

DETERMINATION OF LIVESTOCK COMBINATION STATUS THROUGH DOI'S METHOD: USING GIS PLATFORM IN TAMIL NADU RIVER BASINS, INDIA

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Abstract: *For national economic development, livestock is one of the essential factors in the study area. Description of the varieties of livestock in study area for analysis plays a major role in both regional and economic geography. Yet, apart from purely impressionistic descriptions, studies in the geography of agriculture have largely been concerned with individual classes of livestock, rather than with the complex livestock they are part. Livestock provide many benefits of meat, milk, eggs, thighs, wool, fertilizer products and agricultural power. The importance of livestock breeding for poor farmers provides fixed income for poor livestock growers due to the large number of restrictions in the study area. Tamil Nadu, the highly developing and largest state in India, has been selected as study area. The river basins of Tamil Nadu were divided into 17 major rivers. The livestock data of river basins in Tamil Nadu were collected from Tamil Nadu Statistical Department. The obtained data was tabulated using MS-Excel and SPSS and ranked based upon their distribution. Using Doi's An Abridged of Deviation Analysis method, the livestock combination at the study area was calculated. It is used to determine the actual percentages of livestock animals at different river basin regions in the Tamil Nadu. Using GIS-software ARC GIS 10.1, the thematic maps for the study area are prepared. The livestock combination method of regional planning of future livestock can be used to propose livestock combination which is used to understand the revenue obtained at that environment.*

Key words: Livestock, Cattle, Sheep, Doi's, GIS, Thematic Map.

Introduction

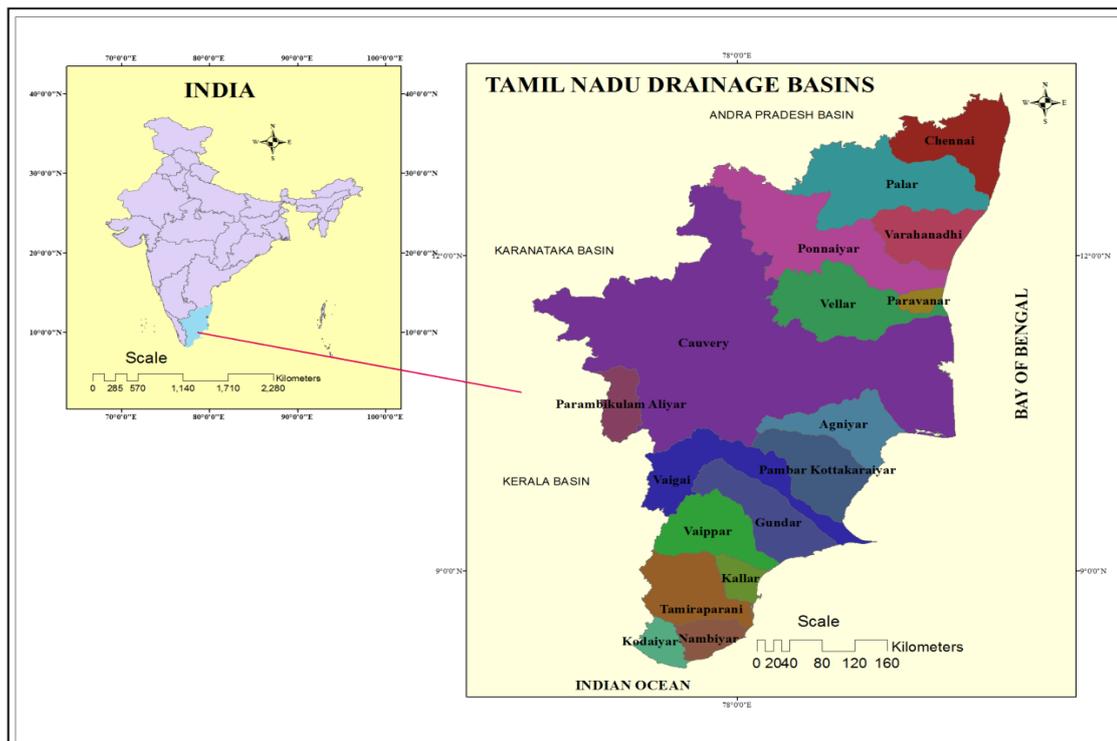
The production of both crops and livestock in the same farm undoubtedly is more common than the raising of either livestock alone. Livestock keeping in the River Basin contributes greatly to human security, income, culture and agricultural gross domestic product (GDP). Inappropriate livestock management uses excessive water and causes water and land degradation. The farmers depend upon the livestock activities from non-cultivated time. Livestock-water interactions are complex, not well understood, and often ignored in agricultural water development. This results in loss of opportunities to achieve sustainable and higher investment returns. Typically, livestock management also ignores important livestock-water issues. This lack of integration creates knowledge gaps resulting in inefficient and inequitable use of water resources. The importance of livestock breeding for poor farmers does not provide sustainable income for poor livestock growers due to enormous controls in the study area. The crop combination regions have been studied time and again by geographers and agricultural land-use planners. But such evidences for livestock combination regions are almost non-existent except Singh (1976) studied the livestock combination different approaches are generally applied for Haryana on the theoretical basis. Two regions for delineation of crop combination regions based on arbitrary choice of crops etc. first crop only, first two crops only, first three crops etc. and development of crop combination regions in terms of variables based on some

theoretical techniques which are considered to be more accurate, scientific and widely acceptable. In this paper, an attempt has been made to delineate the livestock combination regions in Tamil Nadu Cauvery basin based on the statistical and GIS approach identifying the group of significant functions.

Geographical set up

The Tamil Nadu is one of the progressive & largest states in India, is located between $8^{\circ} 07'$ to $13^{\circ} 56'$ N latitudes and $78^{\circ} 23'$ to $80^{\circ} 33'$ E longitudes with total geographical area of 130,058 Km² (Fig. 1). The river basins in Tamil Nadu are grouped into 17 major river basins as furnished Chennai Basin, Palar, Varahanadhi, Ponnaiyaar, Vellar, Paravanar, Cauvery, Agniyar, Pambar and Kottakaraiyar, Vaigai, Gundar, Vaippar, Kallar, Thambaraparani, Nambiyar, Kodaiyar and Parambikulam Aliyar. The temperature of the region range between 18.32°C in the month of January and 36.42° C in the month of April. The upland gradient slope gradually decreases west to east. Thus, agriculture directly or indirectly, remains as an important component of the livelihood Livestock production which contributes the highest share to the Tamil Nadu agricultural GDP, mainly through meat, milk, eggs, wool, hides and skins. Livestock play a vital role adding to stability of farm incomes, food security and farming systems. In Tamil Nadu Large chunk of population is engaged in agriculture activities. Agriculture continues to be the prime mover of the State economy supporting 56 percent of the population.

Figure 1: Study Area



Method and Materials

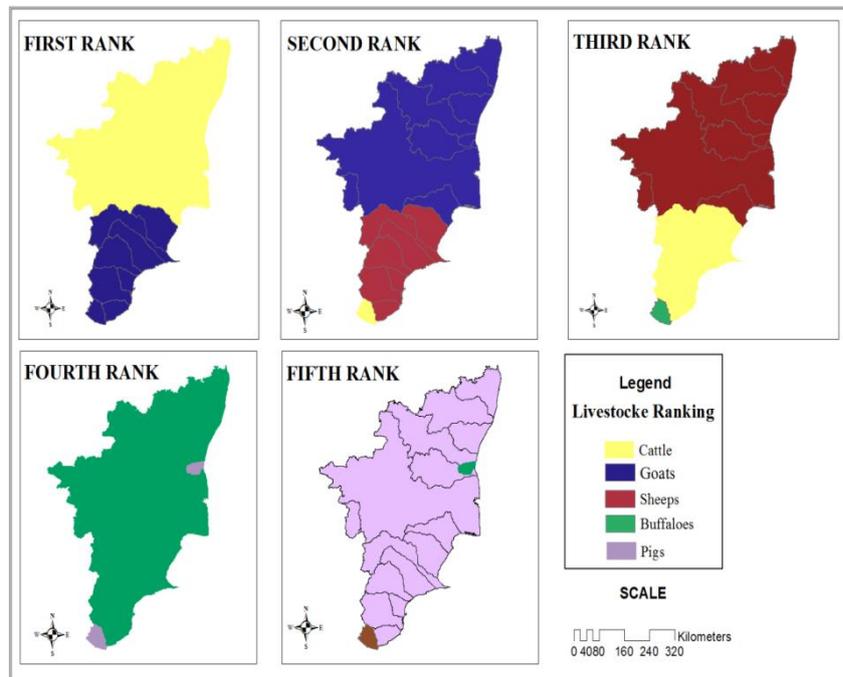
The present study is based on the secondary sources of current research data. It will be collected to the entire state and access to the Tamil Nadu river basin region wise based on the latest administrative set up. The Statistical Handbook of Tamil Nadu is considered as the main source of the data. Livestock related statistics has been also obtained from diverse sources. The secondary type of most of the data used this study. Using the ARC GIS 10.1 GIS software is analysed for the digitization and boundary generation of the selected area and using livestock data prepared thematic maps. Successfully used to MS-Excel and SPSS for tabulate and processing such large amount of statistics. The objective of the study is to analyse Livestock

grow in all 17 River Basins in Tamil Nadu. Read livestock inequality in all the river basin of Tamil Nadu. Policy options for improving the productivity of livestock in the herd.

Livestock Ranking

The percentage livestock of Tamil Nadu River Basin area from ranking first to five, are given in figure 2.

Figure 2: Livestock Ranking in Tamil Nadu



Source: Compiled by author based on G – Return data (2015-2016) of Tamil Nadu Statistical Handbook.

First Rank livestock: The first rank of 2 livestock growing in the study area like Cattle and Goats livestock. This livestock occupying the highest percentage of total livestock area in each of the component areal units could be chosen, no matter what percentage it occupies in the gross First Rank Livestock: The first rank of 2 livestock growing in the study area like Cattle and Goats livestock. With the help of this method, the distribution rank of first rank livestock's was determined. It may be noticed from figure 2 that cattle and goats rank first in 09 and 08 regions are the leading livestock in study area. In the present study area, where monoculture is prevalent with no general diversify in their livestock patterns, there is no merit in the livestock combinations as it helps in ascertaining the areas of dominance of the first rank livestock. (Fig. 2)

Second Rank Livestock: On the basis of Second ranking Livestock, three types livestock is dominated by research areas like Goats, Sheep's and cattle. Goats is living in Chennai Basin, Palar, Varahanadhi, Ponnaiyaar, Vellar, Paravanar, Cauver, Agniyar, Pambar and Kottakaraiyar. The Vaigai, Gundar, Vaippar, Kallar, Thambaraparani, Nambiyar and Parambikulam Aliyar river basin are Growing in the Sheep Population. Cattle is occupied in Kodaiyar river basin. (Fig. 2).

Third Rank Livestock: Third livestock dominated in three livestock from the study area. The sheep's occupied in Chennai Basin, Palar, Varahanadhi, Ponnaiyaar, Vellar, Paravanar, Cauver, Agniyar, Pambar and Kottakaraiyar Northern part of Study area. Cattle are found in Vaigai, Gundar, Vaippar, Kallar, Thambaraparani, Nambiyar river basin. Pigs occupied in Kodaiyar river basin. (Fig.2).

Fourth Rank Livestock: In the fourth rank estimate, there were two livestock from the study area. It is Buffaloes and Pigs. (Fig.2).

Fifth Rank Livestock: The fifth arrays of three livestock dominated the study area. It is pigs, Buffaloes and Sheep. (Fig.2).

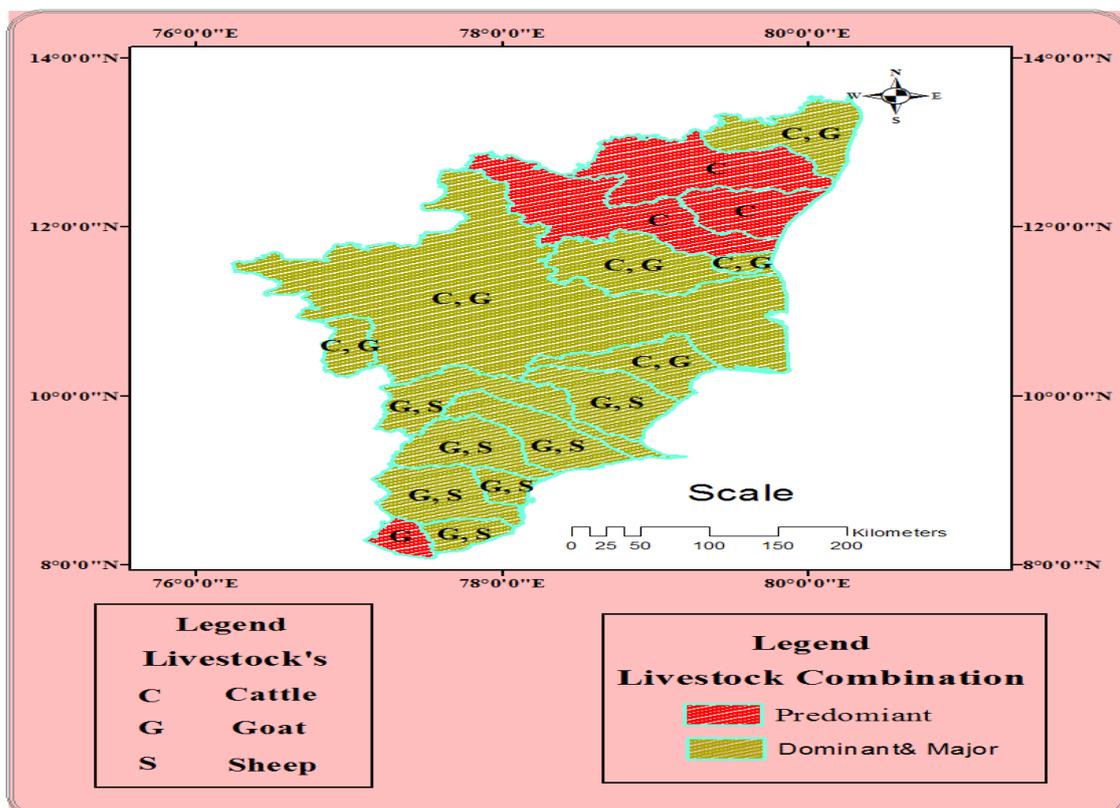
Livestock Combination (Doi's Method)

Weaver's techniques were subsequently modified by Doi's 1959. Doi's techniques used to be considered to be the easiest for combination analysis prior to the application of computer programming facilities. Doi's Deviation Analysis Table was followed in working out actual percentages under different livestock in the Tamil Nadu River basin. Ranking of livestock per cent and cumulative percentage are as shown the Doi's An Abridged of Deviation Analysis Table value find out livestock combination. The Doi's formula may be expressed as:

$$\text{Doi's livestock Combination Formula} = \sum D^2$$

This technique shows that higher ranking crops have high percentage (above 10 per cent), the lower ranking element with less than 5 percent which are usually excluded from the combination. This technique is most profitably applied to such a situation as is found in the livestock combination in which interrelationship exists between the component combinations. Using this technique, industries which has cumulative percentage is less than 50 are included in combination; or the critical value for all the livestock's at different ranks against 50 in Zero. It was found that an individual livestock having 70 percentage and above of the total area in a region constitutes monoculture and other livestock do not find any position in the livestock combination because of their insignificant livestock occupancy status. Thereafter, it is comfortable to decide about the Predominant: 70 to 50 percentages, Dominant: 30 to under 50 Percentage, Major: 15 to under 30 Percentage, Secondary: 5 to under 15 percentage, Minor: under 5 percentage (Fig. 3).

Figure 3: Doi's livestock Combination Method



In this method, the first ranking livestock occupied the highest percentage of the total livestock in district wise. It may be noticed from figure 3 that cattle, Goat, sheep, buffaloes and pigs are the leading livestock in Tamil Nadu river basin.

Predominant and Single Livestock Combination

It was found that an individual livestock having the 70 to 50 percentages, and above of the total area in a region. Predominant are occupied by the largest percentage of total livestock's in Palar, Varahanadhi, Kodaiyar and Ponnaiyaar river basins. It comes out of the four regions of the study area in the 17th regions. The Palar, Varahanadhi and Ponnaiyaar region widely occupied in Cattle's and Kodaiyar river basin occupied in Goat as it spreads widely in the study area of good irrigation and widespread climate. The livestock diversification is low in this region. Therefore, this method helps the livestock's to determine the dominant areas of the region in the area of the study area.

Dominant and First Two Livestock Combination

It was found that an individual livestock will have 30 - 50 % and above. Total area percentage in a region is known as Dominant livestock combination. Dominant livestock combination are occupied by the largest percentage of total livestock's in Chennai Basin, Vellar, Paravanar, Cauvery, Agniyar, Pambar and Kottakaraiyar, Vaigai, Gundar, Vaippar, Kallar, Thambaraparani, Nambiyar and PAP at 17 regions in the area emerges in 14th regions at study area. These Dominant livestock combine the two livestock combination.

Based on the Dominant livestock groups occupied in first two livestock combination, seven livestock categories can be identified in the Tamil Nadu river basin. The resulting livestock combinations present have been shown in the figure 2. The relative strength of the first two livestock combination is cattle- goat at six regions and sheep- goat in seven regions. Cattle, goat and sheep are important livestock combination. Hence, river basin areas are with livestock combination region at suitable climate, good irrigation, low livestock diversification and farmers. So, livestock growth and increased production in study area are major findings.

Conclusions

River basins in Tamil Nadu are grouped into 17 major river basins as furnished Chennai Basin, Palar, Varahanadhi, Ponnaiyaar, Vellar, Paravanar, Cauvery, Agniyar, Pambar and Kottakaraiyar, Vaigai, Gundar, Vaippar, Kallar, Thambaraparani, Nambiyar, Kodaiyar and Parambikulam Aliyar. In the study area, one or two livestock combinations were studied. Predominant and monoculture livestock are present in the four regions out of 17 regions and its diversification was low. Palar, Varahanadhi and Ponnaiyaar river basins were widely distributed with cattle, which is part of the dry land and non-perennial river flowing regions. First two livestock's combinations are cattle- goat at six regions (Chennai Basin, Vellar, Paravanar, Cauvery, Parambikulam Aliyar and Agniyar) and sheep - goat is seven regions (Vaigai, Gundar, Vaippar, Kallar, Thambaraparani, Nambiyar and Kodaiyar) in 13 territories. Adequate terrain, climate, water and vegetation type increases the livestock population and balances its growth. Livestock combination method of regional planning of future livestock can be used to propose and to understand the revenue of the study area.

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