RESEARCH ARTICLE

European Journal of Development Studies
www.ej-develop.org

Logistic Regression and Man-Land Ratio in the Analysis of House-Ownership Status of Four Blocks in Purba Medinipur District, West Bengal, India

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ABSTRACT

It is pertinent to initiate our study of rural economic status by examining the compositional factors of the Man-land ratio and Logistic regression of house ownership. The principal sources of the economy of the rural sector are the agro product. As per the capability of land, it continuously helps to develop its catchment rural area. The productive land directly provides opportunity through the traditional agriculture practice. Our study emphasizes Man-land ratio distribution and Logistic regression analysis of two independent variables of four blocks of the Purba Medinipur district. Consider two independent variables as the number of households and house ownership. Actually, house ownership is one of the alternative setups that may be stable due to stable income source. Secondary data have been collected from an authorized source, from the Ministry of Rural Development, published by the Government of West Bengal in 2001 and 2011. The results of the man-land ratio indicate that, the considered blocks having with a standard level of status due to satisfied level of the Man-land ratio value. The population density of the considered area is an exhibit at a moderate level. Finally, a robust statistical technique like Logistic regression (Hosmer and Lemeshow Test.) was applied over the considered data set with a specific level of section and after binary conversion. The result shows that, the expected house ownership and calculated house ownership make a strong relation between them. B value (slope) is -3.515 and the calculated test statistic value satisfied the significant level at 9th and 10th steps sections at 97 % (P =0.03) level of confidence.

Keywords: Hosmer and Lemeshow Test, Logistic Regression, Man-Land Ratio, Stability and Instability of Society.

Published Online: November 12, 2022

ISSN: 2736-660X

DOI: 10.24018/ejdevelop.2022.2.5.171

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I. INTRODUCTION

Land is the stage or platform on which all anthropogenic activities are being conducted and the source of the materials required for this conduct. Human society use the land resources for different purposes, whether, food production, provision of shelter, recreation, extraction and processing of materials, and so on, as well as the bio-physical characteristics of land itself. Hence forth, land use is being designed under the influence of two broad sets of forces – human own needs and environmental features. As per the requirement of human society, the entire land use and its related activities may change over the time. All these forcing parameters may change consequently for serving the individual or group of people. These changes have at times beneficial, at times detrimental impacts. The density of population is being increased day by day, so tremendous pressure is being also increased as per order of the sequential progressive of time duration. Subsequently, usable land are become closed for agriculture practice and other primary activities. The rural, as well as urban space, is spread. In order to the concept of Man-Land ratio, the value of this statistic moves arbitrary in nature. Moreover, land is a fixed, limited, solid, and permanent nature of resource but being degradable and moveable character, it could be sustainable only if properly used by the human society, in which different land is in a permanent change condition, increasing with numerical progression manner (Saptarshi & Jagdale, 2010). According to Zimmerman, "the Man - land ratio takings into explanation all the people's qualities, behavior on production and all environmental characteristics, both natural and cultural aspect the availability of resources. Various pollution sizes are in a large number of different areas, where man is the only resource that causes changes in the environment (Gadekar, 2015). Human own is a resource, due to his intellectual activities. But the society depletes the entire environment through adverse activities due to the huge load of the population (Gadekar, 2017). Different social scientists always try to understand the measurement way of human activities along with different population data.

For several cases the calculated values may significant and have potential output. The significant measures of HRD are Man land ratio, sex ratio, Population density, population growth rate, and male and female literacy with the occupation structure (Niranjan & Kumar, 2017). Human resources development is a temporal change it is not stable, as well as population density, sex ratio and literacy, are not stable parameters of HRD (Bisen, & Kudnar, 2013; Shejul, 2020). The man land ratio is a major significant measurement that reveals the availability of production of land per person (Shukla & Dubey, 2015). Secondly, it is an indicator of agricultural wealth in the considered geographical area. Finally, if the man-land ratio is measured and known, it is very easy to estimate the economic conditions of landowners, mainly agrarian of any given area. Man land ratio signifies to the ratio of productive or active land in respect to total population of a country or region. Human efforts here refer to the combination of cultural qualities like human efficiency, intelligence, knowledge, strategy and organization and practices. Again, productive land indicates to land that is used directly by people and from which they can create wealth consequently. The Man- land ratio is a qualitative estimation because this ratio value always assesses the relationship between the population and the productive or progressive capacity of the land. Moreover, a perfect signature or scenario of the socio-economic condition of a region cannot be directly obtained through the man-land ratio; the result of Man-land ratio gives an idea about the regions concerning overpopulation or under population and the standard of living of the people of the region. With the help of this ratio estimation, optimum population of a region can be estimated easily. Another one aspect is most essential indicator for a socio-economic condition which is the relationship between house and house ownership. Moreover, it is the living status indicator for any individual or family. Rural or urban both are stated the same impact over this indicator. In many countries around the world, one of the objectives of housing policy is to encourage private schemes of homeownership. These policy objectives are based on the assumption that owning one's own home has a beneficial or positive outcome on the individual as well as on society as a whole (Gurney, 1999b). Homeownership will always, though, propulsion to greater housing satisfaction and greater self-esteem (Karn *et al.,* 1985). Basically, rural society highly depends on productive land, which has some productive capacity for agriculture. Consequently, economic security also plays an important role in the financial functioning of households (Prather, 1990). Piotrowska (2017) defines economic security as "the household's ability to meet its needs while being able to build financial reserves for adverse events" (Piotrowska, 2017).

II. STUDY AREA

Geographically Purba Medinipur district situated in the southern part of the West Bengal state in India. It is divided into 25 C D Blocks. The present study area is considered four coastal C D Blocks. These Blocks are Khejuri I, Khejuri II,Nandigram I and Nandigram II. The study area lies between 21˚ 47 ' 00 " N to 22 ˚ 06 ' 30 " N & 88 ˚ 02 ' 30 " E to 87 ˚ 44 ' 00 " E .The present study is divided into 28 Gram Panchayat and 279 villages. According to the census 2011 the total household of the present study area is 1,33,729, total population is 6,23,685, total area is 55,538.94 hectares respectively. The study area is bounded by the Hooghly River & the Bay of Bengal in the east, Chandipur Block and Bhagawanpur II block in the west, the Haldi River in the north and the Rasulpur River & the Bay of Bengal in the south.

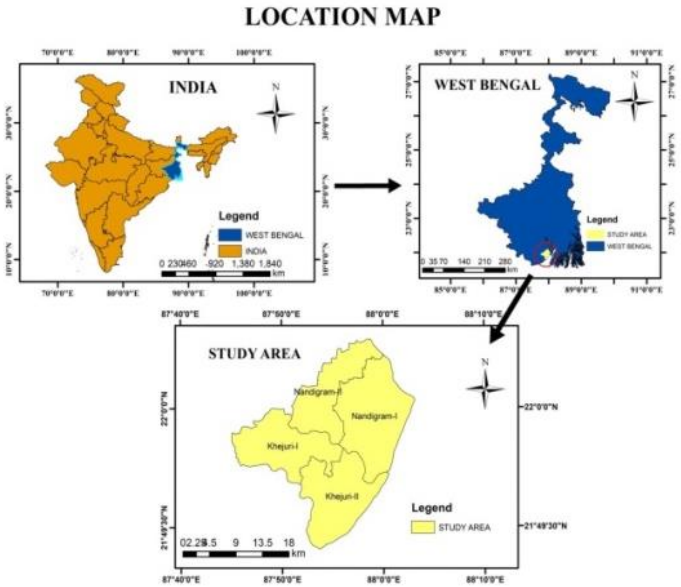


Fig. 1. Location of the study area.

III. Materials and Methods

To complete this paper, we have used the secondary data bank of Nandigram –I & II and Khejury –I& II under publication by Ministry of Rural Development, the government of West Bengal, Socio-economic and Caste Census, West Bengal, 2001 and 2011. The household data set were used as per their house ownership and Land ownership format. House ownership data comprises the number of houses under the number of households. The irrigated land was estimated as per data set in hectors. Moreover, number of households as per considered study area are, Nandigram-I (45343), Nandigram-II (28270), Khejuri –I (30544) and Khejuri-II (29572) respectively. Total irrigated land under each considered Bocks are 2421.99 hector, 2001 (11647.59 hec, 2011) (Nandigram-I), 1480.2 (2001), 6913.43 (2011) (Nandigram-II), 2271.04 (2001), 7164.86 (2011) (Khejuri-I), and 1577.19 (2001), 101614.8 (2011) (Khejuri-II) respectively. To complete this study, (1), (2), (3), (4) and (5) are adopted.

$$\text{Man Land Ratio (MR)} = Em \div El \tag{1}$$

where,
Em = Efficiency of man
El = Efficiency of land

Ultimately (1) estimates the active magnitude of the relationship between Main- Land interaction actively along with their production for expenditure. A statistical Logistic regression analysis has been conducted for the estimates of household ownership for this area. 279 villages' data under household ownership were considered for binary numerical conversion. Cut off level is 500. So, less than 500 number of household value are considered "0" and above 500 household value considered is "1" binary conversion. Actually, this separation is mainly highlighted as two separate control groups. The response variable of this study is household ownership (s), which is shown in (2)

$$x_i = 1,\ if\ number\ of\ house\ hold\ is > 500,$$
$$x_i = 0\ , if\ number\ of\ house\ hold\ is < 500 \tag{2}$$

For this analysis statistical logistic Regression Model is considered, which is given in (3).

$$Log\ \left(\frac{\rho}{1-\rho}\right) = \beta_0 + \beta_1 x \tag{3}$$

where, the values of the explanatory variable x are a number of households. We see that the fitted model is (4).

$$Log\ (odds) = b_0 + b_1 x \tag{4}$$

where, $b_0 = Coefficient\ of\ 0\ binary\ set\ of\ data.\ \ b_1 = Coefficient\ of\ 1\ binary\ set\ of\ data$
The level of significance has set at 97 % ($\rho = 0.03$).

We calculate a 97% confidence interval for β_1 using the estimate b_1 and its standard error (SE_{b_1}) using (5).

$$b_1 \pm z \times SE_{b_1} \tag{5}$$

IV. Results and Discussion

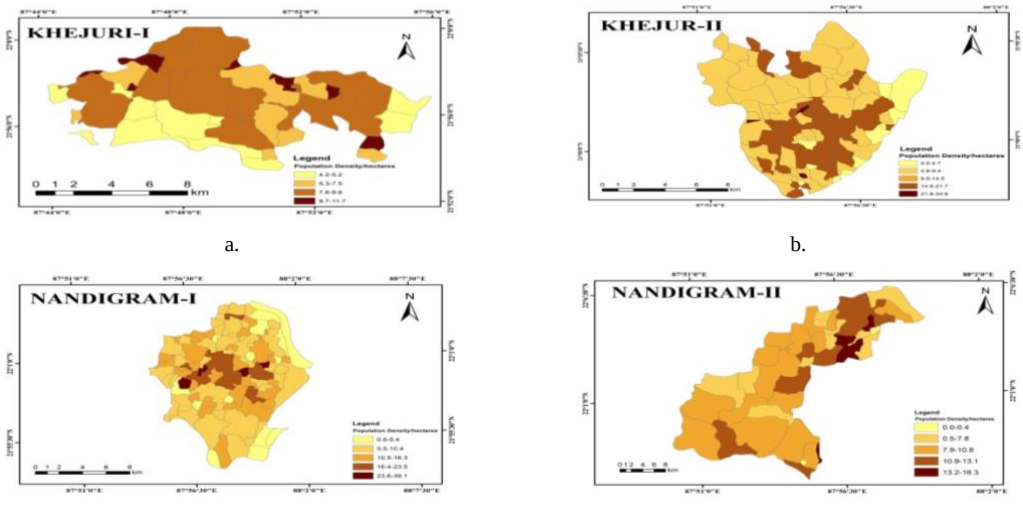
The study was carried out on 1, 33,729 households. From the potential independent variables, two variables were considered which are relatively important for the man land ratio estimation. Secondly, number of households and house ownership coefficient were estimated using logistic regression method. The considered are is mostly rural and which depends on agricultural activities. The population density of the considered area is moderately concentrated with their primary activities. Table-1 shows that, range of population density lies between moderate categories for most of the villages in Khejuri-I block. Total 16 villages indicate their population density between 5.3-7.5/ hectare range, 15 villages indicate their population density range between 7.6-9.6/ hectare rage and 12 villages indicates their population density range between 9.7-11.7/ hectare respectively. On the other hand Khejuri-II blocks indicates 74 villages having with moderate range of population density which lies between 4.8-9.4/ hectare and 9.5- 14.5/ hectare respectively. Moreover, if we look into the results of Man-land ratio, more of the considered villages in Khejuri –I and Khejuri-II lies between moderate categories of ratio range per hector. Average Man-land ratio lies between 2nd and 3rd category. Though the considered study area is almost depends on agriculture practices, the distribution of the village settlements are moderately dispersed. After the physical verification

of this study area it has revealed that, some nodal rural road conjunction points rigidly accumulated the settlement pattern of that. On the other hand, Nandigram –I and II blocks indicates quite similar to Khejuri –I and II results. 44 villages of Nandigram-I blocks indicate their population density range between 5.5-10.4 / hectare. Even 26 villages indicate their population density range between 10.5-16.3/ hectares. Population density of Nandigram-I block results reveals through 5 consecutive categories. But the maximum villages result lies between 1st and 2nd categories span. In view of their statistical Man-land ratio calculation those two categories' results ranges are 14.1-61.1per hectare and 61.2-124.9 per hectare respectively. It is noticeable that, the selected categories have long extent interval. Forth more, population density and Man-land of Nandigram-II block indicates similar such result takes after Khejuri –I & II and Nandigram-I blocks. If we compare the results of Man –land ratio of considered four blocks, Khejuri-II and Nandigram-I have high range of population density as well as Man-land ratio then the result of Khejuri –I and Nandigram-II blocks. The socio-economic condition of the two blocks such as Khejuri-II and Nandigram –I are more consistence then other two blocks. Overall population density and Man-land ratio are exhibited developed economic status for those areas.

Mainly, population density, Man-land ratio, economic status, etc. directly considered the controlling factors of rural developmental status. So, we have employed the data through Logistic regression statistics. Here the parameters are several houses and house ownership. Both are independent in nature. The study was carried out on 133729 households. From the set of potential independent variables Logistic regression analysis was employed.

TABLE I: GP WISE POPULATION DENSITY AND MAN-LAND RATIO OF FOUR CONSIDERED BLOCKS, 2001

Sl. No.	Blocks	Range of Population density/ hectare	Number of villages	Range of Man-land ratio/hectares	Number of villages
		4.2-5.2	05	5.6-6.8	02
		5.3-7.5	16	6.9-47.8	10
1	Khejuri-I	7.6-9.6	15	47.9-71.8	19
		9.7-11.7	12	71.9-129.5	12
				129.6-214.4	05
		0.0-4.7	12	0.0-51.3	28
		4.8-9.4	46	51.4-104.9	30
2	Khejuri-II	9.5-14.5	28	105.0-180.0	27
		14.6-21.7	15	180.1-344.8	15
		21.8-34.6	03	344.9-750.0	04
		0.6-5.4	15	14.1-61.1	26
		5.5-10.4	44	61.2-124.9	41
3	Nandigram -I	10.5-16.3	26	125.0-210.4	14
		16.4-23.5	11	210.5-394.5	13
		23.6-39.1	04	394.6-878.0	06
		0.0-0.4	02	0.0-5.0	02
		0.5-7.8	11	5.1-62.1	16
4	Nandigram-II	7.9-10.8	15	62.2-94.8	14
		10.9-13.1	11	94.9-142.8	06
		13.2-16.3	03	142.9-191.0	04



a. b. c. d.

Fig. 2. Population density differentiation of four considered blocks (2001), a) Khejuri-I; b) Khejuri-II; c) Nandigram-I; d) Nandigram-II blocks.

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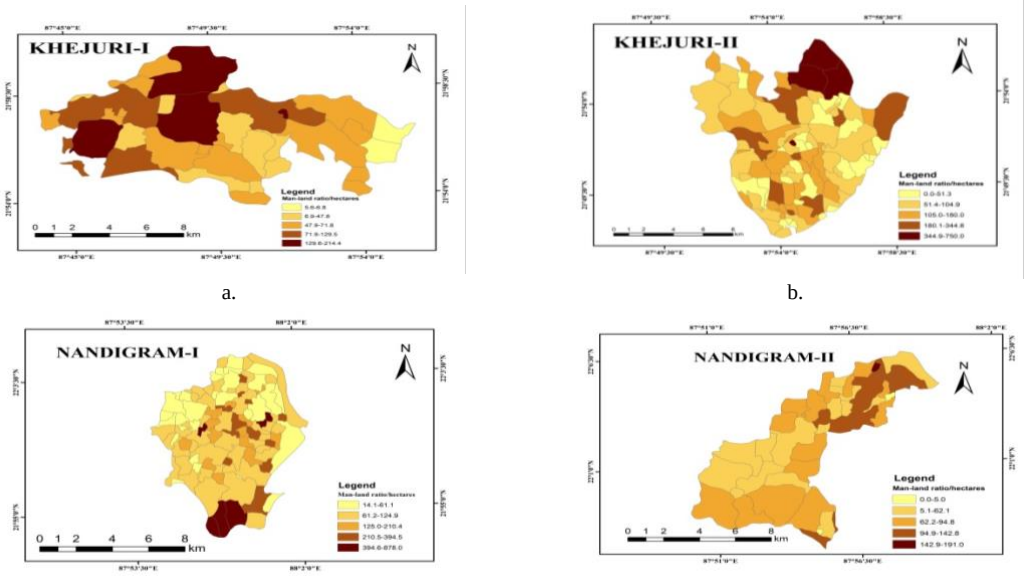

a. b. c. d.

Fig. 3. Man –Land ratio of four considered blocks (2001), a) Khejuri-I; b) Khejuri-II; c) Nandigram-I; d) Nandigram-II blocks.

The rural poverty indicator also depends on household size, so household ownership is considered for this study. As per our study, all the considered households have own cropland. Their economic status is mostly regulated from crop cultivation and marketing. So, total economic setup build by the agro product. Primarily Logistic regression had performed by 10 consecutive steps. Households have been grouped through selective numbers. Expected household relationship have specified along the selected 10 steps. Degree of freedom have confirmed by maximum two sample data (Table II). Calculated value (Relationship) has confirmed at 97 % level of confidence. First 8 steps test statistic value does not satisfy the significant level. Moreover, last two steps test statistic value satisfy the critical values and considered as significant at 97 % level of confidence (P= 0.03). These test statistic values are 1.149 and 1.989 respectively (Table II). These results reveal that, maximum household and their ownership relations are strongly related to both independent variables.

TABLE II: RESULTS LOGISTIC REGRESSION OF HOUSE OWNER RELATIONSHIP AFTER HOSMER AND LEMESHOW TEST

Steps	Observed relationship	Expected relationship	Df (Credit default 0/1)	calculated value (Relationship)	Level of significance	Total
1	26	26.533	1	0.467	*	27
2	28	27.491	0	0.509	*	28
3	26	27.468	2	0.532	*	28
4	28	27.450	0	0.550	*	28
5	27	27.415	1	0.585	*	28
6	28	27.372	0	0.628	*	28
7	29	28.295	0	0.705	*	29
8	27	27.112	1	0.888	*	28
9	27	26.851	1	1.149	***	28
10	23	23.011	2	1.989	***	25

*** = Significant/ * = Insignificant.

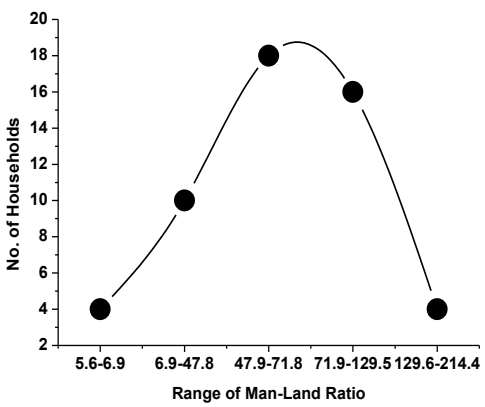

Fig. 4. Status of economic level (household wise) at Khejuri-I block.

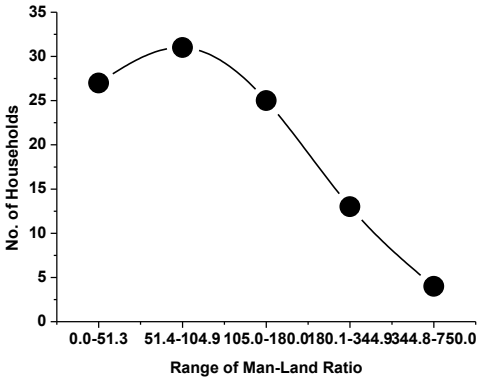

Fig. 5. Status of economic level (household wise) at Khejuri-II block.

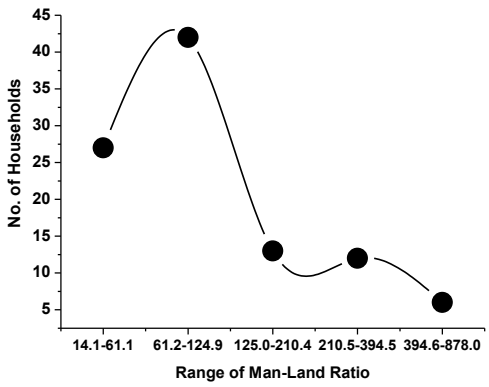

Fig. 6. Status of economic level (household wise) at Nandigram-I block.

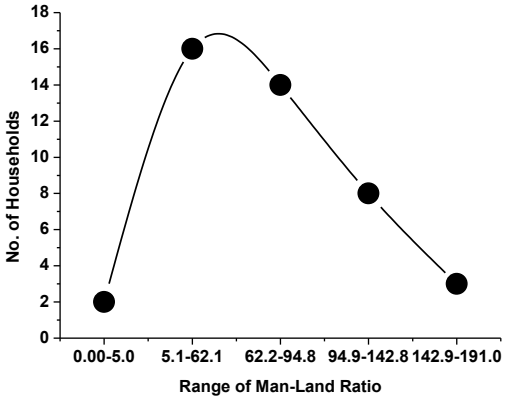

Fig. 7. Status of economic level (household wise) at Nandigram-II block.

TABLE III: RESULTS OF TEST STATISTICS AT 97 % LEVEL OF CONFIDENCE

B value	S.E	Wald	Exp (B)	Chi-square	Percentage correct	P= 0.03 Level of confidence
-3.515	0.359	96.002	0.030	7.534	97.1	0.480

*= Insignificant

Furthermore, slope of the considered data set indicates a negatively strong relationship between household and their house ownership. Standard of error (SE) for this statistic is very less (0.359) and Chi-square test statistic is 7.534 respectively (Table III). It is established that, the strong and significant relation of these considered parameters indicates comfortable or better economic status of the considered households.

V. CONCLUSION

According to Saunders (1990), people have a natural, innate desire to own their home [12]. House ownership ensures basic security, freedom, self-honour and financial advantage and also satisfaction for future of a family. From an Indian perspective, a well-structured house ownership is always ensuring the entire family's security over the coastal area. Our considered study area has concentrated on rural society of the West Bengal coastal area. It is always facing coastal cyclonic threats, so strong relation between the Man-land ratio and house ownership is an essential dimension of socio-economic status analysis.

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