Identification of Contextual Problems of Land Utilization and its Planning Through Land Capability Classification on Purba Medinipur District, W.B.

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Abstract

"Land as a geographical space that utilized for the satisfaction, which the farm population derives from the type of agricultural developed, provision for future production and socio economic development"(J.L.Buck,1951). That way land uses are the most significant and functional variable for socio-economic development of a geographical space Purba Medinipur district. Comparatively population growth and unscientific land utilization process are most prominent indicators for land degradation with reducing agricultural productivity of this region over the day by day. In consequently, to needs the study with land capability classification for proper land use planning in different regional sector of study area. That way "Land capability classification is an exercise for interpretative grouping and grading of soil according to their potentialities and limitations, It helps to organize significant soil factors for conservation" (Stallings, 1975). To promote optimum agricultural growth, carryout the balance of regional development and also land utilized related sustainable development are the fundamental objective and planning of that study.
Key words: Land Utilization. Agricultural Productivity, Land Capability Index (LIC), Optimum Agricultural Growth, Sustainable Development.

Introduction: Land is a complex and dynamic combination factors of geology, topography, hydrology, soil, micro-climates, communities of plants and animals with also vital interacting by peoples activities (Shaxson, T.F., Hudson, N.W., Sanders, D.W., Roose.E., Moldenhauer, W.C., 1989). Land use means the use of land in a certain area. Land use

creates continuous field of tension between human desire and existing available resources. Land use is a product of interactions between a society's cultural background, and its physical needs on the one hand, and the natural potential of land on their (Achard, F., 2002, et.al). Land utilization is the satisfaction, which the farm population derives from the type of agriculture developed, the provision for future production and contribution to mineral needs (Buck, J.L., 1951). Land is the most significant and functional variable for socio economic development of a geographical space inhabited population.

Land use is generally follows qualities of land, which include relief, slope, soil and its various properties in a geographical area. The land use are the most inter related with both physical and non physical parameters these are nature of slope, terrain features, drainage system, under ground water, soil fertility-productivity, irrigational potential, bio-chemical inputs, mechanization, density of population ,migration of population, fragmentation of land, mobility of farm labour, marketing facilities, transport-communicational network, financial aid, etc. (De, N.K. and Jana, N.C., 1996).The land capability classification for agriculture has as its objective the presentation of detailed information on soil, climate and relief in a from which will of value to land use planner, agricultural advisers, farmers and others involved in optimizing the use of land resource. The classification ranks land on the basis of its potential productivity and cropping flexibility determined by the extent to which its physical characteristics (soil, climate and relief) impose long term restrictions on department of agriculture which was designed to be applicable to any scale of mapping and has been modified extensively to fit Britch conditions and requirements. As part of these modifications an assessment of vegetation has been introduced. This is more properly described as a biological rather than a physical characteristic. Land capability classification is a process of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants without weakening over a long period of time. It is a scientific appraisal of physical characters of the land, inherent soil quality and management practices. These concepts are most related with agro-economic developments of Purba Medinipur district, West Bengal (Mondal, M). Land capability is the natural environmental ability of the land to preserve a range of land uses and management practices in the long term without degradation to soil, land, air and water resources (Sonter, R.O. and Lawrie, J.W., 2007). Land capability not only depends upon the geomorphic parameters, soil fertility etc, but also upon technological inputs and management practices. Land capability is measurement basis on the biological characteristics of the land, the level to which this will limit a particular type of land use, and the present technology that is accessible for the management of the land. It provides in sequence on the broad agricultural land uses most physically appropriate to an area, that is, the uses with the best match between the physical rations of the use and the physical qualities of the land, and the potential hazards and limitations associated with specific uses over a site. It can provide guidance on the inputs and management necessities associated with different intensities of agricultural land use. Using land beyond its capability may have serious consequences for the land and soil resources of the State as well as broader environmental impacts on water, air and biodiversity. Impacts can include loss of valuable

soils on agricultural land, soil acidification, structure decline, soil carbon decline and wind erosion leading to poor air quality. All these are general indications of land degradation.

The risk of land degradation and the need to deal with land within its capability has been recognized at the federal level (McKenzie, N.J., Henderson, B., McDonald W.S., 2002),(Campbell, A.,2008). Land capability in one hand helps to find out efficiency of land for particular uses and on the other it helps to prevent improper use of land which leads erosion hazards and decline of land quality. Land capability classification enables the farmers to use the appropriately for sustainable production under required management measures in Purba Medinipur.

Land capability classification necessary for the planning of agricultural development. Land use capability classification has been developed with an objective to discuss the site, soil and climate on farming. The land capability classification as a field investigation of soil properties, slope, degree of soil erosion and changing land use patterns which form the basis for future planning of soil and water conservation (Sharma H.S., 1972). There are several methods commonly used for the rating the land capability classification such as Marbut's method (Marbut C.,1935) is based of statistical information on yield history of the particular piece of land, explain the degree of adaptation of land types of various crop (Morgan's method (Morgan M.F., 1939) establish on the site and physical land factors, Bennett's method (Bennett H.H.,1939) the land capability classes should be determined with the help of physical and economic factors i.e., physiography, soil fertility(Singh R.V., 1970) . Other method are also land capability classification of the Bureau of Reclamation; L. D. Stamp's land classification in Britain; land classification of U.S.S.R.; Land capability classification by A.I.S.L.S.O., I.C.A.R. etc. Present study has been applying for measured the land capability classification of the Purba Medinipur district by method on the basis of R.V. Singh (Singh R.V., 1970). In this method is below:

$$\text{Land Capability Index (LCI)} = \frac{\left(\sum_{i=1}^{n} \frac{R_1 + S_2 + I_3 + \cdots \ldots \ldots \ldots Qn}{\sum PFV} \times 100\right)}{\left(\sum_{i=1}^{n} \frac{Rn_1 + Se_2 + W_3 + \cdots \ldots \ldots \ldots Qn}{\sum NFV} \times 100\right)}$$

Where, LIC = Land capability index, PFV = Positive factors values, NFV = Negative factors values, R, S, I = Rainfall, soil fertility and Irrigation facility represent as positive factors, R,S ,W, F, D, H and T = Ruggedness number, soil erosion, water logging, forest density, drought, higher degree of slope and flood represent as negative factors of land capability.

Table 1. Land Capability Index wise Land Use Classification of Purba Medinipur District:

Blocks	Positive Index Value (∑PFV)	Negative Index Value (∑NFV)	Land Capability Index (LIC)	Percentage of Net sown area to total area
Tamluk	75	45	1.66	2.51
Sahid Matangini	75	50	1.50	2.24
Panskura-I	75	45	1.66	5.84
Kolaghat	75	45	1.66	3.92
Moyna	60	45	1.33	4.03
Nandakumar	60	50	1.20	4.36
Chandipur	60	45	1.33	3.62
Mahishadal	60	45	1.33	3.25
Nandigram-I	50	45	1.11	4.528
Nandigram-II	50	50	1.00	2.86
Sutahata	50	45	1.11	2.00
Haldia	50	45	1.11	1.78
Potashpur-I	45	50	0.90	4.69
Potashpur-II	45	50	0.90	5.14
Bhagawanpur-I	55	50	1.10	5.04
Egra-I	55	65	0.84	5.90
Egra-II	55	65	0.84	5.14
Khejuri-I	50	65	0.76	3.43
Khejuri-II	50	60	0.83	3.81
Bhagawanpur-II	50	65	0.76	5.13
Ramnagar-I	55	35	1.57	3.25
Ramnagar-II	55	40	1.37	3.91
Contai-I	55	35	1.57	4.15
Deshapran	55	40	1.37	4.71
Contai-III	55	35	1.57	4.62

Sources: Based on M. Mondal and Field investigation 2015-16

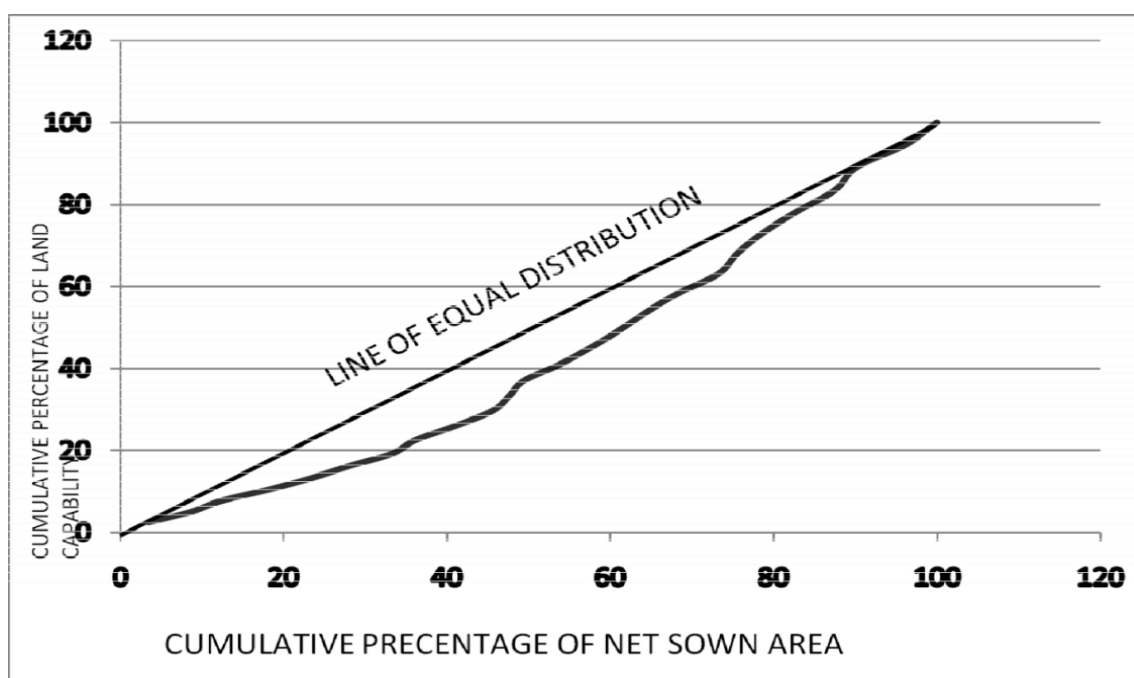**Table 2. Cumulative Percentage of Land Capability and Net Sown Area in Purba Medinipur District (2010-2016)**

Blocks	Cumulative Percentage (X)	Percentage of Land Capability Index	Cumulative percentage of Land Capability Index
Tamluk	3.43	5.471349	2.525238
Sahid Matangini	8.56	4.924213	5.050476
Panskura-I	12.37	5.471349	7.786149
Kolaghat	18.27	5.471349	10.56391
Moyna	23.41	4.377077	13.34167
Nandakumar	28.1	3.93937	16.2962
Chandipur	33.24	4.377077	19.25073
Mahishadal	36.1	4.377077	22.53354
Nandigram-I	41.14	3.647565	26.14463
Nandigram-II	45.66	3.282809	29.79219
Sutahata	47.66	3.647565	33.43976
Haldia	49.44	3.647565	37.08732
Potashpur-I	53.8	2.954528	41.02669
Potashpur-II	57.83	2.954528	45.40377
Bhagawanpur-I	61.45	3.61109	49.78085
Egra-I	64.7	2.777762	54.15792
Egra-II	68.61	2.777762	58.67179
Khejuri-I	73.32	2.525238	63.18565
Khejuri-II	75.56	2.735673	68.10986
Bhagawanpur-II	78.81	2.525238	73.26856
Ramnagar-I	82.96	5.158701	78.42726
Ramnagar-II	87.58	4.513862	83.58596
Contai-I	90.09	5.158701	89.05731
Deshapran	96.08	4.513862	94.52866
Contai-III	100	5.158701	100

Sources: Based on M. Mondal and Field investigation 2015-16

Table 3. Land Capability Index wise Land Use Classification of Purba Medinipr in different District:

Land Capability Index	Value Extension of land capability	Categories of Blocks
High Land Capability Area	>1.44	Panskura-I, Kolaghat Sahid Matangini, Tamluk, Ramnagar-I Contai-I Contai-III

| *Medium Land Capability Area:*	1.22-1.44	Moyna, Chandipur Mahishadal Ramnagar-II Deshapran
Low Land Capability Area	1.00-1.22	Nandakumar, Nandigram-II Nandigram-I Sutahata Haldia Bhagawanpur-I
Very Low Land Capability Area	<1	Potashpur-I, Potashpur-II Khejuri-II Bhagawanpur-II Egra-I Egra-II Khejuri-I

Figure 1. Cumulative percentage of land capability index of Purba Medinipur district 2010-2016

In the evident represent the relationship between land capabilities index in relation to net sown area. A product moment coefficient of correlation has been estimated which comes to r = 0.045. This along significant the relationship of the capability index and the net sown area available in the region. For these two components of land use the regression value comes to y = 0.057× + 1.449. In this way, it can be said that the intensity of net sown area is the real indicator of the potentialities of land capability in a region.

Afterwards Lorenz Curve has been used to measure the dispersion of land use capability index in different block of Purba Medinipur district, West Bengal. This graphical method has merit to illustrate the line of equal distribution of land capability in

relation to the actual dispersion. For the preparation of Lorenz Curve the cumulative percentage of land capability on X axis and cumulative percentage of net area sown area of different block has been used. With the help of Lorenz Curve, it has been found that Purba Medinipur district contains large area and low land capability in comparison with the coastal plains of West Bengal.

   In the evident map of land capability region in Purba Medinipur district has been prepared. The categories of coloring has been chosen on the basis of the 'Semi Inter Quartile Range' principle of statistics, which has been divided a set of data into four sub-group.in this way, the district of Purba Medinipur has been divided into four categories of land capability regions
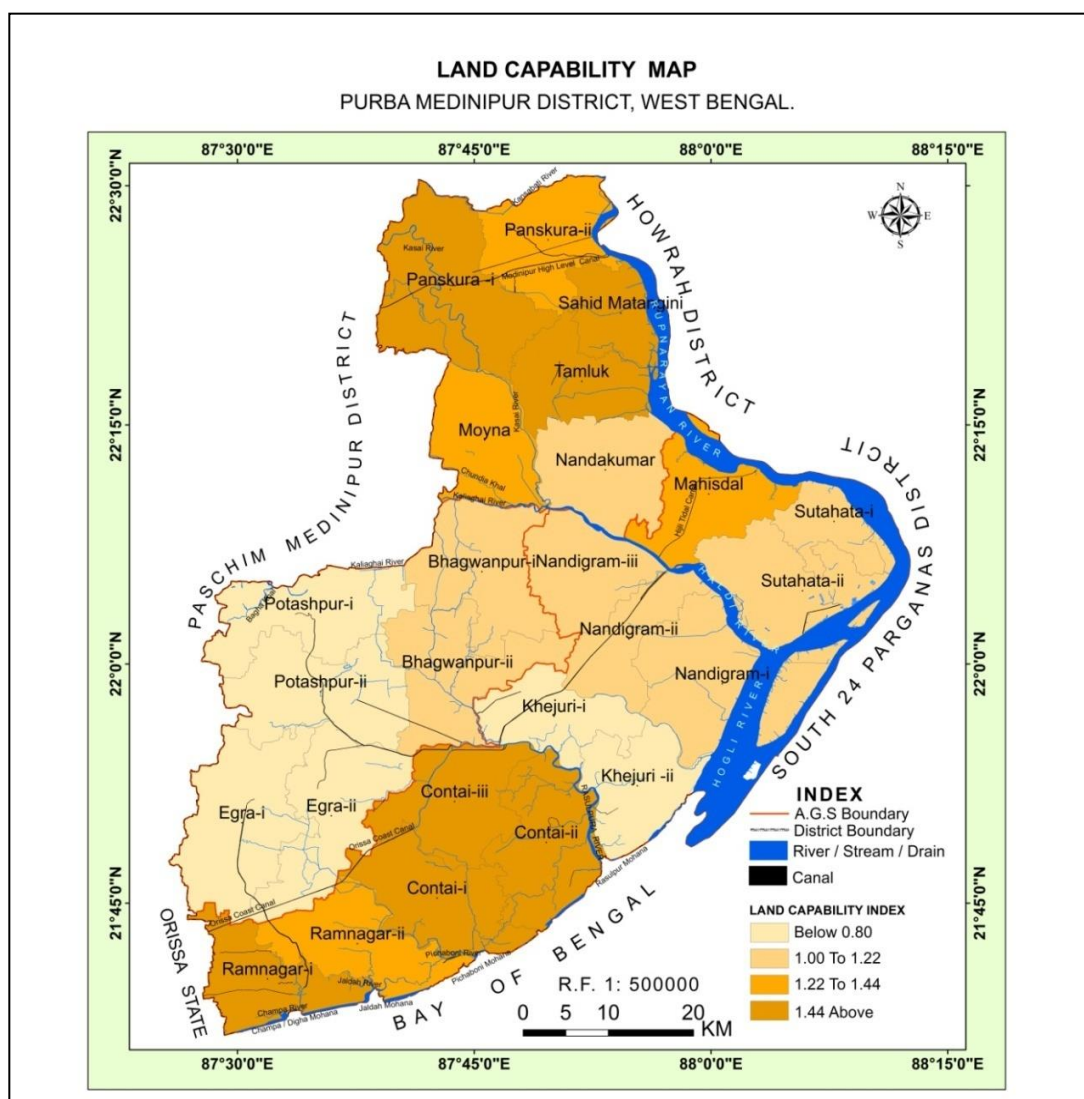
Sources: Authors Field Investigation 2016

Figure 2.   Land Use Capability Index Classification Map in Purba Medinipur District

General land use classification according to land capability index in Purba Medinipur :

I.   **Region of highest Land Capability Index:** The blocks having more than 1.44 land capability index (LCI) come under this categories of region. It comprises the block of Panskura-I, Kolaghat Sahid Matangini, Tamluk, Ramnagar-I Contai-I and Contai-III. In these blocks factors like rainfall and soil fertility for raising better crops supported by artificial irrigation facility keep the capability of the land highest and the positive factors predominate in comparison with the negative factors.

II.   **Region of medium Land Capability Index:** This categories land capability index range value is 1.22-1.44.   It comprises the blocks of Moyna, Chandipur, Mahishadal, Ramnagar-II and Deshapran. Here the land capability is medium due to positive factors and negative factors have been equal effective to the measurement of land capability.

III.   **Region of moderate Land Capability Index:** All the blocks having partly rugged terrain and partly plain come under this group and land capability index value range from 1.00 to 1.22. This categories included the Blocks namely Nandakumar, Nandigram-II, Nandigram-I, Sutahata, Haldia, Bhagawanpur-I. In the above areas the limiting factors are rugged forested terrain, inferior quality of soil, etc. only hard labour and huge capital investment can raise their capability index, which requires fertilizer, and the protection from the hazarded of soil erosion.

IV.   **Region of low Land Capability Index:** Under this categories have land capability index value range less than 1.00 which includes the blocks of Potashpur-I, Potashpur-II Khejuri-II Bhagawanpur-II Egra-I Egra-II and Khejuri-I. In these areas the negative factors are high affected and positive factors are low affected for the land capability determination and for this reason these areas have lowest land capability i n d e x   in Purba Medinipur district.

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