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ORIGINAL ARTICLE

DELINEATION OF AGRICULTURAL REGIONS IN JALPAIGURI DISTRICT, WEST BENGAL

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Abstract:

Agricultural regionalization is basically depends on cropping intensity and combination. The crops are generally grown in combination with other crops (Ramasundaram et. all 2012). Empirical analysis of crop combinations, ranking and agricultural efficiency can be the basis of delineation of agricultural regions in micro and macro level. Agriculture is the backbone of the economy of the district of Jalpaiguri and the land use pattern quite differs from that of West Bengal due to its diversity in relief and climate. Attempts have been made in this paper to show agricultural regions of Jalpaiguri district within its 13 blocks by the statistical techniques.

KEY WORDS:

Regionalization, crop combination, agricultural efficiency

INTRODUCTION

STUDY AREA:

Geographically, the district is the part of Himalayan Terai and Duars. Hence the soil type is sandy to sandy loom having low in water holding capacity. The district lies between 26◦16′ and 27◦00′ N parallels of latitude and between 88◦04′ and 89◦53′ E longitudes. The district is bounded in the north by the Darjiling district and Bhutan, in the east by Assam, in the south by Bangladesh and Koch Bihar district and in the west by Darjiling district and part of Bangladesh. The district covers an area of 6227 sq. Km. which is the largest among the six districts of Jalpaiguri Division and accounts 7.06% of the total geographical area of West Bengal. There are 13 blocks.

OBJECTIVE:

1. To find out the agricultural regions in the district.
2. To find out the level of agricultural efficiency in the district.
3. To find out the degree of specialization of crops in the blocks.
4. To assess the agricultural backwardness in the district.

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DATABASE & METHODOLOGY:

Data has been taken from the secondary sources only. Following are the sources of data in the study:

a)Agriculture Annual Plan, Office of the Principal Agricultural Officer, Jalpaiguri
b)District statistical handbook, Bureau of Applied Economics & Statistics, Jalpaiguri.
c)District Census Report, Census of India.

To find out the agricultural regions in the district of Jalpaiguri block has been taken as unit of study. Agricultural regions are identified by Crop combination method of Weaver and Raffiullah. Crop specialization by Weaver and Agricultural efficiency has been made for identification of crops and their efficiency in the blocks.

a)Crop Combination method of Weaver: In the field of agricultural geography Weaver (1954) was the first to use statistical technique to establish the crop combination of the Middle West of USA. Weaver computed the percentage of total harvested cropland occupied by each crop that held as much as 1 percentage of the total cultivated land. In his work Weaver calculated deviation of the real percentages of crops (occupying over 1 per cent of the cropped area) for all the possible combinations in the component areal units against a theoretical standard are as follows:

Monoculture	= 100 % of the total harvested crop land in one crop.
2-crop combination	= 50 % in each of two crops
3-crop combination	= 33.33 % in each of three crops
4-crop combination	= 25 % in each of four crops
10-crop combination	= 10% in each of ten crops

For the determination of the minimum deviation the standard deviation method was used.
The actual formula he used was excludes the square root as variance.

$D = \Sigma d^2/n$

Where d is the difference between the actual crop percentage and the appropriate percentage in the theoretical standard in a given aerial unit and n is the number of crops in a given combination.

Monoculture	= (100-1st crop′s landuse value) $^2/1$
2-crop combination	= (50-1st crop′s land use value) ^{2} + (50- 2nd crop′s land use value) $^2/2$ and so on.

Least value of the combination will be taken for consideration. Weaver′s method has admirably been accepted and applied for the demarcation of crop combination and agricultural regionalization. Weaver′s technique was subsequently modified by Doi (1959). The Doi formula is (Σd^2).

b)Raffiullah′s method of crop combination: Looking the weakness of Weaver′s method which tends to include all or most of the crops and overgeneralization, Raffiullah (1956) developed a new deviation method. The technique devised by him may be expressed as follows :

$d = (\Sigma D^2p - D^2n)/ N^2$

Where d is the deviation, Dp is the positive difference and Dn is the negative difference from the median value of the theoretical curve value of the combination, N is the number of crops in the combination. Raffiullah,s combination method is known as maximum positive deviation method. From the calculation, maximum value is taken into consideration.

Monoculture	= (1st crop′s land use value-50)^2/ N ^{2}
2 crop combination	= {(1st crop′s land use value-25) ^{2}-(2nd crop′s land use value) ^{2}}/N^2 and so on.

The Statistical technique advocated by Raffiullah is more accurate, objective, and scientific and therefore quite popular for the delineation of crop combination regions.

c)Crop specialization: Crop specialization is done to determine the special crops in that regional unit. It is perhaps done from combination table. Up to last combination level it is counted as 100% area. Again

calculation is done for cropping area. Three hierarchical conditions are assumed. High specialization (more than 66.67%), moderate (33.33- 66.67%) and low (less than 33.33%).
d)Agricultural Efficiency: It is the statistical technique to find out the level of efficiency of agricultural production. To find out the agricultural efficiency of any area, we have first to take the total cropped area of all the crops individually and yield of the crops in individual unit area. Then we find out production per unit area. The following are the series of calculations to draw conclusion.

1. $Iij = (Yij / Yj) \times 100$

Where Iij= Ratio between the yield of any crop (j)

under the individual area 'i' and the entire area 'y'

2.Cij= Area in % for individual crop in individual areal unit.
3.Iij ×cij Table
4.Ei= Σ(Iij ×Cij)/ ΣCij Where Ei=Efficiency
5.SD values of Ei's are tabulated below:

Degree of Efficiency	Mathematical Value
Very High	>100+2SD
Moderate High	100+1SD to 100+2SD
High	100 to 100+1SD
Low	100-1SD to 100
Moderate Low	100-2SD to 100-1SD
Very Low	< 100-2SD

RESULTS AND DISCUSSION:

Agriculture is the backbone of the district's economy. During the post independent period rapid growth of population has been observed. Increasing population squeezes the land. After independence, influx of refugees from East Pakistan (now Bangladesh) and excessive population pressure on land have changed the cultural landscape and agriculture. In Jalpaiguri many workers in hilly tracts engage themselves with the tea gardens. Agroclimatic conditions favour the following agricultural crops in the district are rice (aus, aman and boro), wheat, jute, pulses (Masur, Khesari, Maskalai, Mung), vegetables, potato, oilseeds (Mustard, Sunflower, Rapeseed), wheat, sugarcane etc. Following results have been discovered from the analysis.

Agricultural regionalization: Regionalization is the process of dividing an area into territorial units of uniformities and is the result of a set of processes. The main advantage of agricultural regionalization lies in the fact that it helps in the formulation of agricultural plans which will reduce regional disparities (Husain, 1996).

Table: 1 Percentages of Cropped Area to Total Area of the Block (2007-2008)

Block	Rice	Jute	Potato	Tea	Pulses	Oilseeds	Vegetables
Rajganj	68.93	8.91	3.75	2.47		1.42	5.14
Jalpaiguri	56.22	15.16	6.08	4.29		2.01	5.51
Maynaguri	63.01	20.16	10.76	1.0	0.44	2.37	6.51
Dhupguri	48.86	10.62	13.86	22	0.52	2.51	6.4
Mal	36.91	4.37	5.26	39.57		0.86	4.29
Metiali	20.18	1.09	1.44	68.75		0.98	2.81
Nagrakata	26	1.11	1.46	51.89		0.83	1.46
Kumargram	45.2	3.35	3.25	24.84	1.03	2.56	5.53
Falakata	51.56	8.64	13.04	4.44	2.78	4.8	9.07
Madarihat-Birpara	28.2	3.92	0.96	6	1.15	1.31	1.76
Kalchini	11.02	1.18		34.29		0.74	1.24
Alipurduar-I	56.89	8.89	6.38	2.86	0.51	3.07	6.99
Alipurduar-II	57.47	3.98	6.44	2.55	2.81	3.39	7.23
Total	47.64	8.31	6.56	15.6	0.83	2.24	5.42

Source: Computed by the author from the district statistical Hand Book, Jalpaiguri 2008

In Weaver's combination analysis 7 main crops of the district is taken into consideration which occupy more than 1% area of the gross cropped area. These are Rice, Jute, Tea, Potato, Vegetables, Pulses and oilseeds. By the calculation procedure following table is generalized.

Table: 2 Crop Combinations for Blocks (2007-2008) after Weaver

Sl No	Block	Mono	2 crop	3Crop	4 Crop	5 Crop	6 crop	7 crop	Remarks	Combination Crops
1	Rajganj	965	1023	886	759	662	588		6 crop	RJPTOV
2	Jalpaiguri	1917	626	532	452	397	362		6crop	RJPTOV
3	Maynaguri	1368	530	521	503	486	458		6crop	RJPTOV
4	Dhupguri	2615	393	250	227	230	236	237	4crop	RJPT
5	Mal	3652	140	280	292	275	270		2 crop	RT
6	Metiali	977	620	786	746	675	606		6 crop	RJPTV
7	Nagrakata	2315	290	503	480	431	395		2 crop	RT
8	Kumargram	3003	328	329	314	285	260	243	7 crop	RJPTOVPu
9	Falakata	2346	684	444	342	305	274	253	7 crop	RJPTOVPu
10	Madarihat-Birpara	5155	1487	667	414	257	196	156	7 crop	RJPTOVPu
11	Kalchini	4318	883	509	353				4 crop	RJTV
12	Alipurduar-I	1858	869	615	487	425	376	344	7 crop	RJPTOVPu
13	Alipurduar-II	1809	873	625	496	434	383	351	7 crop	RJPTOVPu
Jalpaiguri District		2742	594	382	305	263	245		6 crop	RJPTOV

Source: Computed by the author.

R=Rice, J=Jute, P=Potato T=Tea Pu=Pulses O=Oilseeds V=Vegetables

From the combination table following agricultural regions have been identified:

2-crop combination region: Nagrakata and Mal-these two subdivisions have 2-crop combination

region. Rice and tea these are two important agro-products. This is due to its location in the uneven terrain and cold climate.

4-crop combination region: only two blocks- Dhupguri and Kalchini show 4 crop combination regions. In Dhupguri, combination is rice-jute-potato-tea and in Kalchini the combination is rice-jute-tea-vegetables.

6-crop combination: 4 blocks namely Rajganj, Jalpaiguri, Maynaguri, Metiali and the district as whole belong to 6-crop combination region. The combinations are Rice-Jute-Potato-Tea-Oilseeds-Vegetables.

7-crop combination: 5 blocks show 7 crop combinations namely Kumargram, Falakata, Madarihat-Birpara, Alipurduar-I and Alipurduar-II.

Raffiullah′s method of crop combination is more accurate and practical in the district of Jalpaiguri. His Maximum positive deviation method is tabulated below:

Table: 3 Crop Combinations for Blocks (2007-2008) after Raffiullah

Sl No	Block	Mono	2 crop	3Crop	4 Crop	5 Crop	6 crop	7 crop	Remarks	Combination Crops
1	Rajganj	358	418	281	190	139	99		2 crop	RJ
2	Jalpaiguri	38	219	161	112	83	61		2 crop	RJ
3	Maynaguri	169	355	233	153	110	76	58	2 crop	RJ
4	Dhupguri	1	125	128	79	55	39	29	3 crop	RTP
5	Mal	108	18	2	1	5	2		Monocrop	T
6	Metiali	353	474	279	181	132	93		2 crop	TR
7	Nagrakata	4	181	102	71	57	39		2 crop	TR
8	Kumargram	23	102	69	49	40	28	21	2 crop	TR
9	Falakata	3	132	135	94	70	51	39	3 crop	RPJ
10	Madarihat-Birpara	475	88	16	1	11	6	6	Monocrop	R
11	Kalchini	246	27	4	14	21	12		Monocrop	T
12	Alipurduar-I	48	190	162	118	89	64	49	2 crop	RJ
13	Alipurduar-II	56	184	164	118	90	65	50	3 Ccrop	RV
Jalpaiguri District		6	106	98	73	56	40	31	2 crop	RT

Source: Computed by the author

Following agricultural regions have been identified by Raffiullah′s method of crop combination:

i.Rice-Jute region: Rajganj, Jalpaiguri, Maynaguri and Alipurduar-I
ii.Rice-Tea region: Metiali, Nagrakata, Kumargram and the district as a whole belongs to this category
iii.Rice Region: Madarihat-Birpara
iv.Tea Region: Mal and Kalchini
v.Rice-Potato-Jute Region: Falakata
vi.Rice-Potato-Tea region: Dhupguri
vii.Rice-Vegetables region: Alipurduar-II.

Crop Specialization: In different blocks different types of crops are specialized in different levels rather than crop diversification. Following table will highlight the condition of crop specialization in the blocks.

Table: 4 Crop Specializations for Blocks (2007-2008) after Weaver

								Degree of Specializations		
Block	Mono Crop	2crop	3Crop	4Crop	5Crop	6crop	7 crop	High (>66.67)	Moderate (33.33-66.66)	Low (<33.33)
Rajganj	76.06	9.83	5.67	4.14	2.73	1.57		Rice		
Jalpaiguri	62.88	16.96	6.8	6.16	4.79	2.25			Rice	
Maynaguri	60.46	19.35	10.33	6.25	2.28	0.92	0.42		Rice	
Dhupguri	51.25	23.08	14.54	11.14					Rice	
Mal	51.74	48.26							Tea, Rice	
Metiali	72.18	21.18	2.95	1.51	1.15	1.02		Tea		
Nagrakata	72.23	24.58	2.04	1.16				Tea		
Kumargram	52.71	28.96	6.44	3.91	3.79	2.99	1.21		Rice	
Falakata	54.66	13.83	9.61	9.16	5.08	4.71	2.95		Rice	
Madarihat-Birpara	65.14	13.86	9.04	4.06	3.03	2.65	2.22		Rice	
Kalchini	70.74	22.73	2.56	2.44	1.52			Tea		
Alipurduar-I	66.48	10.38	8.16	7.45	3.58	3.34	0.60	Rice		
Alipurduar-II	68.51	8.62	7.68	4.75	4.04	3.35	3.04	Rice		

Source: Computed by the author

Following analysis can be made from the table:

i.High specialized blocks: Six blocks are highly specialized either in rice or in production of tea namely Rajganj, Metiali, Nagrakata,Kalchini, Alipurduar-I and Alipurduar-II. Maximum concentration is found for tea in Metiali and Nagrakata and for rice in Rajganj block.
ii.Moderate specialized blocks: Seven blocks are moderately specialized either in rice or in rice and tea both. In rice the blocks are Jalpaiguri, Maynaguri, Kumargram, falakata, Madarihat-Birpara and Dhupguri. The Mal block is moderately specialized by both Rice and Tea.
The district of Jalpaiguri is specialized by rice and tea only. Other crops are insignificant in respect of its area of production. But the actual scenario is that the cultivation of rice is gradually decreasing where tea gardens are gradually increasing. In the tea garden maximum employees are tribal women (Roy 2008). Again potato cultivation in Dhupguri and Falakata is increasing as cash crops.
Agricultural efficiency: Efficiency is the production ability of crops i.e. yield of crops. In the district of Jalpaiguri efficiency of productions of different crops are erratic and irregular. Following table is shown for agricultural efficiency in blocks:

Table: 5 Agricultural Efficiency for Blocks (2007-2008) after Weaver

Sl No.	Block	Efficiency of individual crops (Iij × Cij)							Sum of Iij× Cij	EI	SD	Degree of Efficiency
		Rice	Jute	Potato	Tea	Pulses	Oilseeds	Vegetables				
1	Rajganj	56.76	7.54	4.75	1.65	0.22	0.96	3.08	74.95	0.83	0.68	Very Low
2	Jalpaiguri	59.74	10.50	6.39	2.79	0.17	2.41	3.09	85.08	0.95	0.68	Very Low
3	Maynaguri	65.45	15.51	10.35	0.61	0.54	2.62	5.21	100.29	0.96	0.68	High
4	Dhupguri	60.86	16.34	14.40	13.75	0.48	1.97	10.24	118.05	1.13	0.68	Very High
5	Mal	40.48	3.36	5.27	52.75	0.16	0.73	3.78	106.54	1.17	0.68	Very High
6	Metiali	17.92	0.67	0.44	97.97	0.00	0.48	1.13	118.61	1.25	0.68	Very High
7	Nagrakata	15.74	1.28	0.50	69.18	0.14	0.45	0.88	88.17	1.18	0.68	Very Low
8	Kumargram	40.42	4.13	2.97	20.70	1.14	2.23	2.65	74.24	0.87	0.68	Very Low
9	Falakata	56.67	9.30	12.96	3.63	3.10	4.18	9.79	99.63	1.06	0.68	Low
10	Madarihat-Birpara	12.33	4.22	0.27	6.00	1.47	1.35	0.70	26.34	0.61	0.68	Very Low
11	Kalchini	4.17	0.73	0.13	37.14	0.04	0.33	0.80	43.34	0.89	0.68	Very Low
12	Alipurduar-I	56.15	7.52	6.91	2.14	0.20	2.81	8.38	84.12	0.98	0.68	Very Low
13	Alipurduar-II	58.95	3.67	6.15	2.13	1.86	3.28	9.26	85.30	1.02	0.68	Very Low

Iij=Ratio between the yield of any crop (j) under the individual crop (i) and entire area (y).
Cij= Area in % for individual crop in an individual areal unit.
EI= Σ (Iij × Cij)/ Σ Cij.

Following decisions can be made to analyze the table:

i.Very Low efficiency Blocks: Maximum block show very low in efficiency. Rajganj, Jalpaiguri, Nagrakata, Kumargram, Madarihat-Birpara, Kalchini, Alipurduar-I and Alipurduar-II belongs to this category.
ii.Moderate low: Nil
iii.Low efficiency Blocks: Falakata.
iv.High efficiency Blocks : Maynaguri
v.Moderate High: Nil
vi.Very High efficiency Blocks: Dhupguri, Mal and Metiali belongs to this category.

CONCLUSION:

Following conclusions can be made from the above analysis.

1.Agriculture in the district is very diverse and erratic because of its geographical diversity.
2.Rice and tea plantation are very popular, the other crops are insignificant and are gradually decreasing except potato and vegetables.
3.Maximum number of blocks shows very low efficiency in production i.e their productivity performance is very poor. Proper planning can develop the agricultural condition in the district.
4.Agriculture is basically subsistence in nature because cash crop production is very insignificant excepting tea.
5.By adopting agricultural modernization in agriculturally backward areas both production and surplus can be considerably stepped up (Dhilon 2004).
So, overall development should be taken by proper planning in agriculture. In the days of globalization all efforts to be made in favour of market economy.

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