



Original Article

Agricultural Regionalization Techniques and Methods in Geography

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Abstract

Agriculture has long been a significant occupation for humanity worldwide. 'Agriculture' is first and foremost an industry, and agribusiness is a symbol of the working processes of human society. Agriculture contributes 65% of the country's employment, and agriculture is central to India's national income and development. Agricultural regionalization has been worked on by many geographers from time to time and has defined the types of agriculture and delineated their regional boundaries. Agricultural regionalization demarcation work was initially started by Baker, Burch, Buchanan, and Clarke. But they did not accept fixed parameters of agriculture, and the demarcation of agricultural regionalization remained insufficient. Then Zomowski in Poland gave a new direction to regionalization; Later Whittlesey made important contributions towards the regionalization of world agriculture based on certain variables. In this research article, the techniques and methods of agricultural regionalization have been studied.

Keywords: Agricultural Regionalization, Techniques and methods, Concentration, Intensity, Diversification, Rotation, Productivity, Efficiency, Carrying Capacity

Introduction

The word 'Krishi' is derived from the Sanskrit word 'Krish'; Which means plowing. This is called Agriculture in the English language. It was formed from two Latin words Ager meaning Land and Culture meaning Cultivation. Which means plowing the land and taking crops.

'Agriculture is the science of the practice of farming'.

A region is a unitary area that is distinct from other areas. Depending on the score a region can be considered as a general or inclusive region. Also, in agricultural type, similar types of agriculture are determined based on the attributes of various variables or factors, based on which agricultural area boundaries are easily determined.

"An area of the earth which possesses special qualities of agriculture is called an Agricultural Region."

"An agricultural region is an extensive area of land which has a homogeneity of agricultural activities and other conditions and which stands out from the surrounding area is called an agricultural division."

Since India is an agricultural country, agricultural planning is of special importance here. For a large developing country like India, regionalization is particularly important in formulating short-term and long-term development plans for various regional entities.

"Regionalization is the process of distribution of an area into territorial units of homogeneity, as well as the result of a set of processes."

Agricultural regionalization is not a process of dividing a country into some regional units but a method of understanding agricultural patterns. At any stage of agricultural geographical research, the need to regionalize agriculture may arise. Regionalization is an important element and a basic method in geography.

Methodology: -

In this research article, various techniques and methods of agricultural regionalization are seen to play an important role in the research work of geography.

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Because the agricultural area is demarcated on the basis of these techniques and methods. Geographers can present the research work of various agricultural regions to the world by adopting various methods of agricultural regionalization under agricultural geography in their research work.

Objective of Study: -

1. To study various methods and techniques of agricultural regionalization in geography research under Agricultural Geography.
2. Analyzing the statistics of a region by various methods of agricultural regionalization.
3. Different techniques and methods of agricultural regionalization can be adopted by geographers in their research.
4. To study which method of agricultural regionalization is suitable for that region according to the cropping system of a region.

Techniques of Agricultural Regionalization -

Agricultural landscape maps reflect interactions between biotic and abiotic ecosystems, particularly crops, livestock, patterns of agro-industry, etc. Our geographical knowledge about this, crop and livestock can be the basis of agricultural regionalization. Apart from this level of agricultural productivity, agricultural intensification, types of agricultural practices, a set of agricultural structures, and the diffusion of agricultural technology are also other bases of agricultural regionalization. Various techniques have been used over time for the demarcation of agricultural areas, which have been classified into five categories.

1) Normative Technique -

This technique is completely subjective. Because it was based on predetermined and limited conditions, economic analysis of this technique is highly theoretical as well as basically descriptive and deductive; It was clear. For example, through this technique, the German thinker Von-Thunen proposed the theory of agricultural localization based on his experience. Besides Hoover-1937, Losch-1954, Dunn. 1954 and Izard-1956 presented the framework of this model of economic activity. But it has many drawbacks.

2) Empirical Technique -

Empirical techniques are unlike humanistic techniques, which are based on observational facts. According to Simons - 1967, facts are not based on presuppositions, so their reality cannot be doubted. Empirical techniques were first used by Baker (1925) to explain the distribution of crops. The boundary of agricultural areas in the early 20th century was based entirely on empirical knowledge. Because at that time, detailed statistics and scientific facilities of computers were not available.

3) Single Element Technique -

This technique is also called the object approach. This technique is based on crude as well as subjective methods. thereby demonstrating the centralization of isolated enterprise regions. Early studies of agricultural geography were based on regional studies based on one factor. In this method, the agricultural sector is over-generalized based on one factor. Thus, a principled basis was experimented with in the boundary of agricultural areas. E.g., Engelbrecht mapped the distribution of major US crops and livestock.

4) Statistical Techniques -

As the standard, empirical, and single-factor techniques for agricultural area demarcation were inadequate, agronomists have explored statistical techniques. Hartshorn and Dicken-1935 made the first attempt in this direction. They experimented with the method based on isotopes suggested by Jones-1930. Because this method was better than the empirical technique. To eliminate the influence of subjectivity in this technique, the authors used multi-factor techniques. E.g., crop combination, agricultural activity combination, animal combination, etc.

5) Composite Multi-Agent Technique-

It is a technique with more than one element in its composite form. In this technique, PK and livestock production figures are converted into comparative measurements through a suitable method. For example, by obtaining a weighting factor from the required human labor and investment per acre of different crops and per unit of different animal classes, it is possible to compare different figures.

6) A holistic Multi-Factorial Quantitative and Qualitative Technique -

This method is self-explanatory and presents the idea of the entire agricultural area. Agricultural areas can be viewed as a whole if they are spatial units based on a single factor or if they are units based on a combination of several factors. Geographers are particularly interested in the study of agriculture as a whole. For example, Baker (1926) limited the definition of agricultural area to physical elements. Carroll stated the 14 elements of the agricultural landscape. Whittlesey, Hartshorn, Deacon, Wavell, and Chole considered more than one factor to be influential in the agricultural landscape.

Methods of Agricultural Regionalization-

1. Crop Intensity -

Cropping intensity refers to the frequency of cropping in an agricultural sector. That is, how many times a crop is produced in a particular agricultural area in a year, the frequency of those crops is called the 'crop intensity' of that particular area. Crop intensity, which refers to the crop area on which more than one crop is grown in a year, is a proportional relationship between the net sown area and the total cropped area. In any region, the total cultivated area is more than the net sown area.

B.S. Tyagi (1972) – used the term 'agricultural intensity' in place of cropping intensity, while R. R. Tripathi (1970) - also considered the term 'agricultural intensity' rather than cropping intensity, and used the following formula to measure agricultural intensity.

Formula -
$$I = \frac{G}{N} \times 100$$

1) I = Index of Agricultural intensity, 2) G = Gross sown area, 3) N = Net sown area

Jasbir Singh (1974) finds it appropriate to use the term 'land use efficiency' in place of cropping intensity, finding no fundamental difference in its determination. Thus, land capacity and cropping intensity complement each other.

Therefore, cropping intensity can be defined as the production ratio of one to several crops in a single year in the same area. Singh B. B. (1979) used the following formula to estimate crop intensity:

$$\text{Formula - Crop Intensity} = \frac{\text{Total Crop Area}}{\text{Net Sown Area}} \times 100$$

2. Crop Combination –

The study of 'crop combination' or 'combination' is important in the study of agricultural regionalization along with the regional study of cropping patterns or cropping patterns.

A group of major crops grown in a region or area is called a 'crop combination'.

Today, crop combination is studied by calculating the actual percentage of crops based on the total cultivated area and prioritizing the crops. J.C. Vivar - 1954 revolutionized statistical agricultural geography by first providing information on crop combination regions in his article 'crop combination regions in the Middle East, U.S.A'.

Weaver has used the following formula to break down the agricultural sector based on crop combinations.

$$\text{Formula - Cropping Intensity} - d = \frac{\sum d^2}{N} \times 100$$

d = deviation, d^2 = square of deviation N = number of crops

3. Crop Concentration –

'Crop concentration' is the amount of area under a particular crop in a particular region or area at a particular time.

The study of crop concentration provides an understanding of how crop density varies in a particular region, at a particular time. Changing the density means changing the area under that crop. When the amount of area under a particular crop is increasing. At that time this density is passing. This is called high crop concentration.

1. The Location Quotient method was used by Bhatia in 1965 for crop concentration index

$$\text{Formula - Index of determining the concentration of crop 'a'} = \frac{\frac{\text{Area of crop 'a' in the component area unit}}{\text{Area of all crops in the component area Unit}}}{\frac{\text{Area of crop 'a' in the entire region.}}{\text{Area of all crops in the entire region.}}} \div$$

Apart from Bhatia, Florence (1948), Chisholm (1962), Jasbir Singh (1976) have also used various formulas for crop concentration.

4. Cropping Pattern

The agricultural practices followed in any farm, region, or place during an agricultural year (July to June) are called 'Crop sequence' and 'Crop tradition'.

The proportion of area under different crops in a particular area, at a particular time, is called 'Crop Form'.

1) 'Proportion of area under various crops at point of Space and time.'

2) Cropping pattern means both the time and space sequence of crops.

There are mainly four types of cropping systems prevalent in India

i) Monoculture ii) Crop Rotation iii) Multiple Cropping iv) Mixed cropping system.

To understand the crop pattern in any region, the crops sown and its average yield are important; for this, the average yield in any area can be reported through the following index.

$$1. \text{Formula - Relative yield Index} = \frac{My_i}{My_j} \times 100$$

M = mean, Y = Yield, I = Component area unit j = Total unit area

In this way, crops can be determined based on yield and yield index.

$$2. \text{Formula - Cropping Pattern} = \frac{Ca}{N} \times 100$$

CP = Cropping Pattern, Ca = Area under 'A' crop in the study area. N = Total area under crop in the region selected for study

5. Crop Rotation-

"Rotation of crop means the succession of Crops in a field in a specific period to regain fertility of the soil"

A 'crop rotation' is a sequence under which selected crops are planted one after the other, in a fixed cycle, in the same area to maintain soil fertility. Depending on the crop selected, the duration of the crop cycle can range from 1 year to 3 years or more.

* Intensity of crop rotation-

To calculate the depth of a crop cycle, multiply the number of crops involved by 100 and divide by the number of years in the crop cycle.

$$\text{Formula - Crop cycle depth} = \frac{\text{Number of crops in a crop}}{\text{Crop years}} \times 100$$

Depending on the agricultural depth, the intensity of cropping in the upper range can range from 150% to 200% or more.

6. Intensity of cropland use -

Cropland use intensity means how much crop can be grown in a year from a given agricultural land in any agricultural area. In another form, it can be said how many times a crop (frequency of crops) is produced in a crop year (cropping years) on a fixed agricultural area. It is called the intensity and depth of cropland use in that area.

The following formula can be used to calculate cropland depth -

$$\text{Formula - } I_c = \frac{H}{A} \times 100$$

I_c = Intensity of crop, H = Harvested land, A = arable land

Based on the above formula, if the scores obtained are divided into classes, maximum and minimum scores are kept based on average, then it can be made into 5 classes based on the upper limit and lower limit of the median.

The depth of land use in agriculture is measured based on that land. which are used under more than one crop in a crop year.

7. Crop Diversity -

The concept of crop diversification is opposite to the concept of crop concentration. Crop diversity refers to 'the number of crops grown in a particular area at a particular time.

Crop diversity refers to the abundance of crops in a region i.e. the more the number of crops, the greater the crop diversity. Crop diversity is determined by the ratio of the area under different crops to the total number of crops in a particular region.

'Diversification of cropping patterns means raising a variety of crops for arable land.'

"Crop diversity is the production of different crops in a particular area, at a particular time."

If a field has a total number of 10 crops and each covers 10 percent of the cultivated area, then the level of crop diversity is highest. On the other hand, if a single crop is grown on 100 percent of the cultivated area, crop diversity becomes zero.

The most important attempt to calculate crop diversity was made by Bhatia-1965. In which he used the following formula using crop area.

Formula -

$$\text{Percentage of area sown under 'X' crops}$$

$$\text{Crop Diversity Index} = \frac{\text{Percentage of area sown under 'X' crops}}{\text{'X' number of crops}}$$

Here 'X' crops refer to each crop cultivated on 10% or more of the study area.

Gibbs and Martin (1962) and Jasbir Singh - 1976 used the following formula for the purpose of study of pattern of crop diversity in Haryana.

8. Agricultural Productivity -

The assessment of 'Agricultural Productivity' or 'Crop Productivity' or 'Agricultural Potential' is fundamentally concerned with production per hectare, which is the result of the interplay of all-natural and human factors.

'It is expressed as a quantitative value of quantum production.'

Many important works related to agricultural productivity at the global level have been done by the following scholars. In which M.G. Kendall (1958), M. Shafi (1960 and 1972) S. S. Bhatia (1964), b. N. Sinha (1968) Jasbir Singh (1976, 1985, and 1990), Majid Hussain - 1976 etc.

1) **Jasbir Singh-1979** = 'Agricultural productivity is the output actually obtained from arable land.'

2) **Majid Hussain** - 'Agricultural productivity is the quality of agriculture in terms of hectare production.'

* M. Shafi has used the following formula to calculate agricultural productivity.

$$\text{Formula - } \frac{Y}{Y_n} \div \frac{T}{T_n}$$

Y = Production of the selected crop in the component area unit.

Y_n = Total production of the selected crop in the entire region.

T = Area of the selected crop in the entire region.

T_n = Total area of selected crop in the entire region.

9. Agricultural Efficiency -

The term 'agricultural potential' is conceptual. Therefore, agricultural potential is not real, it is latent, whereas agricultural productivity is an achievement and is based on actual experience. Agricultural productivity is highly correlated with yield per hectare. The term agricultural potential is multifaceted and vast in terms of meaning.

Agricultural Efficiency is the ratio between achievement in terms of production and the actual potential of the land.

S. S. Bhatia - 1967 used the efficiency index method to determine agricultural productivity of Uttar Pradesh. The following formula was adopted to calculate the yield index based on both yield rate and area of 11 major crops.

$$\text{Formula - } I_{ya} = \frac{Y_e}{Y_r} \times 100$$

I_{ya} = Income list of 'A' crop, Y_e = yield per acre of 'A' crops, Y_r = Yield rate of standard unit of 'A' crops

10. Crop Balance -

Crop balance is planning in which crops are grown in separate areas of the farm to maximize profit from each crop and not harm soil fertility.

"The plan according to which crops are raised on individual plots of a form with the object of getting the maximum returns from each crop and without impairing the fertility of the soil is known as crop balancing."

11. Land Carrying Capacity Method -

Stamp - 1958 adopted the technique of 'Soil Carrying Capacity' to know the productivity of land. This method was used in India by Jasbir Singh (1972-74). Jasbir Singh has adopted the following method for determining soil-bearing capacity. The carrying capacity of the cultivated area is measured using the formula given by Jasbir Singh (1972)

Co

Formula - $C_p = \frac{Co}{Sn}$

Sn

1. C_p = Carrying capacity of food-cropped area.

2. Co = The quantity available per unit of output (in calories),

3. Sn = Annual Normative Nutrition Required Per Person

The following formula is adopted to calculate the carrying capacity of the unit area.

Conclusion:

Agricultural regionalization is a crucial concept in agricultural geography, as it helps to classify and analyze different agricultural areas based on various criteria.

1. Using local data, economic factors, soil types, and socio-economic conditions, researchers can create cluster-wise regional profiles that help develop specific local agricultural policies and practices.

2. Statistical analysis, geospatial methods, and qualitative approaches are important for understanding the nuances of regional agricultural systems.

3. Regionalization methods need to be tailored to local conditions. What works in one region may not work in another due to differences in climate, soil, and agricultural practices.

4. Geographers can analyze the cropping pattern of a region by using different methods and formulas of agricultural regionalization for their research.

5. The techniques and methods of agricultural regionalization are diverse and based on local conditions specific to each region. Carefully selecting and aggregating data using quantitative and qualitative approaches provides effective, valuable insights for agricultural planning and policy making.

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Conflicts of interest

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