rank) 2018-19

Crop Combination By Weaver's Method

The study of crop combination region constitutes an important aspect of agricultural geography as it provides a good basic for agricultural regionalization for the rural planning. Owing to high density of population and ever growing population, it is necessary to produce more crops in the same field. So diversification and suitable combination of crops with short duration is necessary for an increase in the production. The study of crop combination is also helpful for the

study of the comprehensive area development planning particularly for the rural areas.

Prof. John C. Weaver presented a valuable statistical method of combination analysis in 1954 in his study of crop combination regions in the Middle West, U.S.A. He takes into consideration the percentage of crop area to the total cropped area and has calculated deviation of real percentage for all the possible combination in the areal units against a theoretical standard.

Monoculture =100 percent of the total harvested crop land in one crop.

2-crop combination=50 percent in each of two crops.

3-crop combination=33.3 percent in each of three crops.

4-crop combination=25 percent in each of four crops.

5-crops combination=20 percent in each of five crops.

10-crops combination=10 percent in each of ten crops.

For the determination of the minimum deviation the standard deviation method was used

$$SD = \sqrt{\frac{\Sigma d^2}{n}}$$

Where d is the difference between the actual crop percentage in a given country (area unit) and the appropriate percentage in the theoretical curve and n is the number of crops in a given combination.

Cropping pattern

The cropping pattern is based on both time and space-sequence of crop. The variety in cropping pattern is the result of physical, socio-economic factors, physical factors often decide the cropping pattern to a large extent.

Crop Combination By Doi's Method

Doi modified the weaver formula for finding combination index

Doi formula is more accurate for intensive farming countries like india. In doi's technique, it is not required to calculate $\Sigma \mathbf{d}^2$ for each combination but the crop combination is actually established by one sheet table, which represents critical values for various elements at different ranks against cumulative percentage of elements.

This technique shows that higher ranking crops have high percentage, the lower ranking element with less than 5% which are usually excluded from the combination. Using this technique industries which has cumulative percentage is less than 50 are included in combination or the critical value for all the crops at different ranks against 50 is zero. In this we provide the rank according to production and area.
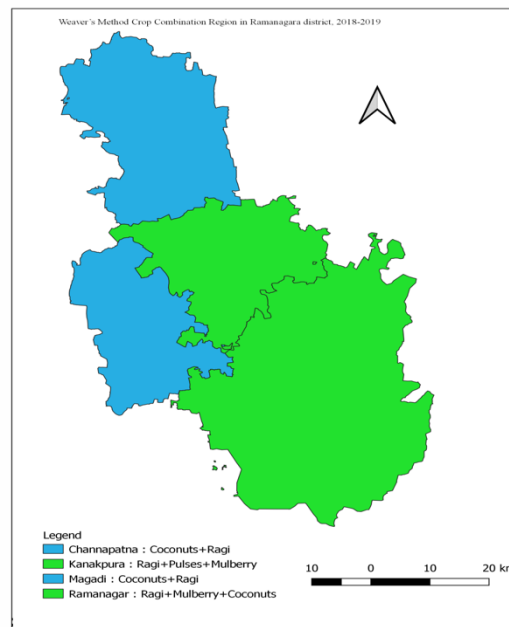
Doi Formula: $SD = \sum \mathbf{d}^2$

Fig. 4. Weaver's Method Crop Combination Region in Ramanagara district

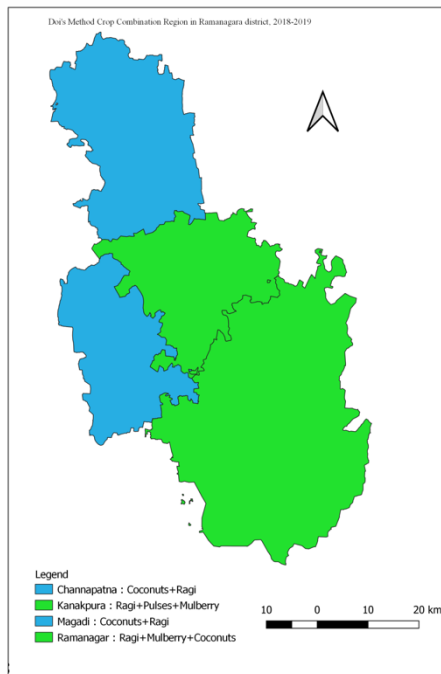| Sl.No	Taluk's Name	No. Crops	Name of Crops
1	Channapatna	2 Crops	Coconuts+Ragi
2	Kanakapura	3 Crops	Ragi+Pulses+Mulberry
3	Magadi	2 Crops	Coconuts+Ragi
4	Ramanagara	3 Crops	Ragi+Mulberry+Coconuts

Fig. 5. Doi's Method Crop Combination Region in Ramanagara district

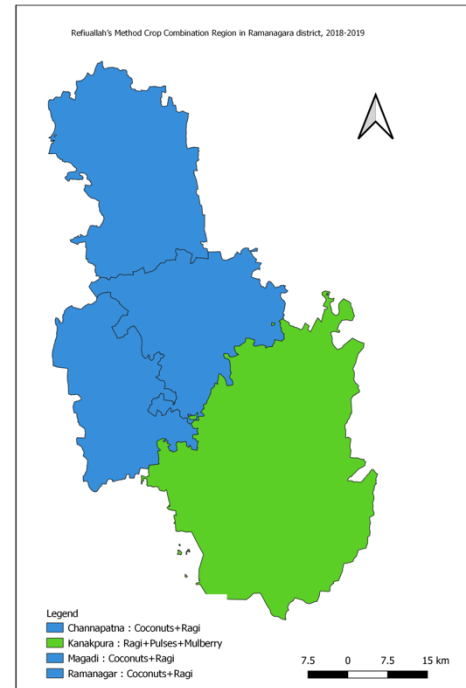## Crop Combination By Rafiuallah's Method

The defect over generalization in Weavers method of crop combination is rectified through the method adopted by Rafiullah (1950). The insignificant crops are avoided from being brought in to crop combination by applying maximum deviations method.

The statistical technique adopted by rafiuallah is more accurate and rational and therefore, it is quite popular for delineation for crop combination regions this technique has the capacity to handle the highly diversified cropping structures in general the crop combinations demarcated on the basis of statistical techniques provide a sound base for agricultural planning and development.

Standard measurement was employed as:

Fig. 6. Doi's Crop Combination

Monoculture = 50 percent of the gross cropped area of one crop.

2-crop combination=25 percent in each of two crops.
3-crop combination=16.7 percent in each of three crops.
4-crop combination=12.5 percent in each of four crops.
5-crops combination=10 percent in each of five crops.
10-crops combination=5 percent in each of ten crops.
Rafiullah Formula:

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

Sl.No	Taluk's Name	No. Crops	Name of Crops
1	Channapatna	2 Crops	Coconuts+Ragi
2	Kanakapura	3 Crops	Ragi+Pulses+Mulberry
3	Magadi	2 Crops	Coconuts+Ragi
4	Ramanagara	2 Crops	Ragi+Coconuts

Fig. 7. Rafiuallah's Method Crop Combination Region in Ramanagara district

Results

Two crops combination

According to Weaver's and Doi's method two crops combination is found in Channapatna and Magadi taluks in 2018-19.

Fig. 8. Refiuallah's Method Crop Combination Region in Ramanagara district, 2018-2019

The crops grown in respective taluks are Ragi and coconuts. By applying Rafiuollah technique are Ragi and Coconuts are the two crop combination found channapattana, Magadi and Ramanagara taluks. Our field observations, discussions with farmers and concerned authorities' reveals that, the crop combination from two taluks to another have changed due to some significant reasons like soil fertility, variation in prices of the crops and impact of urban centres.

In addition, it can be generalized that, the taluks receive more rain fall/more irrigation have lesser number of crops under combination. Whereas, the dry taluks/less irrigated taluks exhibit more number of crops under combination. Agriculture in Ramanagara district is changing towards commercial type, due to the trend of diffusion of Agricultural innovation.

Tree crop combination

According to Weaver's and Doi's method tree crops combination was Kanakapura and Ramanagara taluks in the year 2018-19. Kanakapura taluk found three crop combination region in Rafiuollah method. The high concentration of land was under coconuts and followed by Ragi, Pulses and Mulberry. This is an account of deep tube well irrigation and recent improvement of agricultural practice. In spite of these factors, the diversity in the combination increased due to variation in Rainfall, Soil, and the interest of farmers in rotation

the crops for better yields.

Conclusion

The change in the cropping pattern and introduction of crop in relation to agro climatic condition can provide high standard of productivity. To determine the region character of crop distribution various method of analyzing cropping pattern is made to bring out the regional dominates of crop. The study area Ramanagara District located in southern most part of Karnataka experiences tropical monsoon climate. The district receives maximum rain fall during South West and North East Monsoon seasons with the availability of fertile soil like alluvial, gravelly clay to clayey and red soil variety of crops are cultivated. The study area, Ramanagara District is agriculturally rich due to the availability of fertile lands and presence of perennial rivers. The principal crops such as paddy, ragi, coconuts, mulberry, maize, fruits, vegetables, oil seeds and pulses are cultivated. The ranking of crops data shows that ragi and coconuts. ragi, pulses and mulberry cultivated as tree crops in most of the Kanakapura taluk. Ragi, coconuts and mulberry cultivated as tree crops in Ramanagara taluks. The analysis of area under different crops revealed that the ragi and coconuts dominates as two crops in most of the Channapattana and Magadi taluks in Ramanagara District.

According to Weaver's method of crop combination analysis there are maximum of 3 crop combination region are in Ramanagara District. To conclude, the analysis of crop combination and their association reveals that there are diversified cropping pattern in Ramanagara. According to Doi's method of analysis there are 2 and 3 crop combination regions are found in Ramanagara. By applying Rafiuollah technique Channapattana, Magadi and Ramanagara taluks two crops combination region and Kanakapura only tree crop combination region. The analysis shows that there is no diversification of cropping pattern in most if the districts of Ramanagara.

References

1) Husain M.   Crop Combination Regions of Uttar Pradesh: A Study in Methodology. *Geographical Review of India*. 1972;p. 38–39.
2) Singh J. Vishal Publications. 1976.
3) Kavitha D, Aruchamy S. Development of dynamic thematics for cropping pattern using GIS- A case study of Tiruchirappalli District. *International Journal of Current Research and Academic Review*. 2013;(1):57–68.
4) Khan A. 1973.
5) Nagesh P, Jalagar, Dr, Biradar SI.   Crop Combination Regions in Bailhongal Taluk Belglaum District, Karnataka State". ANVESHAN" A Research Volume Social Sciences. LE. Society"s Lingaraj College. 2013.