punjab geographer

A JOURNAL OF THE ASSOCIATION OF PUNJAB GEOGRAPHERS, INDIA

VOLUME 10 OCTOBER 2014

PUNJAB GEOGRAPHER : ISSN- 0973–3485 Volume 10 October 2014

CHANGES IN LAND UTILIZATION IN WEST BENGAL: DISTRICT AND C.D. BLOCK LEVEL ANALYSIS

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Abstract

This paper has examined the pattern of changes in land utilization over a period of three decades with a special focus on non-agricultural and cultivable land. The study is based on the available secondary data at C.D. Block and District level in West Bengal. Given the underlying extremely low share of barren and uncultivable land to total geographical area in the state, the present form of development activities viz. urbanization, housing colonies and infrastructure creation has emerged as a potential threat to agricultural land. A phenomenal change in land use pattern has been observed in different parts of the state. The study unveils a steady increase in share of area under non-agricultural uses across the districts in the state and majority of the C.D. Blocks in five districts (Howrah, Hugli, North 24 Parganas, South 24 Parganas and Nadia) around Kolkata primarily at the expense of agricultural land. The net sown area is under great stress with a gradual declining trend. Although after mid 1990s the growth in area under non-agricultural land among the districts surrounding Kolkata has been higher than that of the non-adjacent districts, a contrasting scenario has been noticed in case of the C.D. Blocks surrounding Kolkata.

Introduction

Change in land use has been a phenomenon ever since the beginning of human civilization. However, this phenomenon has attained momentum in recent years, particularly in developing countries. Numerous empirical studies on both developed (Best and Champion, 1970; Shaklee et al., 1984; Pyle, 1985; Blewett and Lane, 1988; Drozd and Johnson, 2004) and developing countries (Ding, 2007; Narain, 2009; Kumar et al., 2011; Dadhich and Hanaoka, 2011; Kumar, 2012; Bhupal, 2012; Ge, 2012; Tang et al., 2012; Hui and Bao, 2013) have confirmed that the cultivable land is continuously going out of agriculture and is being used for rapid urbanisation. This phenomenon has initiated debate and turned into a critical issue for land use planning for quite some time in developed (Shaklee et al., 1984; Plantinga and Miller, 2001; Drozd and Johnson, 2004) and as well as in developing countries like India (Reddy and Reddy, 2007; Narain, 2009; Roy, 2014), Bangladesh (Dewan and Yamaguchi, 2009; Johnson and Haque, 2014), China (Ho and Lin, 2004; Su et al., 2011) and so on in recent years. Among all the major states in India, including West Bengal, the demand of land for non-agricultural purposes has gone up dramatically in recent years, especially after the adoption of neo-liberal economic policy in 1991 and enactment of SEZ Act, 2005 which has encouraged private capital giants for industrialisation, planned urbanisation and

infrastructure development with new vigour. The latest data from the Ministry of Agriculture shows that twenty states in India have registered a decline of 4.06 lac hectares of cultivable land over a short span of four years between 2007-08 and 2010-11 (Mohan, 2013). West Bengal started experiencing pressure on agricultural land after independence. This pressure has intensified over time with increasing demand of land for urban expansion, infrastructure development and industrialisation. Hence, an assessment of spatial and temporal pattern of land utilisation across districts and C.D. Blocks of five districts (Howrah, Hugli, North 24 Parganas, South 24 Parganas and Nadia) surrounding Kolkata in West Bengal would be of an important academic undertaking.

Objectives

Major objectives of the study are:

- To examine the pattern of change in land use with special emphasis on non-agricultural and cultivable land across districts in West Bengal over a period of twenty nine years between 1980-81 and 2009-10.
- To capture the pattern of change in concentration of area under non-agricultural and cultivable land in 100 C.D. Blocks of five districts around Kolkata between 1996-97 and 2009-10.
- To identify the factors affecting the variation in share of area under non-agricultural land at the district level.

Data Base and Methodology

The study is based on secondary data obtained from different sources at district and C.D. Block level. While the nine-fold land utilization data for all the districts in West Bengal have been collected from the Bureau of Applied Economics and Statistics (Statistical Abstract of West Bengal), Government of West Bengal and Directorate of Economics and Statistics, Ministry of Agriculture, Government of India for a period of 29 years between 1980-81 and 2009-10, the same has been drawn for 100 C.D. Blocks in five districts (Howrah, Hugli, North 24 Parganas, South 24 Parganas and Nadia) surrounding Kolkata from the Directorate of Agriculture, Government of West Bengal for a period of thirteen years between 1996-97 and 2009-10. The nine-fold land utilization data at C.D. Block level were first time estimated and made available in 1996-97. Hence, even for district level analysis, the year 1996-97 has also been taken as a breakpoint to compare the results between the two. The 'cultivable land' has been estimated by combining fallow land, net sown area, cultivable wasteland and fallow other than current fallow land together. The term 'non-agricultural land' used in this study indicates 'area under non-agricultural uses'. However, data on cropping intensity and share of gross irrigated area to gross cropped area and share of urban population to total population have successively been collected from the Department of Agriculture, Government of West Bengal and Census of India. All the districts and blocks have been grouped into two categories such as districts and blocks surrounding and non-surrounding Kolkata. Dynamics of land use pattern at both district and block level has been examined with the help of percentage share and annual compound growth rates of various categories of land at different points of time. Multivariate linear regression model has been applied at two points of time (1996-97 and 2009-10) to identify the factors affecting the variation in share of area under non-agricultural land (dependent variable) across the districts in West Bengal. The regression equation is:

$$Y=\beta_0+\beta_1X_1-\beta_2X_2+\beta_3\beta_3+\ldots\ldots\ldots\ldots-\beta_nX_n-\varepsilon$$

where, Y indicates dependent variable; X_1, X_2, X_3 ..... X_n indicate predictor variables; β_0 indicates intercept; β_1, β_2, β_3.....β_n indicate regression coefficients; and ε indicates residual error. The independent variables used in the models are per capita income (Rupees) at current prices, share of urban population to total population, cropping intensity and share of gross irrigated area (GIA) to gross cropped area (GCA).

Results and Discussion

I. Level of Change in Land Use

Land use denotes any kind of permanent or cyclic human intervention on land in the environment to satisfy man's needs (Vink, 1975; Lillesand and Kiefer, 1987). The degree of change in land use pattern in an administrative unit or a country largely depends upon the policies adopted by the government for various development activities along with its growth of population. In last one and half decades, West Bengal has witnessed phenomenal changes in the existing land use pattern in several parts, particularly, in different C.D. Blocks of five districts (North 24 Parganas, South 24 Parganas, Nadia, Hugli and Howrah) around Kolkata due to perpetual demand of land for residential uses, infrastructure development, industrial and commercial activities, parks, educational institutes, hospitals, roads, malls etc. Moreover, a rapid real estate boom in rural areas bordering Kolkata since 2000s, especially for constructing luxurious housing complexes and apartments, is strikingly changing the land use pattern in its surrounding districts. The level of these changes in land use has been examined in terms of share of different categories of land over time.

District Level Scenario

Because of their close proximity with Kolkata which is the main commercial and financial hub of east and northeast India and home of many industrial units (both heavy and IT) operated by large public and private sector corporations, the share of area under non-agricultural uses had been higher in districts (Howrah, Hugli, Nadia, North 24 Parganas and South 24 Parganas) surrounding Kolkata compared to the remaining districts of West Bengal (Table 1), throughout the study period (1980-81 and 2009-10). All the districts of the state witnessed continuous increase in share of area under non-agricultural land and a corresponding decline in cultivable land (Table 2). Noticeably, in 2009-10, higher share in non-agricultural land had been observed in three adjacent districts to Kolkata (Howrah, Hugli and North 24 Parganas) and in a non-adjacent district Burdwan (Fig. 1). In terms of the absolute change in share of area under non-agricultural land, three districts around Kolkata, namely Howrah, Hugli and Nadia experienced high increase in its share by more than nine per cent during the study period (Fig. 2). On the other hand, only Burdwan from the category of remaining districts experienced

Table 1
West Bengal: Year-wise, Percentage of Area under Non-agricultural Land, Cultivable Land and Net Sown Area

Macro Area	Non-Agricultural land			Cultivable Land			Net Sown Area		
	1980-81	1996-97	2009-10	1980-81	1996-97	2009-10	1980-81	1996-97	2009-10
Districts around Kolkata	16.84	19.34	22.95	62.25	60.23	56.70	60.84	57.84	53.37
Remaining Districts	13.88	18.44	19.96	73.43	68.16	67.53	65.67	64.49	62.92
West Bengal	15.14	18.66	20.71	70.07	66.16	64.82	64.01	62.82	60.52

Source: Statistical Abstract of West Bengal, 1997-98 and Directorate of Economics & Statistics, Ministry of Agriculture, GOI, 2012-13

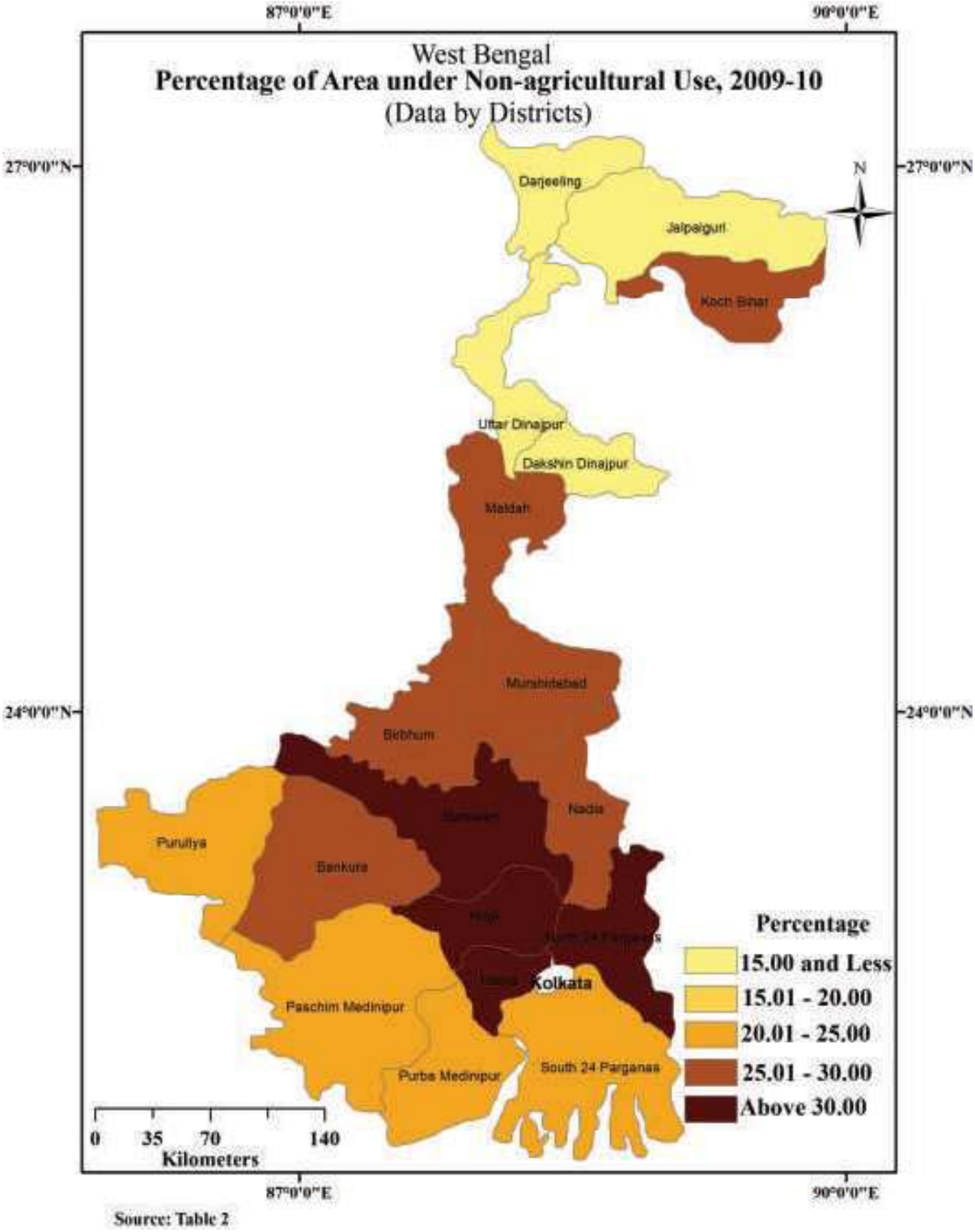
Table 2
West Bengal: Percentage of Area under Various Land Use Categories

District	Forest			Non-agricultural Land			Barren & Uncultivable Land		
	1980-81	1996-97	2009-10	1980-81	1996-97	2009-10	1980-81	1996-97	2009-10
Howrah	-	-	-	26.85	31.43	37.52	0.03	0.01	-
Hugli	0.09	0.21	0.17	20.17	26.21	30.10	0.09	0.24	0.07
Nadia	0.32	0.31	0.31	13.44	19.36	22.77	0.13	0.08	0.06
24 Parganas (N+S)*	31.34	31.71	31.93	15.98	16.51	19.81	0.02	0.11	0.04
N. 24 Parganas	n. a.	-	-	n. a.	26.31	31.88	n. a.	0.11	0.02
S. 24 Parganas	n. a.	44.12	44.93	n. a.	12.68	14.89	n. a.	0.11	0.05
Above 5 districts total	*19.35*	*19.61*	*19.65*	*16.84*	*19.34*	*22.95*	*0.05*	*0.12*	*0.05*
Burdwan	4.42	4.12	3.03	17.43	24.92	29.84	0.28	0.15	0.20
Birbhum	3.36	3.33	3.51	13.77	22.25	21.80	0.14	0.44	0.11
Bankura	20.36	21.56	21.65	13.04	18.95	20.37	0.81	0.25	0.34
Medinipur (E+S)*	12.65	12.90	13.04	14.07	20.31	19.71	0.33	0.42	0.22
Murshidabad	0.15	0.14	0.14	15.75	20.03	24.30	0.21	0.30	0.37
Dinajpur (N+S)*	0.24	0.27	0.28	8.93	12.11	12.17	0.09	0.39	0.03
Malda	0.38	0.45	0.45	16.48	17.53	23.90	0.08	-	-
Jalpaiguri	28.01	28.75	28.75	13.24	15.73	14.12	0.28	1.28	0.50
Darjeeling @	-	38.28	38.28	-	10.06	12.34	-	1.51	0.66
Cooch Bihar	1.67	2.57	1.28	13.54	20.98	20.53	0.83	0.11	0.26
Purulia	14.05	14.05	12.00	11.11	14.18	16.70	4.01	0.95	0.85
West Bengal	12.53	13.74	13.52	15.14	18.66	20.71	0.52	0.41	0.25

Cont...

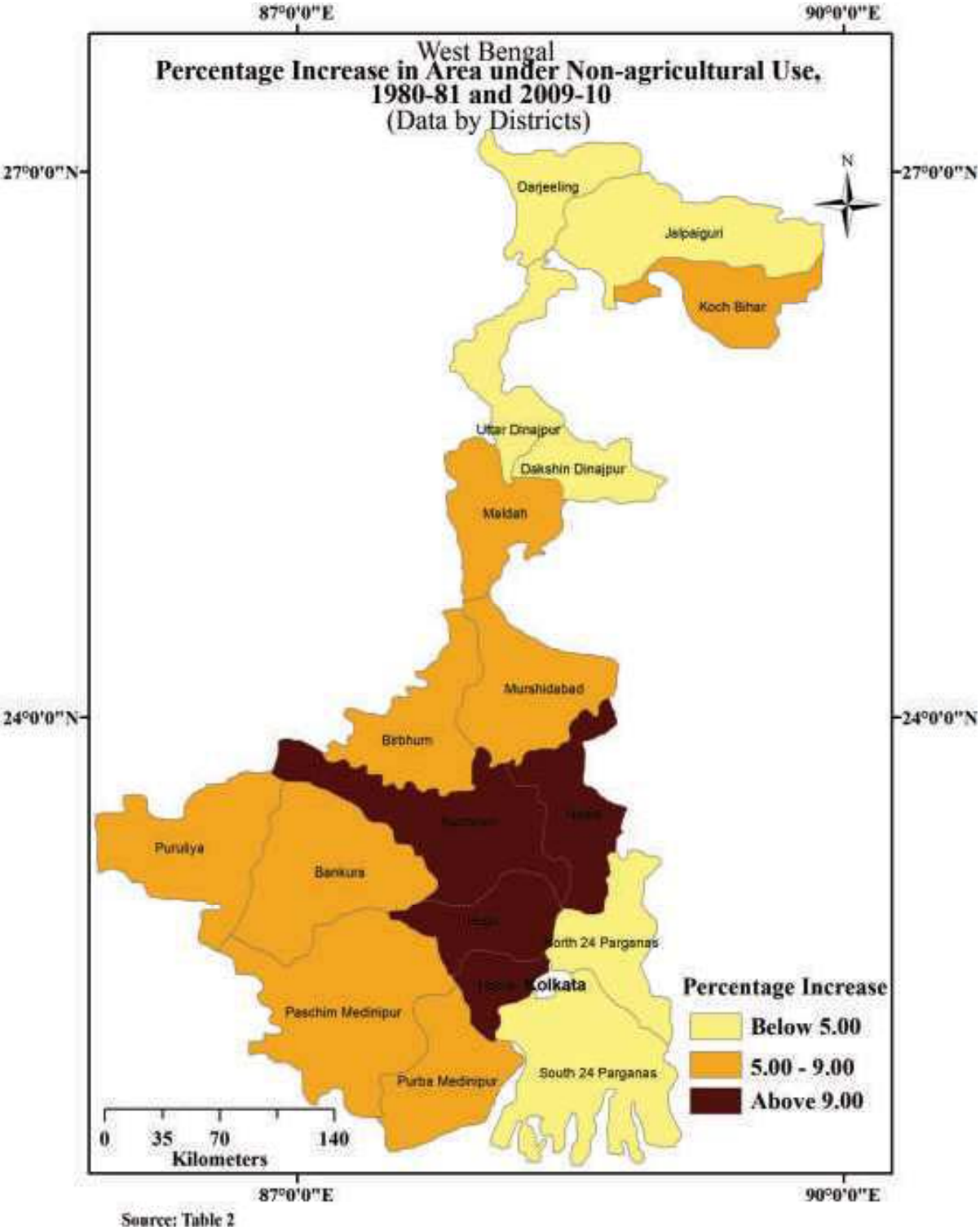
District	Pastures & Grazing Land			Misc. Tree Crops & Groves			Cultivable Land		
	1980-81	1996-97	2009-10	1980-81	1996-97	2009-10	1980-81	1996-97	2009-10
Howrah	-	-	0.06	2.98	0.76	0.99	70.13	67.80	61.43
Hugli	-	0.01	0.03	2.14	0.68	0.50	77.51	72.65	69.14
Nadia	0.05	0.05	0.01	2.73	0.92	1.00	83.33	79.28	75.85
24 Parganas (N+S)*	0.02	-	-	0.81	0.62	0.54	51.83	51.04	47.69
N. 24 Parganas	n. a.	-	-	n. a.	1.07	1.16	n. a.	72.51	66.95
S. 24 Parganas	n. a.	-	-	n. a.	0.45	0.28	n. a.	42.63	39.84
Above 5 districts total	*0.02*	*0.01*	*0.01*	*1.48*	*0.69*	*0.64*	*62.25*	*60.23*	*56.70*
Burdwan	0.04	0.03	0.03	0.97	0.19	0.20	76.86	70.59	66.70
Birbhum	0.03	0.19	0.05	1.09	1.83	0.19	81.62	71.97	74.34
Bankura	0.03	0.39	0.12	1.20	0.28	0.41	64.57	58.57	56.12
Medinipur (E+W)*	0.14	0.07	0.22	3.02	1.06	0.91	69.79	65.24	66.05
Murshidabad	-	0.09	-	1.58	1.73	0.22	82.31	77.71	74.96
Dinajpur (N+S)*	-	0.01	0.01	1.00	0.91	0.58	89.73	86.31	86.92
Malda	0.01	-	-	2.05	0.84	0.92	81.01	81.17	74.73
Jalpaiguri	0.04	0.03	-	1.03	1.40	0.85	57.40	52.81	55.79
Darjeeling @	-	0.50	0.35	-	0.57	0.72	-	49.08	47.67
Cooch Bihar	0.04	-	0.01	2.85	2.55	1.70	81.07	73.78	76.22
Purulia	-	0.11	0.41	2.30	0.52	0.51	68.54	70.19	69.54
West Bengal	0.04	0.09	0.07	1.70	0.93	0.64	70.07	66.16	64.82

Source: Statistical Abstract of West Bengal, 1997-98 and Directorate of Economics and Statistics,GOI, 2012-13.
*Note : *indicates figure for undivided district; @ Data for entire district in 1980-81 is not available*



Source: Table 2

Fig. 1



Source: Table 2

Fig. 2

similar trend. As far as the other categories of land utilisation are concerned, all of them but forest land witnessed a gradual decline in their share to total reporting area in majority of the districts and in the state as a whole (Table 2). A sharp decline in cultivable land had been observed among several districts namely, Howrah, Hugli, Burdwan, Birbhum, Bankura, Nadia, Murshidabad and Darjeeling. The state as a whole also experienced decline in share of cultivable land from 70.07 per cent in 1980-81 to 64.82 per cent in 2009-10. The increasing demand for land for non-agricultural purposes had been met by extracting land from net sown area, miscellaneous tree crops and groves and barren and uncultivable wasteland. Consequently, majority of the districts witnessed declining trends in their share of agricultural land over time (Table 2 and Table 3).

C.D. Block Level Scenario

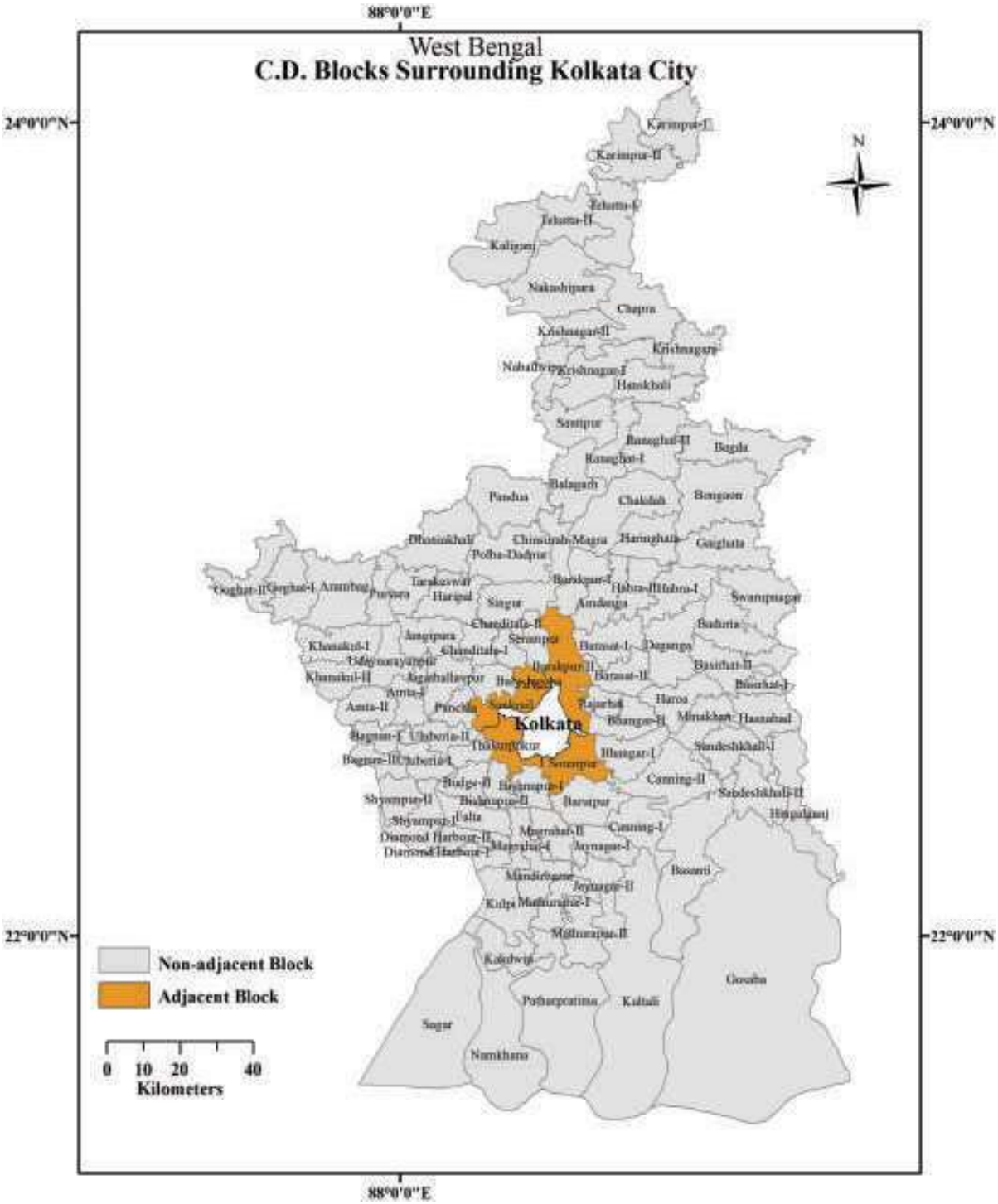
Blocks around (surrounding or adjacent to) Kolkata comprise five C.D. Blocks, namely Baly-Jagcha, Sankrail, Sonarpur, Thakurpukur and Barakpur-II (Fig. 3). Non-surrounding (or non-adjacent) blocks include remaining 95 C.D. Blocks.

Majority of the C.D. Blocks in districts around Kolkata experienced increase in share of area under non-agricultural land over time. However, the trend reversed in case of cultivable land, which virtually indicated an outflow of cultivable land from agriculture to non-agricultural activities. The share of area under non-agricultural land sharply increased in Singur and Rajarhat blocks with a corresponding decline in area under cultivable land. Notably, these are the two blocks where the government acquired large tracts of agricultural land successively for setting up a

Table 3
West Bengal: Percentage of Cultivable Waste Land, Current Fallow, Fallow other than Current Fallow and Net Sown Area

District	Cultivable Waste Land		Fallow other than Current Fallow		Current Fallow		Net Area Sown	
	1980-81	2009-10	1980-81	2009-10	1980-81	2009-10	1980-81	2009-10
Howrah	2.32	0.06	0.63	0.13	0.49	3.39	66.69	57.85
Hugli	2.39	0.50	0.22	0.15	0.36	0.12	74.53	68.37
Nadia	0.68	0.20	0.40	0.09	0.31	1.13	81.95	74.42
N. 24 Parganas	0.59	0.00	0.19	0.00	0.07	10.12	50.98	56.82
S. 24 Parganas	0.59	0.16	0.19	0.00	0.07	1.99	50.98	37.69
Burdwan	7.31	0.80	0.38	0.20	1.79	0.71	66.30	64.99
Birbhum	6.85	0.80	0.74	0.70	0.73	1.41	73.30	71.43
Bankura	9.32	0.30	1.38	0.24	1.43	4.70	52.44	50.89
Medinipur (E+W)	4.08	0.32	1.08	0.23	1.28	1.09	63.35	64.40
Murshidabad	1.47	0.19	0.82	0.03	0.50	0.10	79.52	74.64
Dinajpur (N+S)	1.57	0.03	0.08	0.04	0.37	0.54	87.71	86.31
Malda	1.97	0.02	0.03	0.09	0.26	16.37	78.75	58.24
Jalpaiguri	5.27	0.02	0.22	0.01	0.35	1.84	51.56	53.92
Darjeeling@	4.71	0.48	0.95	1.12	0.44	5.43	54.50	40.64
Cooch Bihar	3.46	0.03	0.08	0.01	0.06	0.36	77.47	75.81
Purulia	13.10	1.32	2.70	0.75	4.30	16.42	48.43	51.05
West Bengal	4.39	0.35	0.70	0.22	0.96	3.72	64.01	60.52

Source: Statistical Abstract of West Bengal, 1997-98 and Directorate of Economics and Statistics, GOI, 2012-13.
Note: @ Data for entire district in 1980-81 is not available


88°0'0"E
West Bengal
C.D. Blocks Surrounding Kolkata City
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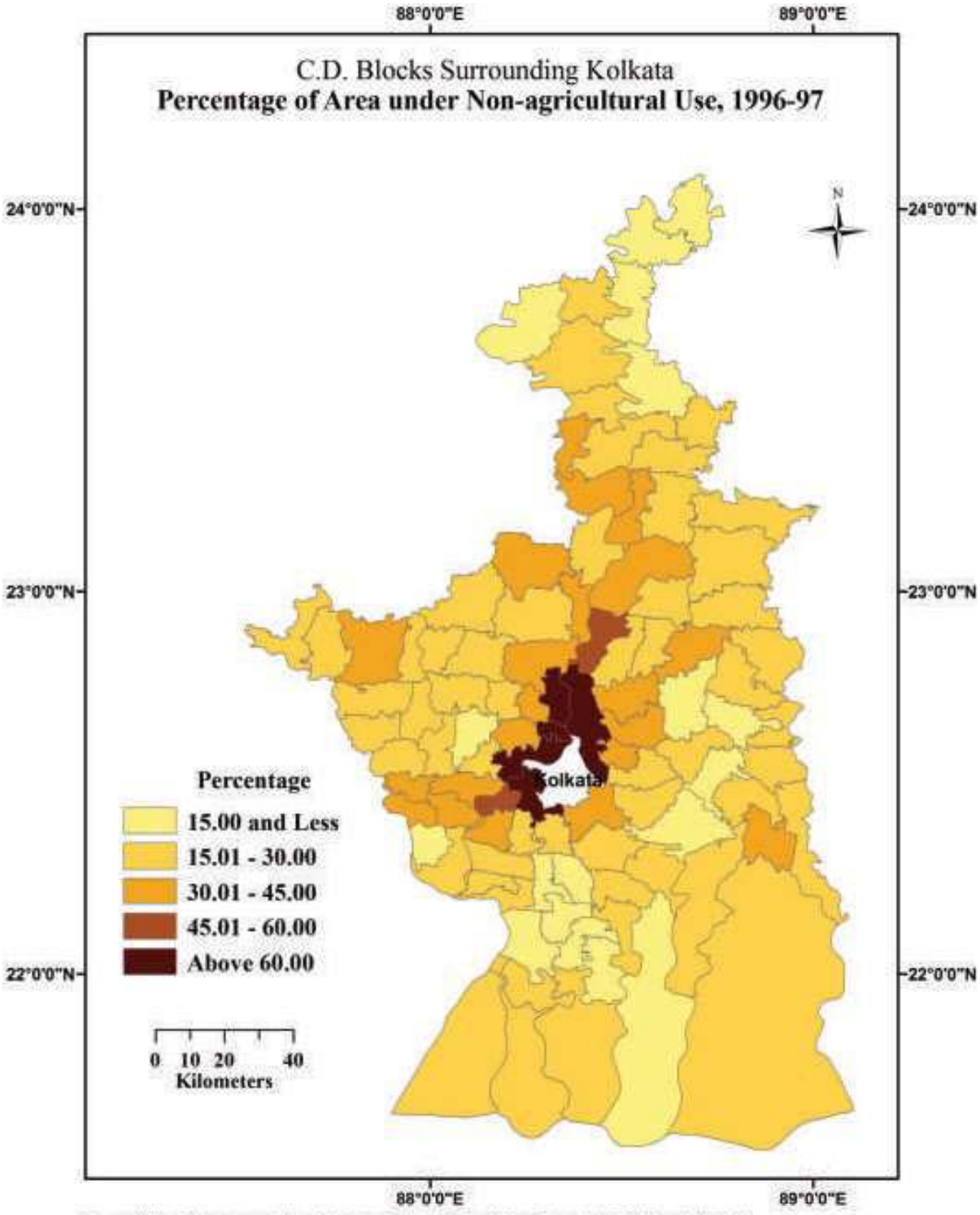
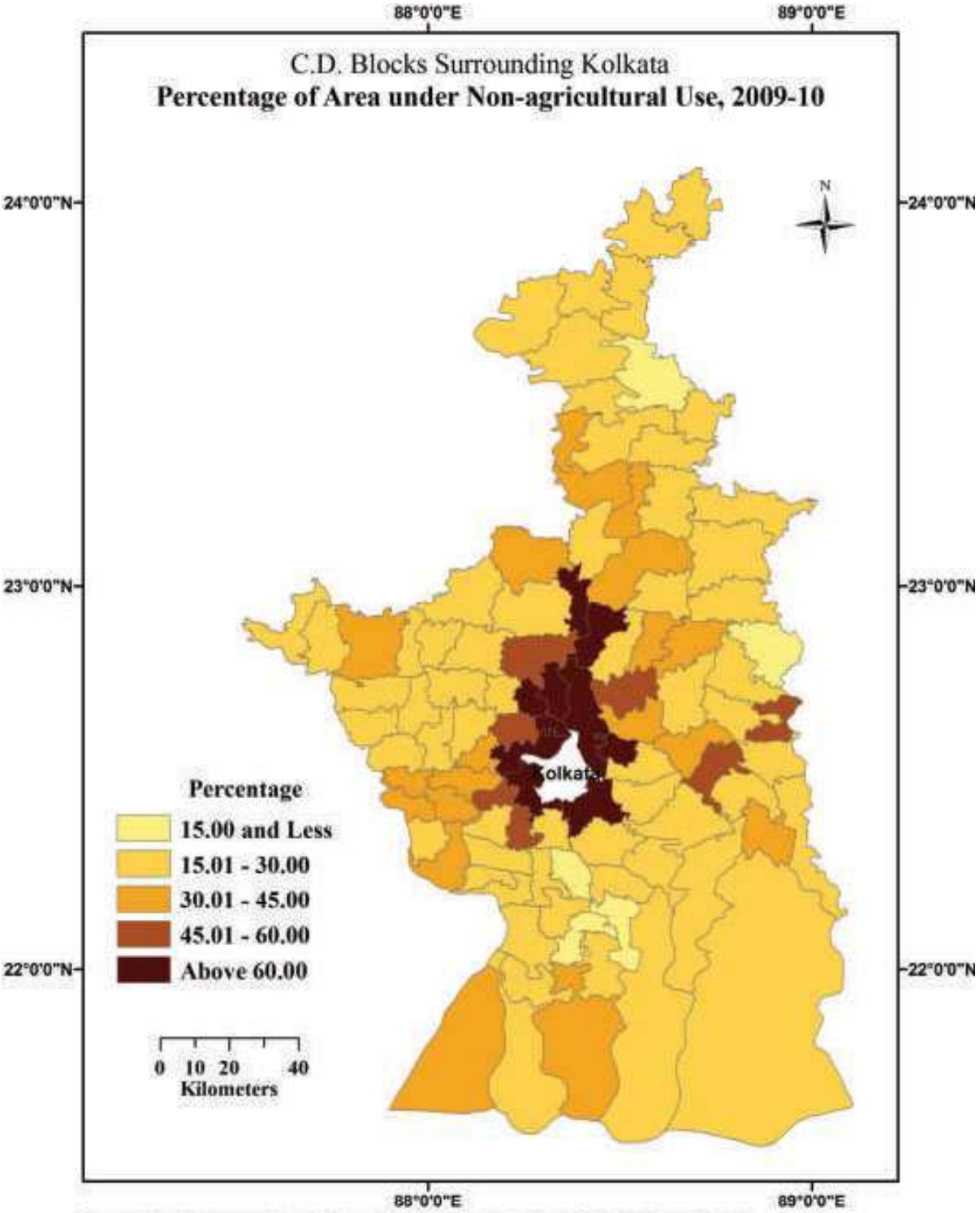
0 10 20 40
Kilometers

Fig. 3



Source: The Directorate of Agriculture, Government of West Bengal, 1996-97 and 2009-10.

Fig. 4



Source: The Directorate of Agriculture, Government of West Bengal, 1996-97 and 2009-10.

Fig. 5

manufacturing industry and an information technology Hub. In 1996-97, few blocks adjacent to Kolkata had a share of above 60 per cent in area under non-agricultural land (Fig. 4). However, the pattern changed over time; and several other non-adjacent blocks entered into this group in 2009-10 (Fig. 5). The count of blocks with a share of area under non-agricultural land between 45.01 and 60.00 per cent also increased from two to seven.

The decline in cultivable land might not necessarily mean decline in net sown area. The demand of land for non-agricultural uses might be met at the expense of cultivable waste land or fallow other than current fallow or from the both. But the decline of net sown area is a matter of great concern. Surprisingly, a decline in net sown area had been noticed among majority of these C.D. Blocks. Low net return from cultivation (Roy, 2007; Khasnabis, 2008) perhaps became a crucial factor that made a section of farmers to be engaged in non-farm activities by selling off their land for non-agricultural purposes. The count of blocks with very low share of net sown area increased sharply over time around and to the north of Kolkata (Fig. 6 and Fig. 7).

II. Growth Pattern of Non-agricultural and Cultivable Land

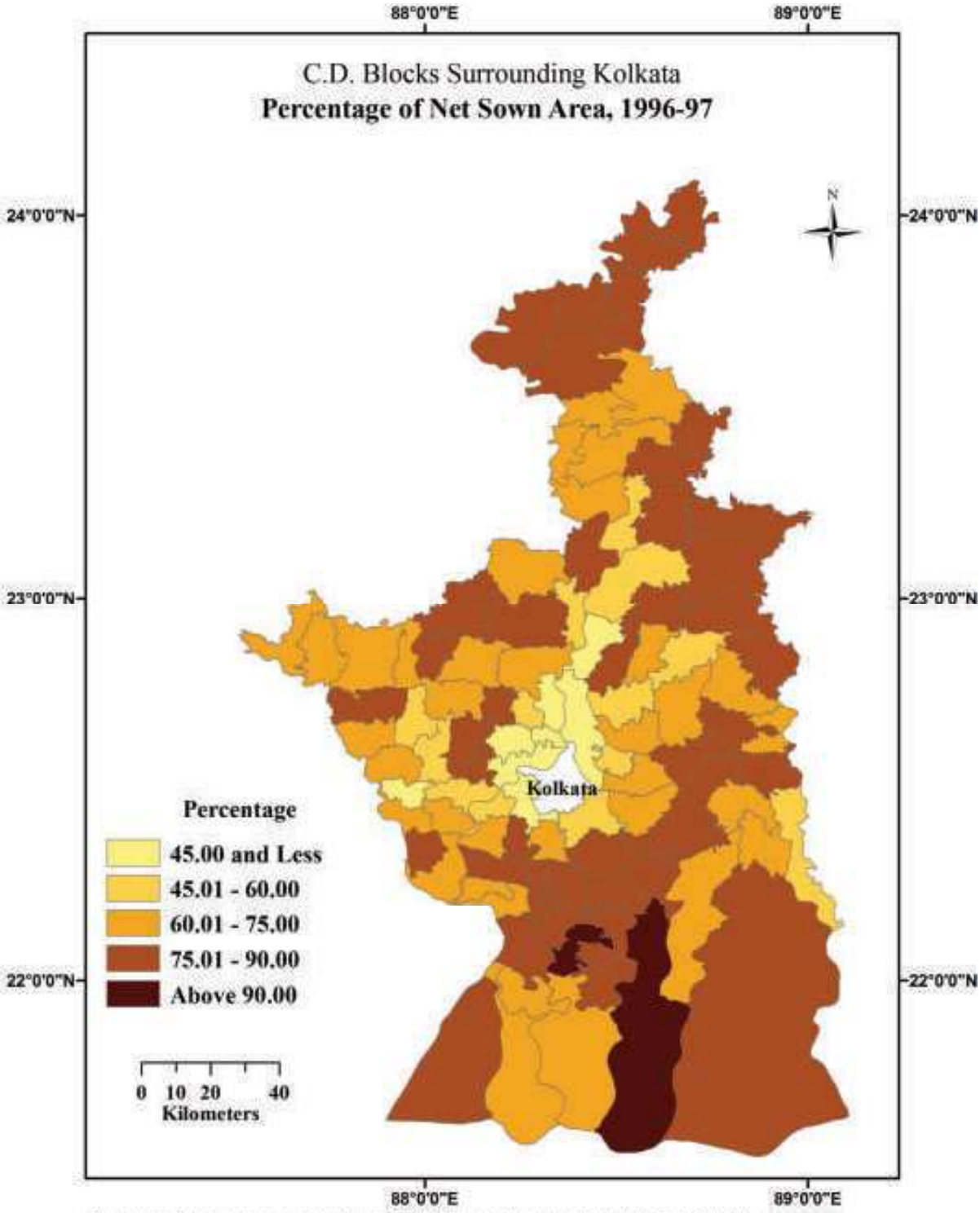
The pattern of change in non-agricultural and cultivable land has been studied in terms of annual compound growth rates. At district level, the entire study period has been divided into two sub-periods: (i) 1980-81 to 1996-97 and (ii) 1996-97 to 2009-10 for two reasons: firstly, for better understanding of changing scenario in growth of these two categories of land; and secondly, to keep parity with the study period taken for block level analysis.

District Level Scenario

All the districts witnessed a positive growth in area under non-agricultural land between 1980-81 and 2009-10, whereas an inverse scenario had been noticed in case of cultivable land (Fig. 8 and Fig.9). Non-adjacent districts, such as Bankura (1.73 per cent) and Birbhum (1.48 per cent) successively registered high and moderate annual growth in non-agricultural land (Table 4). Noticeably, this growth was achieved primarily in the first sub-period (1980-81 to 1996-97). The growth rates sharply declined in these two districts in the second sub-period (1996-97 to 2009-10). Birbhum had actually experienced negative growth (-0.17) in second sub-period along with several other non-adjacent districts. On the contrary, five districts, namely Howrah, Hugli, Nadia, North 24 Parganas and South 24 Parganas around Kolkata jointly witnessed a steady positive growth in area under non-agricultural land in both sub-periods at the expense of area under cultivable land (Table 5). Interestingly, in the second sub-period, the annual growth in area under non-agricultural land in districts around Kolkata became more than double the annual growth of the non-surrounding districts.

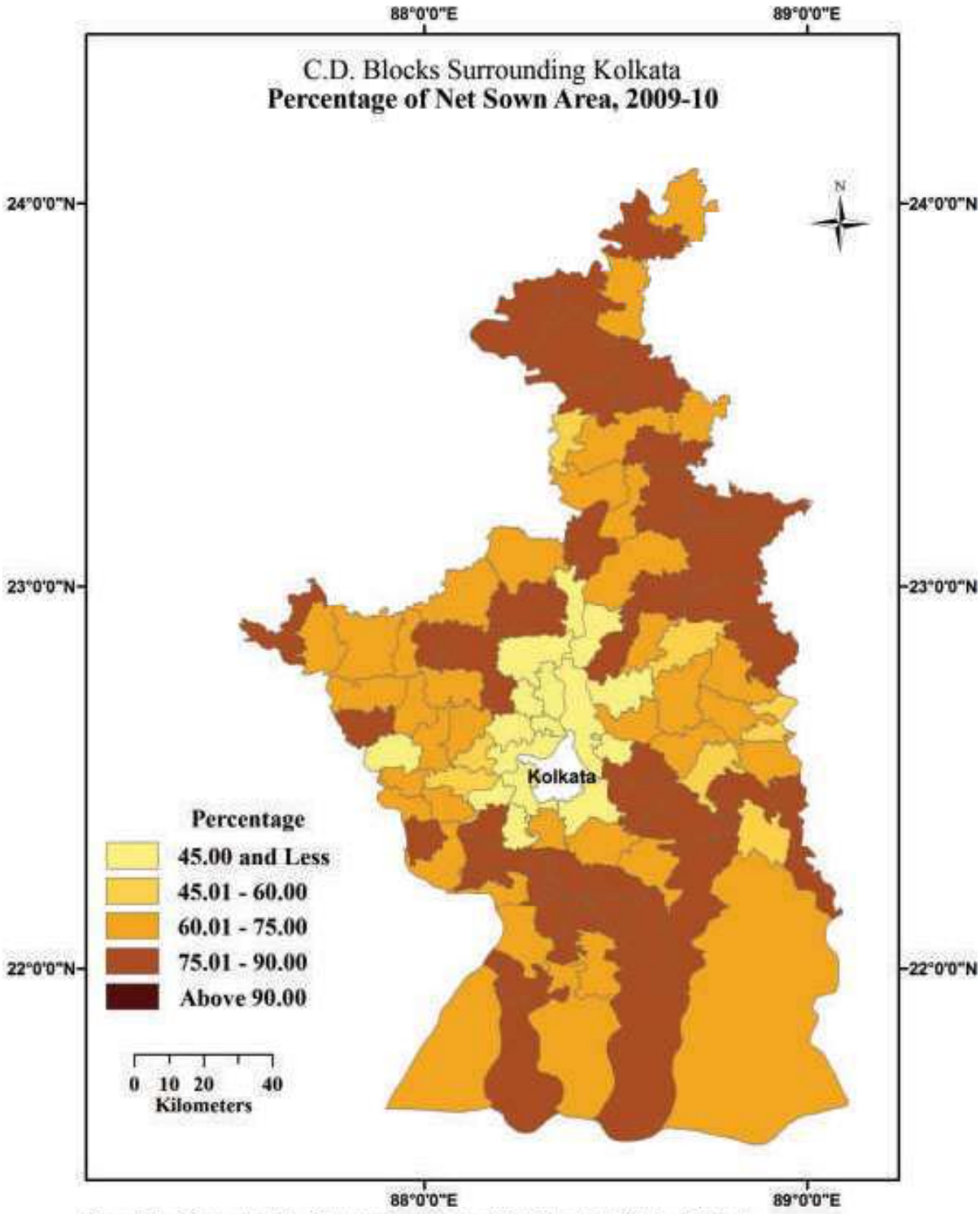
C.D. Block Level Scenario

The growth in non-agricultural land among the C.D. Blocks of districts surrounding Kolkata was highly varied during 1996-97 to 2009-10 (Fig. 10). None of the C.D. Blocks adjacent to Kolkata enjoyed high annual growth rate (six per cent per annum or more); only two blocks (Sonarpur and Thakurpukur) experienced moderate growth rates (Table 6). On the other hand, a number of non-adjacent blocks registered high annual growth in area under non-agricultural land and many others witnessed moderate growth rates. In last two decades, various development projects (manufacturing and services) under government and private sectors had been initiated in several non-adjacent blocks, such as Rajarhat, Baruipur, Dankuni, Uluberia-II,



Source: The Directorate of Agriculture, Government of West Bengal, 1996-97 and 2009-10.

Fig. 6



Source: The Directorate of Agriculture, Government of West Bengal, 1996-97 and 2009-10.

Fig. 7

Table 4
West Bengal: Annual Compound Growth Rates of Area under Non-agricultural and Cultivable Land

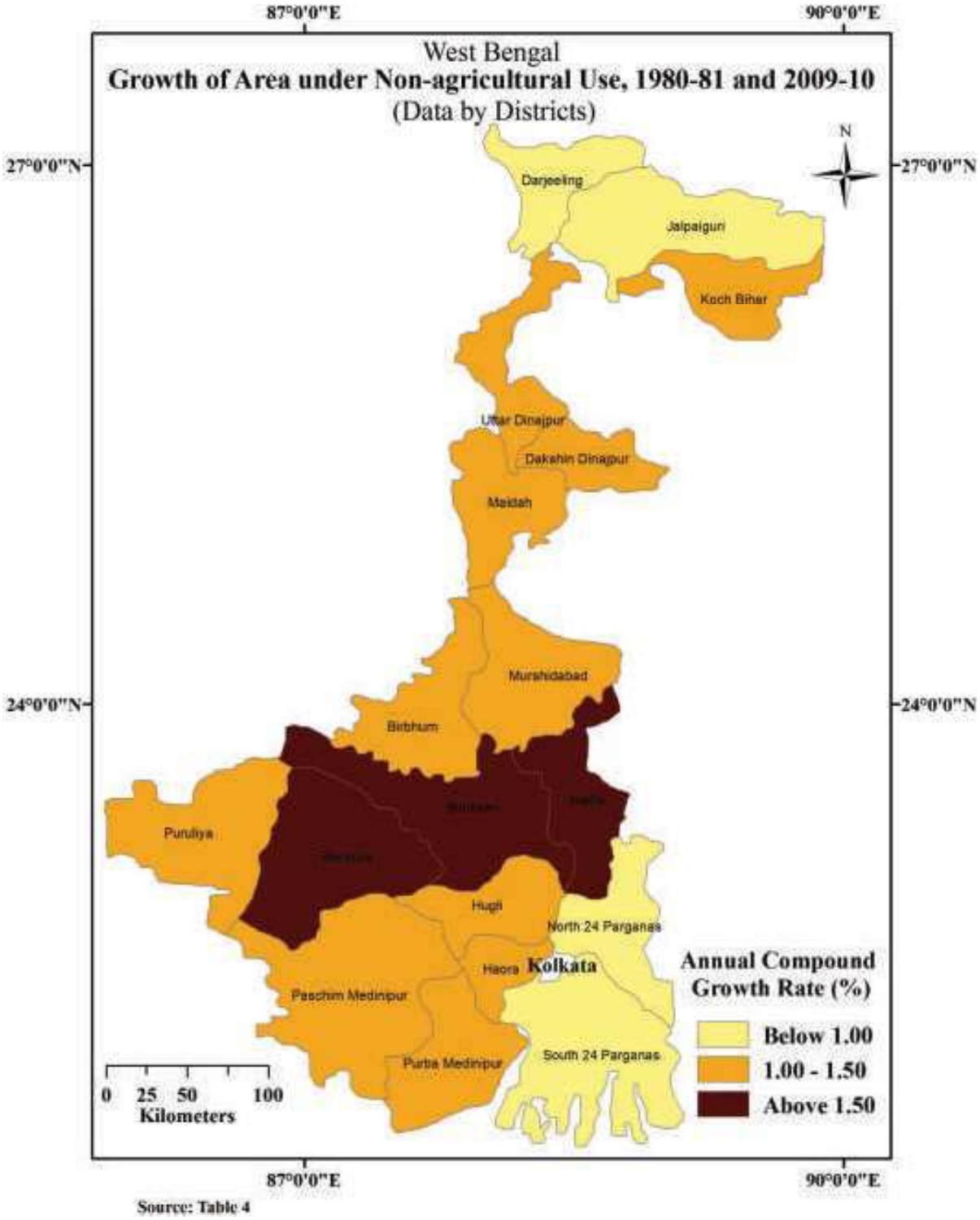
District	Area under Non-agricultural Land			Area under Cultivable Land		
	1980-81 to 1996-97	1996-97 to 2009-10	1980-81 to 2009-10	1980-81 to 1996-97	1996-97 to 2009-10	1980-81 to 2009-10
Howrah	0.58	1.52	1.01	-0.61	-0.61	-0.61
Hugli	1.61	1.10	1.38	-0.45	-0.35	-0.41
Nadia	2.30	1.26	1.83	-0.32	-0.34	-0.33
24 Parganas (N+S)*	0.13	1.36	0.68	-0.17	-0.57	-0.35
N. 24 Parganas	-	1.66	-	-	-0.44	-
S. 24 Parganas	-	1.10	-	-	-0.66	-
Burdwan	1.74	1.40	1.86	-0.55	-0.43	-0.50
Birbhum	2.85	-0.17	1.48	-0.98	0.23	-0.44
Bankura	2.39	0.93	1.73	-0.86	-0.33	-0.62
Medinipur (E+W)*	2.15	-0.22	1.08	-0.59	0.10	-0.28
Murshidabad	1.46	1.50	1.48	-0.41	-0.27	-0.35
Dinajpur (N+S)*	1.92	0.05	1.08	-0.24	0.06	-0.11
Malda	0.57	2.41	1.39	0.19	-0.64	-0.18
Jalpaiguri	1.15	-0.83	0.26	-0.45	0.42	-0.06
Darjeeling @	-	1.58	-	-	-0.22	-
Cooch Bihar	2.78	-0.39	1.34	-0.58	0.02	-0.31
Purulia	1.54	1.29	1.43	0.15	-0.04	0.06
West Bengal	1.38	0.79	1.12	-0.29	-0.17	-0.24

Source: Statistical Abstract of West Bengal, 1997-98 and Directorate of Economics & Statistics,GOI, 2012-13
*Note: * indicates figure for undivided district; @ Data for entire district in 1980-81 is not available.*

Table 5
West Bengal: Year-wise, Annual Compound Growth Rates of Area under Non-agricultural Land, Cultivable Land and Net Sown Area

Macro Area	Non-agricultural Land			Cultivable Land			Net Sown Area		
	1980-81 to 1996-97	1996-97 to 2009-10	1980-81 to 2009-10	1980-81 to 1996-97	1996-97 to 2009-10	1980-81 to 2009-10	1980-81 to 1996-97	1996-97 to 2009-10	1980-81 to 2009-10
Districts around Kolkata	0.79	1.31	1.02	-0.28	-0.48	-0.37	-0.39	-0.64	-0.50
Remaining Districts	1.99	0.60	1.37	-0.27	-0.08	-0.18	0.09	-0.20	-0.04
West Bengal	1.38	0.79	1.12	-0.29	-0.17	-0.24	-0.05	-0.30	-0.16

Source: Statistical Abstract of West Bengal, 1997-98 and Directorate of Economics and Statistics, Ministry of Agriculture, GOI, 2012-13.



Source: Table 4

Fig. 8

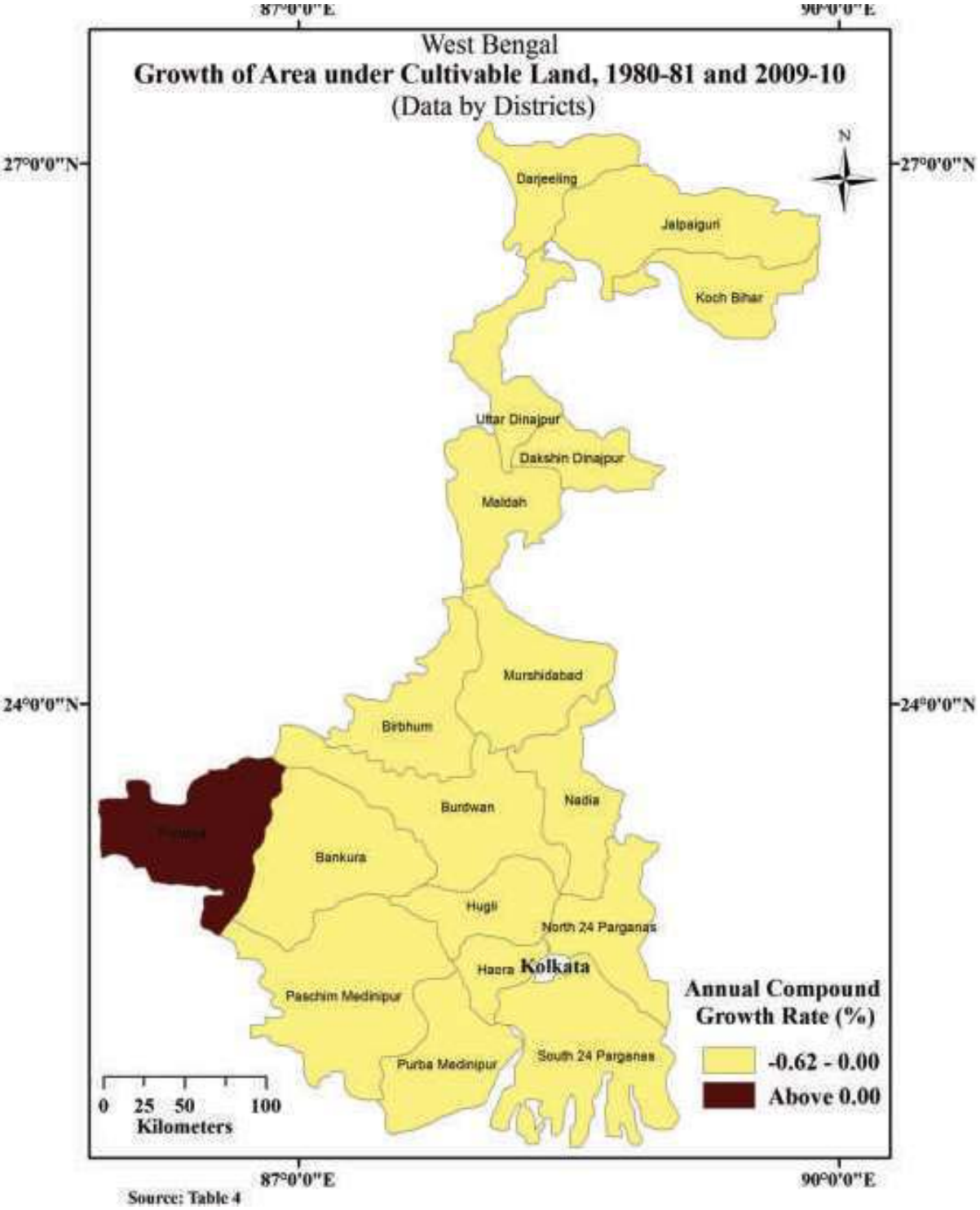

West Bengal
Growth of Area under Cultivable Land, 1980-81 and 2009-10
(Data by Districts)
87°0'0"E
90°0'0"E
27°0'0"N
24°0'0"N
N
Darjeeling
Jalpaiguri
Koch Bihar
Uttar Dinajpur
Dakshin Dinajpur
Maldah
Murshidabad
Birbhum
Bardwan
Nadia
Purulia
Bankura
Hugli
North 24 Parganas
Haora
Kolkata
Paschim Medinipur
Purba Medinipur
South 24 Parganas
0 25 50 100
Kilometers
Annual Compound Growth Rate (%)
-0.62 - 0.00
Above 0.00
Source: Table 4

Fig. 9

Table 6
C.D. Blocks Surrounding Kolkata: Annual Compound Growth Rates of Area under Non-agricultural and Cultivable Land, 1996-97 and 2009-10

C.D. Block	Area under Non-agricultural Land	Cultivable Land	C.D. Block	Area under Non-agricultural Land	Cultivable Land
Baly-Jagcha	1.59	-18.51	Diamond Harbour-II	-1.13	0.45
Sankrail	0.63	-3.81	Magrahat-I	1.70	-0.42
Sonarpur	4.36	-4.37	Magrahat-II	0.41	-0.02
Thakurpukur	3.07	CY=0	Mathurapur-I	14.12	0.17
Barakpur-II	1.52	-3.29	Mathurapur-II	4.44	-1.13
Above 5 Blocks (Adjacent Blocks to Kolkata)	***2.15***	***-5.05***	Patharpratima	1.93	-1.83
Balagarh	-1.23	0.75	Kakdwip	-3.54	0.05
Pandua	-0.28	0.13	Namkhana	-3.11	0.96
Chinsura-Mogra	3.76	-4.12	Sagar	5.30	-2.10
Polba-Dadpur	1.23	-0.36	Falta	0.83	-0.16
Dhaniakhali	1.99	-0.43	Mandirbazar	2.86	0.19
Tarakeswar	1.33	-0.27	Kulpi	13.63	-2.35
Haripal	-0.74	0.27	Amdanga	1.48	0.07
Singur	3.73	-3.00	Barasat-I	2.35	-1.70
Jangiapara	0.99	-0.02	Barasat-II	1.49	-0.49
Chanditola-I	-1.30	0.25	Barakpur-I	1.13	-1.65
Chanditola-II	3.89	-4.31	Deganga	2.25	-0.53
Serampur-Uttarpara	2.36	-9.78	Habra-I	-0.17	0.06
Pursura	-0.19	-0.02	Habra-II	1.42	-0.91
Arambag	-0.40	0.40	Rajarhat	3.80	-4.03
Khanakul-I	1.96	-0.66	Baduria	0.47	-0.48
Khanakul-II	-0.80	0.22	Basirhat-I	7.55	-2.05
Goghat-I	2.36	-0.36	Basirhat-II	8.72	-2.00
Goghat-II	-1.75	0.48	Haroa	3.10	-1.03
Panchla	7.72	-2.76	Hasnabad	4.11	3.05
Domjur	2.45	-2.23	Hinjalganj	0.38	-0.27
Jagatballavpur	5.06	-1.05	Minakhan	12.77	-5.10
Uluberia-I	1.09	-0.59	Sandeshkhali-I	-1.56	0.44
Uluberia-II	3.02	-1.99	sandeshkhali-II	0.00	-0.09
Bagnan-I	-1.29	1.05	Swarupnagar	-0.86	0.00
Bagnan-II	0.00	-0.06	Bagdah	-0.04	0.25
Shyampur-I	2.18	-1.01	Bongaon	-2.59	0.70
Shyampur-II	3.20	-0.63	Gaighata	0.39	-0.10
Amta-I	-1.85	0.42	Krishnanagar-I	1.30	-0.51
Amta-II	1.18	-0.41	Krishnanagar-II	-0.49	0.16
Udaynarayanpur	-1.77	0.73	Nabadwip	0.86	-0.62
Bhangore-I	0.73	0.02	Chapra	3.62	-0.46
Bhangore-II	-1.29	0.94	Krishnaganj	4.02	-0.87
Baruipur	3.71	-1.10	Karimpur-I	13.99	-1.61
Joynagar-I	0.93	0.19	Karimpur-II	7.69	-0.93
Joynagar-II	-3.28	0.67	Tehatta-I	7.11	-0.94
Kultali	16.88	-1.52	Tehatta-II	-1.33	0.30
Canning-I	1.41	-0.43	Kaliganj	3.29	-0.93
Canning-II	4.31	-1.14	Nakashipara	-0.58	0.09
Basanti	-0.80	0.25	Santipur	0.91	-0.53
Gosaba	4.04	-0.99	Hanskhali	2.81	-0.68
Bishnupur-I	-0.61	0.47	Ranaghat-I	-2.45	1.36
Bishnupur-II	8.99	-4.53	Ranaghat-II	-0.69	0.08
Budge Budge-I	0.66	-1.21	Chakdah	-0.49	0.26
Budge Budge-II	-3.66	1.57	Haringhata	0.44	-0.10
Diamond Harbour-I	2.94	-0.84	***All Non-adjacent Blocks to Kolkata***	***1.49***	***-0.45***

Source: The Directorate of Agriculture, Government of West Bengal, 1996-97 and 2009-10.
Note: CY = 0 indicates the value of a particular category of land in latest year 0.

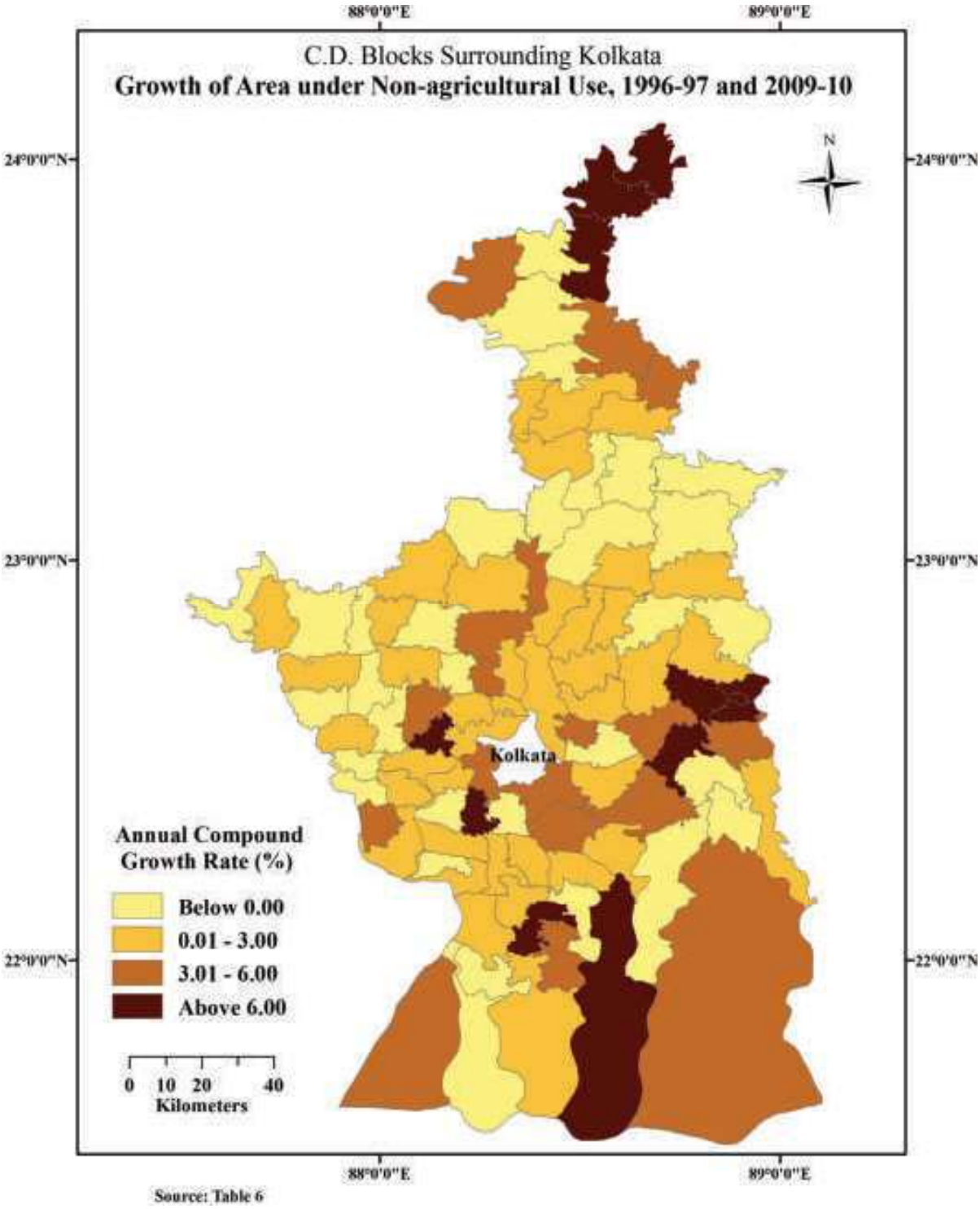

88°0'0"E
89°0'0"E
C.D. Blocks Surrounding Kolkata
Growth of Area under Non-agricultural Use, 1996-97 and 2009-10
24°0'0"N
23°0'0"N
22°0'0"N
N
Kolkata
Annual Compound Growth Rate (%)
Below 0.00
0.01 - 3.00
3.01 - 6.00
Above 6.00
0 10 20 40
Kilometers
Source: Table 6

Fig. 10

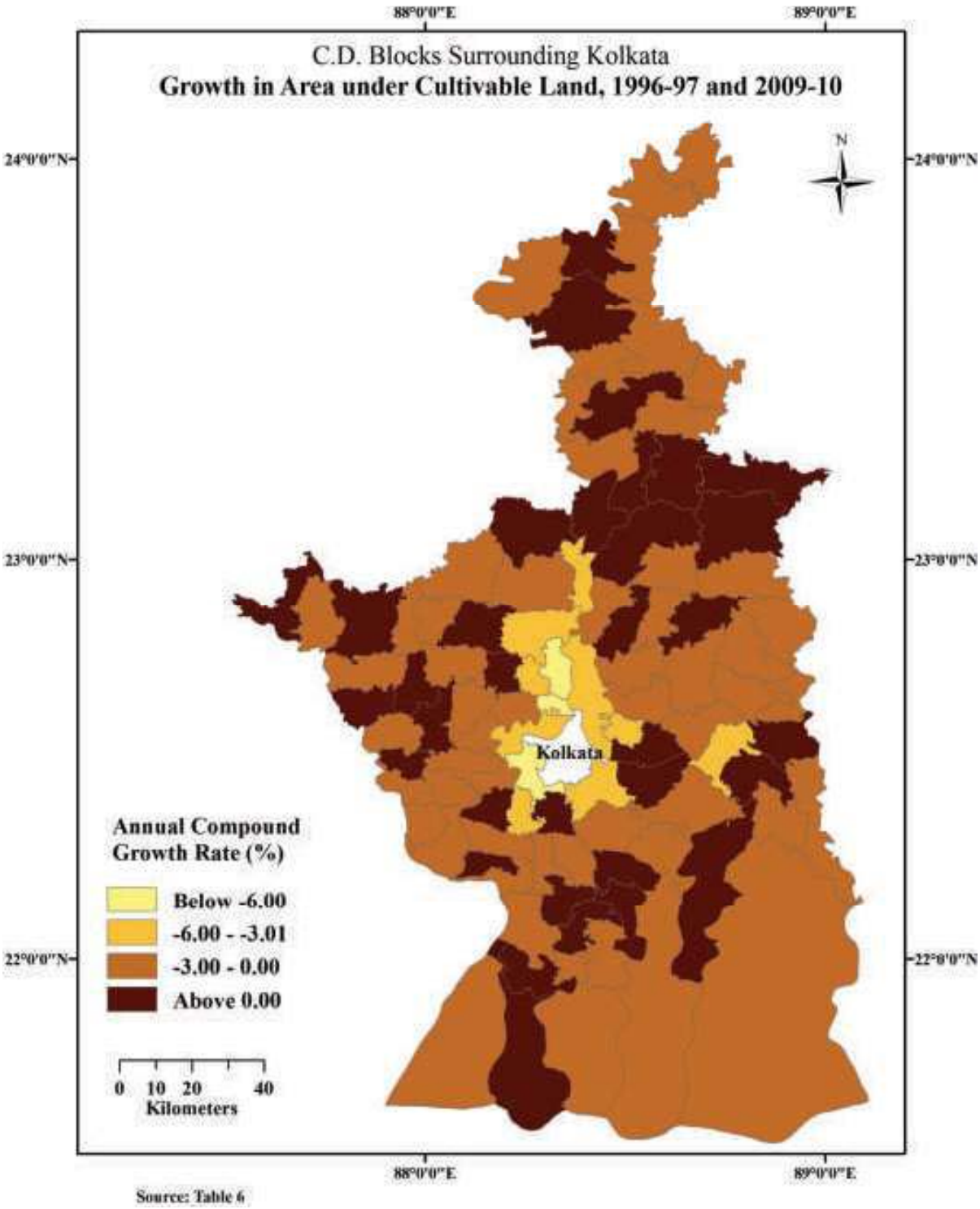

88°0'0"E
89°0'0"E
C.D. Blocks Surrounding Kolkata
Growth in Area under Cultivable Land, 1996-97 and 2009-10
24°0'0"N
23°0'0"N
22°0'0"N
N
Kolkata
Annual Compound Growth Rate (%)
Below -6.00
-6.00 - -3.01
-3.00 - 0.00
Above 0.00
0 10 20 40
Kilometers
Source: Table 6

Fig. 11

Table 7
West Bengal: Year-wise, Regression Analysis of Factors affecting Variation in Percentage of Non-agricultural Land across Districts
Dependent variable: Year-wise, Percentage of Area under Non-agricultural Land to Total Reporting Area

Independent Variables	Regression Coefficient		t-value		Standard Error	
	1996-97	2009-10	1996-97	2009-10	1996-97	2009-10
1. Per capita income (Rs.)	- 0.06	0.28	-0.09	1.23	0.71	0.22
2. Share of urban population to total population	0.17	0.16	2.19**	1.84**	0.08	0.09
3. Cropping intensity	0.07	0.07	1.85*	2.02*	0.04	0.03
4. Share of GIA to GCA	0.11	0.17	1.20	2.20	0.08	0.08
5. Intercept	2.26	-7.15	0.23	-0.95	9.78	7.49

Year 1996-97: R-squared = 0.59, Adjusted R-squared = 0.46, F = 4.68 and N = 18;
Year 2009-10: R-squared = 0.70, Adjusted R-squared = 0.60, F = 7.42 and N = 18.
*Note: ** and * indicate level of significance at 5 and 10 percent level respectively.*
Source: Bureau of Applied Economics and Statistics, GOWB, 2011; Dept. of Agriculture, GOWB, 2012; Census of India, 2001 and 2011

Singur, Gosaba, Haroa, Mathurapur-II and Sonarpur etc; and all of these witnessed moderate growth in area under non-agricultural land. In case of area under cultivable land, all adjacent blocks and majority of the non-adjacent blocks experienced negative growth (Fig. 11, Table 6). Two adjacent blocks Baly-Jagcha and Thakurpukur registered high negative growth (below -6.00 per annum) in cultivable land largely due to the conversion of cultivable land for residential uses.

III. Determinants of Change in Share of Non-agricultural Land across Districts

Several factors, such as real estate investment and net income per unit of agricultural land etc. play significant role in change in share of area under non-agricultural land (dependent variable). However, non-availability of data on these variables restricted estimating their impact on the dependent variable. Thus, a set of independent variables[1] comprising per capita income (Rupees) at current prices, share of urban population to total population, cropping intensity and share of gross irrigated area (GIA) to gross cropped area (GCA) have been used in the multivariate linear regression model for analyzing variation in share of area under non-agricultural land at two points (1996-97 and 2009-10) of time across districts in West Bengal.

The model determined share of urban population and cropping intensity as the two significant predictor variables successively at five and ten per cent level of significance for both years (Table 7). The determination of cropping intensity as a statistically significant predictor variable by the model implies that increase in share of area under non-agricultural land with a decline in net sown area (as noticed earlier) is likely to increase the cropping intensity. The adjusted R-squared values of 0.46 and 0.60 successively for both base and latest years implied that 46 per cent and 60 per cent of the variation in share of non-agricultural land to total reporting area were explained by the independent variables used in the analysis for years 1996-97 and 2009-10.

Conclusions

The state as a whole witnessed continuous increase in the share of area under

1. Initially, five predictor variables, namely yield of rice, per capita income, share of urban population to total population, cropping intensity and share of gross irrigated area (GIA) to gross cropped area (GCA) were used in the regression model for both the base and latest years. However, yield of rice was dropped as an independent variable from the regression model due to higher multi-co-linearity with the share of GIA to GCA; and of course the model excluding yield of rice provided better result than the model excluding share of GIA to GCA.

non-agricultural land and a corresponding decline in cultivable land over time. Similar picture had been noticed among majority of the C.D. Blocks of five districts around Kolkata. However, throughout the study period, the share of area under non-agricultural land remained higher in the group of districts around Kolkata than the remaining districts in the state. In the first sub-period between 1980-81 and 1996-97, the districts around Kolkata jointly experienced lower annual growth in area under non-agricultural land than the remaining districts. This growth pattern, however, reversed in the second sub-period between 1996-97 and 2009-10, whereby the former enjoyed higher annual growth (1.31 per cent) in area under non-agricultural land than the latter (0.60 per cent). At micro level, a number of C.D. Blocks enjoyed very high annual growth (above six per cent) in area under non-agricultural land but unlike district level scenario, none of them was adjacent to Kolkata. Although the share of urban population to total population had been determined as a statistically significant predictor variable at 5 per cent level of significance by the regression model, the per capita income came out as an insignificant predictor variable.

Acknowledgements

Author is grateful to Prof. Sucharita Sen, Centre for the Study of Regional Development, Jawaharlal Nehru University, New Delhi; Prof. H. S. Mangat, the Editor, Punjab Geographer and Dr. Rajib Stradhar, Assistant Professor, Institute of Economic Growth, New Delhi for their critical evaluation and suggestions that assuage this piece of work in present form.

References

Best, R. H. and Champion, A.G. 1970. Regional conversions of agricultural land to urban use in England and Wales 1945-67. *Transaction of the Institute of British Geographers*, 49: 15-32.

Blewett, R.A. and Lane, J. I. 1988. Development rights and the differentials assessment of agricultural land: Functional valuation of farmland is ineffective for preserving open space and subsidizes speculation. *American Journal of Economics and Sociology*, 47 (2): 195-205.

Bhupal, D. S. 2012. Changing land use pattern in India and its impact on supply of fresh vegetables. *Journal of Agricultural Science and Technology,* 2: 952-961.

Dadhich, P. N. and Hanaoka, S. 2011. Spatio-temporal urban growth modeling of Jaipur, India. *Journal of Urban Technology*, 18 (3): 45-65.

Dewan, A. M. and Yamaguchi, Y. 2009. Land use and land cover change in Greater Dhaka, Bangladesh: Using remote sensing to promote sustainable urbanization. *Applied Geography*, 29: 390-401.

Ding, C. 2007. Policy and praxis of land acquisition in China. *Land Use Policy*, 24: 1-13.

Drozd, D. J. and Johnson, B. B. 2004. Dynamics of a rural land market experiencing farmland conversion to acreages: the case of Saunders County, Nebraska. *Land Economics*, 80 (2): 294-311.

Ge, H. 2012. Farmland acquisition system in China: problems and responses. *Canadian Social Science*, 8(4): 258-63.

Ho, S. P. S and Lin, G. C. S. 2004. Non-agricultural land use in post-reform China. *China Quarterly*, 179: 758-781.

Hui, E. C. M. and Bao, H. 2013. The logic behind conflicts in land acquisition in contemporary China: A framework based upon game theory. *Land Use Policy*, 30: 373-380.

Johnson, C. and Haque, I. 2014.Compensating displacement: the politics of urban land acquisition in Bangladesh. Presented at the World Bank Conference on 'Land and Poverty' at the World Bank, Washington D.C., March 24-27, 2014.

Khasnabis, R. 2008. The economy of West Bengal. *Economic and Political Weekly*, 43(52):103-15.

Kumar, V. 2012. SEZs land linked conflicts: In quest of amicable resolutions. *Indian Streams Research Journal*, 2(7): 1-15.

Kumar, A., Pandey, A.C., Hoda, N. and Jeyaseelan, A.T. 2011. Evaluating the long term urban expansion of Ranchi urban agglomeration, India using geospatial technology. *Journal of the Indian Society of Remote Sensing*, 39 (2): 213-224.

Lillesand, T. and Kiefer R.W. 1987. *Remote Sensing and Image Interpretation*. John Wiley and Sons Inc, New York: 1-746.

Mohan, V. 2013. Cultivable land continues to shrink. The Times of India,(16/08/2013).

Narain, V. 2009. Growing city, shrinking hinterland: land acquisition, transition and conflict in peri-urban Gurgaon, India. *Environment and Urbanization*, 21(2): 501-512.

Plantinga, A. J. and Miller, D.J. 2001. Agricultural land values and the value of rights to future land development. *Land Economics*, 77(1): 56-67.

Pyle, L. A. 1985. The land market beyond the urban fringe. *Geographical Review*,75(1): 32-43.

Reddy, V. R. and Reddy, B.S. 2007. Land alienation and local communities case studies in Hyderabad-Secunderabad. *Economic and Political Weekly*, 42(31): 3233-3240.

Roy, A. 2007. Paradigmatic change in cropping pattern and net return from the major crops in West Bengal. *Asian Studies*, 25(2): 28-46.

Roy, A. 2014. Development, land acquisition and changing facets of rural livelihood: A case study from West Bengal. *Journal of Rural Development*, 33(1): 15-32.

Shaklee, R. V., Sorenson, C.J. and Bussing, C.E. 1984. Conversion of agricultural land in Wyandotte County, Kansas. *Transactions of the Kansas Academy of Science*, 87(1-2): 1-11.

Su, S., Jiang, Z., Zhang, Q. and Zhang, Y.2011. Transformation of agricultural landscape under rapid urbanization: A threat to sustainability in Hang-Jia-Hu region, China. *Applied Geography*, 31: 439-449.

Tang, Y., Mason, R.J. and Sun, P. 2012. Interest distribution in the process of coordination of urban and rural construction land in China. *Habitat International*, 36: 388-395.

Vink, A. P. A. 1975. *Land Use in Advancing Agricultural*. Springer, Berlin: 1-394.

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