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SOCIO-ECONOMIC FACTORS AND POPULATION GROWTH

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Introduction

It has been claimed by many social scientists—especially by many of those who have been influenced by the ideas of Karl Marx—that both social and economic factors are important as determinants of population growth. They insist that the economic condition of a country plagued by the problem of over-population has to be improved and, at the same time, basic structural changes have to be brought about in its polity and economy before it can expect a lasting solution to the problem. The implication is that economic development is not enough : economic development has to be achieved within a socialist framework in order that a true and lasting solution may be found for country's population problem.

Indeed, in his critique of the Malthusian standpoint on the population question, Marx argues that the problem of over-population could arise only under a capitalist system. For a capitalist system, it is essential, he claims, to have unemployment or relatively surplus labour. Under capitalism, capital-intensive modes of production result in a reduction of the total wage bill and places a larger quantum of surplus value, in the form of profits, in the hands of the rich. Capital-intensive production being itself an achievement of labour, labour has a rightful claim to the consumption of the surplus value. If this claim were conceded by society, there would be no problems of poverty and unemployment. But the need for a larger capital leads to large-scale unemployment among the masses and hence to the problem of over-population. Marx writes : "The labouring population therefore produces, along with the accumulation of capital produced by it, the means by which itself is made relatively superfluous, is turned into a relatively surplus population ; and it does this to an ever increasing extent."[1]

Little wonder, the Soviet delegate at the United Nations Population Commission in 1947 declared : "We consider any proposition formulated by this Commission in favour of limiting marriages or births in wedlock as barbarous. Over-population is only a fruit of capitalism ; an adequte social regime can meet any increase of population. It is the economy which should be adapted to the population, and not *vice versa*."[2] *The Great Soviet Encyclopaedia*, in its 22nd Volume (published in 1955) stated more categorically : "There cannot be any surplus population under a socialist

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regime, in spite of rapid demographic growth."[3] After the Communists came to power in China, Mao Tse-Tung also declared that his government was against population control and regarded the country's big population as an asset to be utilized in building up a strong and prosperous China.[4]

Quite in line with the Soviet and Chinese policies, Marxists of the Third World countries for a long time vehemently opposed the population control programmes undertaken by the respective governments. It is only in recent years that we find a change in their attitude from outright opposition to lukewarm support. They concede the need for such programmes but, at the same time, assert that population control efforts in these countries cannot meet with success unless they go in for a socialist system of government.

In the course of a letter written to Kautsky, Engels admitted as far back as that there was "an abstract possibility" that an inordinately large population would make it imperative to restrict the growth of population. But he asserted that a planned socialist system that had been able to control "production of things" would be able to control "production of human beings" as well. According to him, such a society, and such a society alone, could do so without difficulty.[5]

A recent collection of essays by Soviet demographers recognizes that family planning programmes of one sort or another are now being carried on in a large number of developing countries. But it asserts that success in the effort to bring down the birth rate and limit population growth depends directly on a country's social and economic development. Population control measures can be effective, it avers, only when the people are prepared for the concept of "conscious parenthood" by the entire course of the community's social, economic and cultural development, when the great majority of the people has the opportunity to find employment requiring skill and experience and when the true status of women in society has been recognized. It points out : "These changes···can only follow in the wake of fundamental socio-economic change. It is first and foremost radical change in society that can accelerate rates of economic development and ensure social progress. It is precisely such radical change that would make it possible to unleash the colossal economic potential of these countries."[6]

Elaborating on their cotention, the writers add : "As the developing countries become more industrialized, a significant section of young people, particularly the men, will move from rural areas to the towns and, as a result, the birth rate will fall in the villages and consequently in the country as a whole. As more and more women are being drawn into productive work, and thanks to improved educational opportunities into work of an increasingly qualified type, so deliberate limitation of family size will gain ground. Urbanization and a number of other factors will have an impact on reproductive patterns." They expect these changes would proceed in

these countries at a more rapid pace than was the case in Europe, "given that, after once resolving to follow a path of non-capitalist development, these young independent states will be able to set up industry at a more rapid pace and train the necessary personnel to run it." "This last factor in its turn," they claim, "will help promote reproductive conditions under which a lower birth rate is the more suitable."[7]

Varying experience of different countries :

In order to judge the validity, or otherwise, of the new Marxist viewpoint, we may well consider the situation prevailing in the different countries of the world. If economic prosperity is taken to mean just a high level of national income (say, as measured by annual per capita GNP) and the fertility level is measured simply by the crude birth rate, then the countries of the world may be divided into four broad groups. The first group is quite big and comprises essentially the countries of Europe (including those of Eastern Europe), the USA and Canada, Australia, Newzealand, Japan, South Korea, Taiwan, Argentina and USSR, where the per capita GNP is high and the birth rate low. Both the second and third groups are rather small. Mainly the oil-rich countries of Asia, Africa and Latin America, that have high per capita GNP and also high birth rate, form the second group. The third group is composed of the countries that have low per capita GNP and also low birth rate. The remaining countries of the world form the fourth group, the biggest : it thus comprises of theThird World countries and is characterized by low per capita GNP and high birth rate. We take the groups in this order since high GNP is good whilelow GNP is not ; on the other hand, low birth rate is desirable while high birth rate is not.

(Here "high per capita GNP" means a per capita GNP of, say, 4,000 US dollars or more ; by "high birth rate" is meant an annual birth rate of 30 or more per thousand of people.)

This broad classification based on Demeny[8] and data taken from some United Nations publications[9],[10] is indicated in the table 1 below :

If one keeps this table before one's eyes, then it is clear that in taking economic prosperity as a means to population control, one should not mean by economic prosperity simply a high level of per capita national income. The term is to be used in a more comprehensive sense—in the sense of a high quality of life for the people. Indeed, the features that are common to Groups I and III in the above table are mass education, a proper health care system, high status accorded to women in society and, more or less, full employment for able-bodied adults (including adult females). It is these factors—and not simply a rise in per capita national income—that have played the most important role in bringing down the fertility level strikingly

TABLE 1

Group I (high income, low fertility)	Group II (high income, high fertility)	Group III (low income, low fertility)	Group IV (low income, high fertility)	
Bulgaria	Brunei	Bahamas	Algeria	Angola
Czechoslovakia	Mexico	Chile	Botswana	Egypt
Denmark	Venezuela	Cuba	Ethiopia	Ghana
France	Kuwait	Uruguay	Kenya	Libya
East Germany	South Africa	China	Morocco	Sudan
West Germany	Saudi Arabia	Mauritius	Tunisia	Tanzania
Hungary	United Arab		Uganda	Zaire
Ireland	Emirates		Zambia	Zimbabwe
Italy	Nigeria		Cameroon	Bolivia
Netherland			Brazil	Ecuador
Norway			Costa Rica	El Salvador
Poland			Guyana	Haiti
Portugal			Nicaragua	Peru
Romania			Dominican	Bangladesh
Spain			Republic	India
Sweden			Afganistan	Iran
Switzerland			Burma	Jordan
United Kingdom			Indonesia	Mongolia
Yugoslavia			Iraq	Nepal
Canada			Lebanon	Thailand
USA			Malaysia	Vietnam
Argentina			Philippines	North
Hong Kong			Sri Lanka	Korea
Japan			Yemen	
Singapore				
South Korea				
Taiwan				
Israel (Jewish population)				
USSR				

in Group I (the annual birth rate here being around 20 per thousand of population) and very substantially in Group III (where the annual birth rate has come down to about 25 per thousand of population). Rapid transition

from an essentially agrarian economy to a mainly industrial has also helped some countries in Group III in their efforts to reduce the fertility level. But the above-noted features are absent or virtually absent in the countries of Groups II and IV, where the annual birth rate still remains above 30—in some cases, even around 40—per thousand of population.

It is also to be noted that not all socialist countries have low fertility, although most are. As to the non-socialist countries, those with a high quality of life (viz. those in Group I) have invariably low levels of fertility while countries having a low quality of life, whether with a high per capita national income or not (i.e. whether in Group II or in Group IV), have still to grapple with very high fertility levels.

Structural Changes

The countries of Groups II and III deserve special attention. In Group II, we have countries like Brunei, Kuwait, Saudi Arabia and Unted Arab Emirates which are some of the richest countries (in terms of per capita GNP) of the world. Yet, these are also countries with some of the highest levels of fertility (and some of the highest rates of population growth). This paradox may be largely attributed to the fact that the governments of these countries are yet to involve the general mass of their people in social welfare programmes in the fields of education and health care. The people live in tradition-bound communities and money comes to them so easily that the need for employment (in the sense we use the term) is seldom pressing. Women have rather low status in society. Female education does not get high priority and employment among women is virtually absent. As such, the motivation for keeping the size of family small is, by and large non-existent.

On the contrary, the countries of Group III are not endowed with much economic prosperity ; indeed, most are still to be regared as poor countries. Even so, countries like China, Cuba and Mauritius have governments that are vigorously implementing programmes for universal elementary education, public health and social medicine. They try to provide employment to all able-bodied adults and have largely done away with sex-discrimination in different walks of life. Hence, in spite of their low economic levels, these countries have made a significant headway in reducing the fertility levels and also the rates of population growth. China's achievement in this field especially has received acclamation from such international agencies as the WHO, the UNFPA and the World Bank. A very objective account of the changes brought about largely throngh governmental measures in China is given by Wolf[11]. The experience of Kerala, one of the poorest and rather densely populated States of India has been somewhat similar[12]. With a high level of literacy, spread of female education, a high employment rate and a

decentralized health care system, Kerala has the lowest fertility level among the Indian States (the birth rate being 22 per thousand of population as against the all-India rate of 32 per thousand of population). These records should bear out the importance of improving the overall quality of life, rather than just having a high per capita national income, in putting a check on population growth.

It is also seen that to suppose that a socialist system is a *ine qua non* for success in population control would be erroneous. The countries of Group I have very little population growth—indeed, in both West Germany and the Uuited Kingdom, we find a slight decline in population size—although most of these have a well-enrenched capitalist system. Fertlity levels have decreased in these countries with little or no governmental effort : the decline or slowing down has set in more as a response of individual couples to their perception of their own welfare. By contrst, Ethiopia, Mongolia, North Korea and Vietnam, that are recognized as socialist countries, and also Angola, Mexico aud Yemen, that claim to be socialist, have quite high rates of population growth. In such countries, programmes of mass education, public health and employment have not made much headway. Consequently, socialism has not succeeded in providing the masses with a high quality of liie.

It would thus be proper to conclude that basic structural changes in a country's polity and economy are not essential for success in population control. What is imporiant is an improvement in the overall quality of life of the people. At the same time, the leaders of a community should have the political will to bring about a rise in the common man's level of living and also to implement population control programmes. The striking succes of China and Cuba in bringing down their fertility levels and the rates of population growth is to be atiributed to this political will and not really to socialism. The great importance attached to the family planning pogramme by the Chinese government in the post-Mao era and the way the bureaucratic and party set-ups—the people's committees in the urban areas and the communes in the rural—are well brought out in Hou Wenrou[13] Pi-Chao-Chen[14].

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THE CHANGING STRUCTURE OF LANDHOLDINGS AND TENANCY IN WEST BENGAL

SANKAR KUMAR BHAUMIK*

I. Introduction

The main purpose of this paper is to understand and analyse the changes in the structure of landholdings and tenancy in West Bengal since the independence. The need for such a study requires no great elaboration insofar as West Bengal has been one of the States in India with generally high pressure of population on the agricultural land. Naturally, the very pattern of distribution of agricultural land as well as the prevailing system of tenancy would have direct bearing on the majority of its agriculture-dependent population.

The study is based on the data thrown up by various rounds of the National Sample Survey (NSS). Actually, the NSS data are now available for four separate rounds viz., 8th Round (1953-54), 16th Round (1960-61), 26th Round (1971-72) and 37th Round (1982). To the extent that there is not much problem of comparability of data collected over various NSS rounds[1], we could utilise data for all four points of time. However, we have dropped 16th Round from our analysis because of non-availability of detailed information on many aspects of tenancy for that round. While delineating the changes in the landholdings pattern and tenancy structure, our endeavour would also be to locate the changes between 1953-54 to 1971-72 (henceforth sub-period I) and 1971-72 to 1982 (sub-period II). It is well known that while most, of the radical land reforms legislations in the State were enacted in the beginning of the 70s, most of their implementaion is claimed to have been done since 1977[2]. That being so, sub-period II is likely to reflect the changing agrarian structure (as revealed by changes in landholdings pattern and tenancy structure) consequent upon the implementation of land reforms measure.

II. Ownership Distribution

We begin our examination of changes in landholdings pattern by looking into the distribution of ownership holdings. This is to be followed by the discussion on the distribution of operational holdings. While the distribution of ownership holdings reveals the position of the rural households in the land owning hierarchy, the size of operational holdings represents their status as cultivators and their access to land; more pointedly, their earning capabilities and employment potential are determined by operational holdings.

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In order to capture more fully as to how different landholding groups share the agricultural lands, we have divided them notionally into few categories : (i) landless (less than 0.01 acre) ; (ii) marginal (0.01 – 2.49 acres) ; (iii) small (2.50 – 4.99 acres) ; (iv) medium (5.00 – 9.99 acres) ; (v) big (10.00 – 14.99 acres) ; and (vi) large (15.00 acres and above).

Table I admits of several important observations as regards the distribution of ownership holdings in the State : (a) About one-fifth of the rural households were recorded as 'landless' in West Bengal in 1953-54 which declined significantly to less than one-tenth in 1971-72. However, the figure for 1982 shows a fairly sharp rise in the percentage of the 'landless' (17.21 percent). This is quite baffling considering the fact that West Bengal is considered to be one of the front-ranking States where land reform measures such as distribution of vested land to the landless proceeded at a fast rate, particularly, in recent years[3] ; (b) Although the proportion of households in the 'marginal' category increased during sub-period I, a decline in the same is noticeable in sub-period II. However, if households in the 'landless' and 'marginal' categories are put together, a continuous increase in the percentage of households under these categories is observed in West Bengal. These two categories together constituted nearly 73 percent, 77 percent and 82 percent of all households respectively in 1953-54, 1971-72 and 1982 ; (c) There took place a decline in the percentage of 'small' households during sub-period II. The decline in the percentage of households in 'marginal' and 'small' categories is, however, associated with an increase in the percentage of area owned by them. As a result, there took place an increase in the 'concentration ratio'[4] for these categories. In other words, in spite of a decline in terms of the percentage of households, these categories consolidated their position in respect of owned area in 1982 compared with 1971-72 ; (d) The decline in the percentage of households is also noticeable in the 'middle', 'big' and 'large' categories. However, in their case, the rate of decline of the percentage of owned area has been lower than the rate of decline in the percentage of households. This resulted in an increase in their concentration ratios over time. It may also be noted that while in 1953-54, the 'middle' categories of owners comprised 8.56 percent of rural households and occupied 25.51 percent of owned area, in 1982, the corresponding figures were 5.54 perceut and 27.23 percent respectively. The increase in the percentage of owned area despite the fall in the percentage of households in the 'middle' category clearly indicates increased concentration of land with them in West Bengal in recent years ; and (e) Another important point to note is that the 'big' and 'large' categories together comprised 1.37 percent of households but they accounted for 13.67 percent of owned area in 1982.

Table I : DISTRIBUTION OF OWNERSHIP HOLDINGS IN RURAL WEST BENGAL

Size Class (in acres)	Percentage of households			Percentage of owned area			Concentration ratio		
	1953-54	1971-72	1982	1953-54	1971-72	1982	1953-54	1971-72	1982
Less than 0.01 (Landless	20.54	9.78	17.21						
0.01-2.49 (Marginal)	52.92	67.83	64.38	15.90	27.27	30.33	0.30	0.40	0.47
2.50-4,99 (Small)	12.61	12.65	11.50	18.60	25.69	28.77	1.48	2.03	2.50
5.00-9.99 (Medium)	8.56	7.30	5.54	25.51	27.72	27.23	2.98	3.78	4.92
10.00.14.99 (Big)	2.76	1.72	1.09	13.99	11.55	9.47	5.07	6.72	8.69
15.00 & above (Large)	2.60	0.72	0.28	26.00	7.77	4.20	10 00	10.79	15.00
All sizes	100.00	100.00	100.00	100.00	100.00	100.00			

Notes : Concentration ratio is defined as the ratio of percentage of area owned to percentage of households.
Average size of holding (in acres) : 1953-54=2.39 ; 1971-72=1.73 ; 1982=1.36
Gini Ratio : 1953-54=0.73 ; 1971-72=0.67 ; 1982=0.70

Sources : (1) *N.S.S. Report No. 66 ; 8th Round (1953-54)*
(2) *N.S.S Report No. 215.21 ; 26th Round (1971-72)*
(3) *N.S.S. Report No. 330 ; 37th Round (1982)*

All the above observations lead us to the conclusion that although the 'marginal' and 'small' owners consolidated their positions to some extent in terms of area owned, it is the 'middle' categories of owners who have benefited the most in terms of area-shift in the recent years. Neverthelss, quite a substantial proportion of area in West Bengal is still occupied by the 'big' and 'large' categories of owners. These developments along with the increase in landlessness explain high degree of inequality in the distribution of ownership holdings even in 1982. In fact, for West Bengal, there took place a small increase in the inequality of distribution of ownership holdings in 1982 compared with 1971-72. This is revealed by the value of Gini Ratios of 0.67 in 1970-71 and 0.70 in 1982[5].

III. Operational Holdings

We now come to the study of the changing pattern of operational holdings in the State. As said earlier, operational holdings by taking cognizance of land-leasing by the households provide better idea of their relative economic position. As before, we examine the distribution of operational holding by dividing the households into several categories.

Table II brings out a few important features : Firstly, the largest section of the rural households in West Bengal belonged to the category of 'marginal' farmers and the extent of 'marginalisation' increased over time. While 64.51 percent of operational holdings belonged to this category in 1953-54, they increased to 74.32 percent in 1982. Secondly, although the percentage of holdings in 'small' and 'medium' categories increased in sub-period I, a clear decline is noticeable in sub-period II. For other categories, percentage of holdings declined consistently over the years. For all these categories, except the 'small', percentage of operated area declined. However, as the percentage of operated area declined at a rate lower than the percentage of holdings, there took place increase in their concentration ratios Thirdly, the distribution of operational holdings is also far from being equal. Even in 1982, while about 90 percent of holdings at the bottom (marginal and small categories) operated about 58 percent of area, only 1.77 percent of holdings at the top ('big' and 'large' categories) accounted for 13.71 per eent of area operated. Moreover, 8.07 percent of households in the middle range control 28.25 percent of operated area in West Bengal today. Fourthly, the average size of operational holding in the State has declined gradually, particularly in sub-period II. In 1982, the average size of operational holding for the State stood at 1.91 acre only.

Table II : DISTRIBUTION OF OPERATIONAL HOLDINGS IN RURAL BENGAL

Size Class (in acres)	Percentage of households			Percentage of operated area			Concentration ratio		
	1953-54	1971-72	1982	1953-54	1971-72	1982	1953-54	1971-72	1982
Less than 2.50 (Marginal)	64.51	61.20	74.32	14.29	24.81	29.27	0.22	0.41	0.39
2.50-4.99 (Small)	17.74	22.80	15.83	23.01	28.91	28.77	1.30	1.27	1.82
5.00-9.99 (Medium)	12.48	12.94	8.07	31.32	31.06	28.25	2.51	2.40	3.50
10.00-14.99 (Big)	2.91	2.12	1.36	12.42	8.78	8.51	4.27	4.14	6.26
15.00 & above (Large)	2.36	0.94	0.41	18.96	6.44	5.20	8.03	6.85	12.58
All sizes	100.00	100.00	100.00	100.00	100.00	100.00			

Notes : Concentration ratio is defined as the ratio of percentage of area operated to percentage of holdings.
Average size of holding (in acres) : 1953-54 = 2.77 ; 1971-72 = 2.76 ; 1982 = 1.91
Gini Ratio : 1953-54 = 0.65 ; 1971-72 = 0.65 ; 1982 = 0.60

Source : (1) *N.S.S. Report No. 66 ; 8th Round (1953-54)*
(2) *N.S.S. Report No. 215.21 ; 26th Round (1971-72)*
(3) *N.S.S. Report No. 331 ; 37th Round (1982)*

IV. Tenancy Structure

Having outlined the changes in the distribution of ownership and operational holdings, we now turn towards examination of the changes in the tenancy structure in the State since independence. In this regard, our main point of inquiry would be to find out the changes in the pattern of land-leasing, composition of lessors and lessees and the type of tenancy in the State.

Table III presents information on the leasing-out operation by various ownership categories in the State. The first point to note is that for all categories of owners, there took place a continuous decline between 1953-54 and 1982, both in the percentage of households as well as the percentage of owned area leased-out. Thus, while 10·41 percent of all owners leased-out their land in 1953-54, and 9.48 percent in 1971-72, the figure in 1982 is sharply reduced to a mere 3.71 percent. Although this may in part be due to under-reporting by the lessors, a large part of this decline may be attributed to landowners' fear of enforcement of tenancy laws on their leased-out land, particularly, in recent years. Secondly, the incidence of leasing-out land has not been the same for all categories of owners. The higher categories generally tended to reveal higher propensity to lease-out their land. Accordingly, the percentage of households leasing-out as well as the percentage of owned area leased-out have been greater for the higher categories of owners. Thirdly, although the practice of leasing-out is found to be greater for the higher categories of owners, the percentage of households leasing-out has not been insignificant for 'small' and 'medium' categories either. In 1982, 8.74 percent of 'small' and 13·84 percent of 'medium' owners leased-out their land. Fourthly, the fact that the higher categories of owners reflect greater tendency to lease-out their land does not necessarily mean that the majority of the lessors would come from them. This is, particularly, the case where 'marginal' and 'small' owners dominate the rural scene. Thus when we consider the distribution of households leasing-out into various categories (Table IV), it is found that the majority of lessors in West Bengal actually come from the lower categories. Not only that the share of 'marginal' holdings in the distribution of all households lesaing-out has been the highest at each point of time, but their share actually increased over the years. Another point to note in this context is that the shares of 'medium', 'big' and 'large' categories in the distribution of households leasing-out declined in 1982 compared with 1953-54 and those of 'marginal' and 'small' categories increased. While 47·76 percent of all households leasing-out belonged to 'marginal' and 'small' categories in 1953-54, the corresponding figure becomes 82·16 percent in 1982.

Data on leasing-in operation are presented in Table V. Several points emerge from the table. Firstly, as in the case of leasing out, there took

Table III : LEASING-OUT OPERATION BY OWNERSHIP SIZE GROUPS IN RURAL WEST BENGAL

Size Class (in acres)	Percentage of households leasing out			Percentage of owned area leased out			Area Leased out per household leasing out (in acres)		
	1953-54	1971-72	1982	1953-54	1971-72	1982	1953-54	1971-72	1982
0.01—2.49 (Marginal)	8·26	7 34	2.52	9.96	7.91	1.75	0.87	0.78	0.17
2.50—4.99 (Small)	14.66	14.34	8.74	10.09	9.59	3.17	2.43	2.34	1.23
5.00—9.99 (Medium)	22·68	12.90	13.84	12.07	7.89	2.18	3.80	4.00	1.05
10.00—14.99 (Big)	33.90	31.97	24.26	17.61	11.22	2.47	6.30	4.07	1.20
15.00 above (Large)	50.45	38.38	18.54	25.04	11.09	4.99	11.90	5·41	5.37
All classes	10.41	9.48	3.71	15·51	8.95	2.48	3.57	1.80	0.91

Source : *As in Table I*

Table IV : DISTRIBUTION OF HOUSEHOLDS LEASING-OUT AND LEASING-IN IN RURAL WEST BENGAL

(Percentage)

Size Class (in acres)	1953-54		1971-72		1982	
	HLO	HLI	HLO	HLI	HLO	HLI
0.01—2.49 (Marginal)	40.01	62.35	55.36	57.68	62.35	73.05
2.50—4.99 (Small)	17.75	19.81	22.62	29.72	19.81	16.75
5.00—9.99 (Medium)	18.65	14.37	11.74	11.24	14.37	9.07
10.00—14.99 (Big)	8.99	2.20	6.85	1.10	2.20	0.94
15.00 & above (Large)	12.60	1.27	3.43	0.26	1.27	0.19
Total	100.00	100.00	100.00	100.00	10.000	100.00

Notes : HLO=Households Leasing Out ; HLI=Households Leasing In.

Sources : (1) *N.S.S. Report No. 66 ; 8th Round (1953-54)*

(2) *N.S.S. Report No. 215.21 ; 26th Round (1971-72)*

(3) *N.S.S. Report Nos. 330 and 331 ; 37th Round (1982)*

place a continuous decline in the percentage of holdings reporting area leased-in as well as the percentage of operated area leased-in by all categories of operators in the State. For the State as a whole, while 41.49 percent of holding reported area leased-in in 1953-54, the corresponding figure for 1982 got reduced to 22·15 percent. Moreover. the percentage of operated area leased-in declined from 25·45 percent in 1953-54 to 12·34 percent in 1982. This clearly indicates that tenancy cultivation has been on the decline in West Bengal, as in most other states.[6] The declining tendency towards tenant cultivation could be due to several factors such as sub-division of land through inheritances, eviction of tenants following tenancy ligislations, redistribution of celling-surplus land among hitherto share-croppers and landless, retuctance on the part of the landowners to initiate fresh tenancy arrangements for the fear of tenancy legislations, awarding the sharecropper a higher proportion of crop and shielding him against eviction and so on.[7] An important reason towards decline in tenancy in recent years could also be the spread of new technology in agriculture which made cultivation with hired labour more attractive to many landowners.[8]

The second important point to note from Table V is that the practice of leasing-in is relatively higher in the lower categories. Among them, however, 'marginal', 'small' and 'medium' categories have responded almost equally in the matter of leasing-in land in West Bengal. Thus in 1982, while 22.58 percent of 'marginal' operators reported area leased-in, the corresponding figures for 'small' and 'medium' categories have been 24.04 percent and 25.56 percent respectively. The proportion of households reporting area leased-in have not been insignificant for the 'big' and 'large' categories also. Although the percentage of households reporting area leased in declined significantly in lower categories, particularly, during sub-period II, such decline is not very prominent for 'big' and 'large' categories. This means that some households in the higher categories do involve themselves in leasing-in land signifying the presence of 'reverse tenancy', though not as intensively as in some green-revolution areas of India.[9]

Thirdly, if we consider the distribution of holdings leasing-in into various categories (Table IV above), it is observed that a majority of such holdings fall in the 'marginal' category. The share of this category in total holdings reporting area leased-in increased further over the years (from 62.25 percent in 1953-54 to 73·05 percent in 1982). Next to follow are the 'small' and 'medium' groups (16·75 percent and 9·07 percent respectively in 1982). In as much as the majority of households leasing-out land as well as the holdings leasing-in come from 'marginal', 'small' and 'medium' categories (this is more prominent in 1982), any radical policy towards tenancy reform in the future is likely to affect these categories of households most in West Bengal.

Table V : LEASING-IN OPERATION BY SIZE GROUPS OF OPERATIONAL HOLDINGS IN RURAL WEST BENGAL

Size Class (in acres)	Percentage of holdings reporting area leased in			Percentage of operated area leased in			Area leased-in per holding leasing in (acres)		
	1953-54	1971-72	1982	1953-54	1971-72	1982	1953-54	1971-72	1982
0·01—2.49 (Marginal)	40.09	32.57	22.58	28.92	25.82	13.25	0.44	0.88	0.44
2·50—4·99 (Small)	46.34	45.06	24.04	32.94	24.08	11.27	2.41	1.87	1.62
5.00—9.99 (Medium)	47.78	30.04	25.56	31.63	14.51	11.12	4.60	3 20	2.90
10.00—14.99 (Big)	31.40	17.90	15.34	17.83	5.68	4.54	6.71	3.64	3.52
15.00 & above (Large)	22.45	9.50	12.11	8.43	6.85	5.31	8.37	13.72	8.46
All classes	41.49	34.15	22.15	25.45	18.73	12.34	1.70	1.50	1.03

Note : The N.S.S. report for 1982 shows 27 pure tenant holdings operating 50.00 acres and above which we have not included in our analysis.

Source : *As in Table II*

Table VI : PERCENTAGES OF ENTIRELY OWNED, ENTIRELY LEASED-IN AND MIXED HOLDINGS BY SIZE GROUPS OF OPERATIONAL HOLDINGS IN RURAL WEST BENGAL

Size Class in acres)	Entirely owned			Entirely leased-in			Partly leased-in		
	1953-54	1971-72	1982	1953-54	1971-72	1982	1953-54	1971-72	1982
0.01-2.49 (Marginal)	59.91	67·43	76.72	28.65	3.79	9.06	11.44	28.78	14.22
2.50-4.99 (Small)	53.66	54.94	71.55	10.84	2.55	0.66	35.50	42.51	20.62
5.00-9.99 (Medium)	52.22	69.97	74.92	5.78	2.91	4.83	42.00	27.12	20.25
10.00-14.99 (Big)	68.60	82.10	87.41	1.65	—	—	29.75	17.90	12.59
15.00 & above (Large)	77.75	90.50	89.24	1.02	—	—	21.23	9.50	10.75
All Classes	58.51	65.44	76.65	21.20	3.28	7.52	20.29	31.28	15.83

Source : As in Table II

Table VII : LEASED-IN AREA BY TYPES OF TENANCY IN RURAL WEST BENGAL

Size Class (in acres)	Percentage of operated area under				Percentage of leased-in area under			
	Share tenancy		Fixed-rent tenancy		Share tenancy		Fixed-rent tenancy	
	1971-72	1982	1971-72	1982	1971-72	1982	1971-72	1982
0.01-2.49 (Marginal)	23.41	9.38	0.81	1.23	90.70	70.71	3.14	9.25
2.50-4.99 (Small)	22.64	8.94	1.06	1.19	94.02	79.33	4.40	10.56
5.00-9.99 (Medium)	13.78	6.50	0.42	3.60	94.93	58.39	2.91	32.33
10.00-14.99 (Big)	10.19	1.85	—	0.92	100.00	40.86	—	20.20
15.00 & above (Large)	4.48	—	—	0.77	65.61	—	—	14.48
All classes	17.34	6.85	0.64	1.82	92.58	55.83	3.42	14.75

Source : (1) *N.S.S. Report No.* 215.21 ; 26*th Round* (1971-72)
(2) *N.S.S. Report No.* 331 ; 37*th Round* (1982)

An important aspect of the change in tenancy structure in West Bengal since independence is the decline in the importance of entirely leased-in holdings. As seen in Table VI, the entirely leased in holdings in the State declined from 21.20 percent of operational holdings in 1253-54 to 7.52 percent in 1982. This may be due to the eviction of large number of poor tenants who are pushed to the rank of agricultural labourers. This may also explain in part the increase in the percentage of agricultural labourers in West Bengal since independence.[10] Partly leased-in holdings represented much higher percentage in total operational holdings in 1982 (15·83 percent) compared with entirely leased-in holdings.[11] Another important point to note is that the percentage of entirely leased-in holdings is higher in the lower size classes.

As regards the types of tenancy, Table VII clearly demonstrates the importance of share tenancy as the dominant form of tenancy in the State. In 1971-72, 92·58 percent of total leased-in area was under share tenancy. Although, over the years, there took place a big decline in the importance of share tenancy, still about 56 percent of leased-in area is found to be under share-tenancy in 1982. This decline is associated with an increase in the percentage of leased-in area under fixed rent tenancy (increasing form 3.42 percent in 1971-72 to 14·75 percent in 1982). In other words, there is a clear tendency towards shift away from share-tendancy to fixed-rent tenancy in West Bengal. Another interesting point to note is that while the lower categories of holdings prefer to lease-in land more on share tenancy, the higher categories tend to represent higher percentage of leased-in area under fixed-rent tenancy. This trend is more clearly observed in 1982. This is understandable for, with the penetration of new technology in agriculture, higher categories of lessees are not possibly willing to share the benefits of improved cultivation with the lessors.[12]

V. Summary and Conclusions

The analysis of distribution of ownership holdings in West Bengal reveals that the incidence of landlessness has increased over time. The percentage of the landless and marginal owners together showed a rising tendency. For all other categories, there took place a decline in the percentage of households. However, a decline in the percentage of households in case of middle category of owners (owning 5.00-9.99 acres) is accompanied by increase in percentage of owned area. This implies increased concentration of lands in the hands of the owners in this category. Quite a substantial proportion of area is still owned by 'big' and 'large' owners in West Bengal. This along with the rise in the percentage of 'landless' explains the increase in inequality of ownership holdings in the State.

The study of operational holdings indicates the increase in the percentage of 'marginal' holdings over time. Nearly three-fourth of operational holdings fell in this category in 1982. The distribution of operational holdings is also far from being equal. Average size of operational holding declined continuously in West Bengal and it stands at 1.91 acre in 1982.

As regards changes in the structure of tenancy in West Bengal, at least four important points bear stressing : Firstly, in West Bengal, there has been a gradual decline in the extent of tenancy cultivation. As per the 1982 N.S.S. estimates, about 13 percent of operated area in the State was under tenant cultivation which is much lower than its counterpart (about 25.0 percent) in 1953-54. The decline in tenancy cultivated area has been particularly prominent in the years sinee 1971-72. The reasons for such a drastic decline in tenancy might be due to the rigorous application of tenancy legislations and progress in agricultural technology in recent years which render self-cultivation safe and remunerative In spite of the fact that the rigorous application of tenancy laws and/or improvement in agricultural production conditions tend to put a downward pressure on the extent of tenancy, such a low reporting of tenancy might also be due to a growing tendency of its concealment in recent years. Even after accepting with due scepticism the extent of tenant cultivation as reported in the official documents, it would perhaps be a valid conjecture that area under tenancy in West Bengal has reached a low-level equilibrium from which it is unlikely to decline in thr near future. With a big majority of the tenants having been mobilised to record their names under the programme of Operation Barga (which makes tenant eviction difficult except under extraordinary circumstances) and that a substantial proportion of land still being held by high landowing/non-cultivating categories, tenancy in the State would continue for quite some time at least to the extent as it stands now.

The second important aspect of changing tenancy structure in West Bengal relates to the growing preponderance of lower land owing/operating categories both as lessors and lessees. Although the propensity of leasing out is still greater among the higher land-owning categories and the propensity of leasing-in greater among lower categories, the distribution of lessors and lessees into various size-groups clearly reveals an increasing tendency of land-leasing being confined among the households belonging to lower (marginal and small) categories. This has important implications for formulating future policy for conferring ownership rights on the actual tillers of the soil. It would also be interesting to see whether even the Left parties in power would like to designate this bulk of low-landowing lessors as 'landlords' or 'jotedars' and give a call for their extinction when all political parties are competing with one another to woo majority support purely on electoral considerations at the grass-root level.

The third important point that deserves to be under-lined is that the land-lease market in West Bengal is now dominated by mixed holdings (i.e. owner-cum-tenants) rather than entirely leased-in holdings (pure tenants). This renders most of recently developed neo-classical models on tenancy inapplicable owing to their traditional notion that the class of tenants necessarily comprise the landless.

Fourthly, although sharecropping continues as the predominant form of tenancy in West Bengal, there has been a tendency, in recent years, of its decline with the growing importance of fixed-rent tenancy. This possibly happens with the progress of agricultural technology (which is likely to discourage the tenant to share its benefits with the land-owner through crop-sharing arrangement) as also with growing tendency towards seasonalisation of tenancy contracts[13] (since a seasonal tenancy arrangement makes evasion of tenancy laws by the landowner easier and that both the tenant and land-owner show preference for fixed-rent contract for such an arrangement[1]. In that sense, our study projects fixed-rent tenancy gaining more prominence in the years to come.

NOTES

1. See Sanyal (1988 : 122-23).
2. For detailed discussion on adoption and implementation of various land reforms measures in West Bengal, see Dasgupta (1987),
3. It may be noted that the decline in 'landlessness' has been an All-India phenomenon between 1953-54 and 1971-72 and it seems to have reduced in the individual States too. However, between 1971-72 and 1982, the proportion of 'landless' increased in most of the States as well as for India as a whole. See Sanyal (1988 : 127) ; Haque (1987 : 318).
4. Concentration ratio is defined as the ratio of percentage of area owned to percentage of households.
5. In order to calculate Gini Ratio, we have used data given for all possible size classes in the NSS reports.
6. The fact that tenancy is declining in West Bengal has also been reported by Bardhan and Rudra (1978 : 381) from their survey of 110 villages in 1975-76.
7. See Sengupta (1981 : A89).
8. Dasgupta (1984 : A93).
9. For evidence in green-revolution areas, one may refer to Singh (1989).
10. It may be noted that the percentage of agricultural labourers in total rural work-force increased in West Bengal from 18.97 percent in 1951 to 32·95 percent in 1981. See Dasgupta (1984B : A141).
11. This is at variance with the general presumption in most of the neo-classical models on tenancy that tenants are completely landless. The fact that the land-lease market is actually dominated by 'mixed' categories (i.e., owner-cum-tenants), rather

than by 'pure' tenants is also emphasised by Dantwala and Shah in their study of some regions in Maharastra and Gujrat, See Dantwala and Shah (1971 : 194).

12. Ghosh in his study of two villages in Burdwan district of West Bengal observes how the lease market underwent several changes with the coming of new technology. He notes, *inter alia*, that the sharecropping is more prevalent among the small farmers as compared to large farmers who now prefer fixed rent tenancy. See Ghosh (1911 : 158).
13. For a discussion on this aspect see Bhaumik (1989 : Ch. VI).

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ROLE OF RURAL DEVELOPMENT IN NATIONAL PLANS

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After three decades of economic planning in our country it was suddenly realised that some change in the planning strategies was called for, in order to change the persistent trend of economic growth sans social justice and equality. In order to reduce the inequalities of income accrued to the people the variance in income, it was realised, should be reduced. This could be done, one may put it naively, by decreasing the "no-income" (hence, the unemployed) group. Formulating the general objective as "to increase the average realisable purchasing power" coupled with "decreasing the standard deviation (or some other suitable measure of dispersion) of realisable purchasing power" would automatically ensure decrease in unemployment. The decision by the Planning Commission to launch a direct attack on poverty through rural development programmes (such as, Integrated Rural Development Programmes, Jawahar Rojgar Yojna etc.) is a way—not the best way—of attaining the aforementioned objectives because the targets obtained in such programmes are not the solutions of a well-formulated set of optimal decision rules, but are arrived at in an adhoc fashion. The main purpose of this article is to indicate such a formulation using the modern methods of the theory of optimization and control.

2. Before embarking on the subject proper it is perhaps necessary to discuss very briefly the frameworks of the previous five-year plans. It is now quite well-known that our first five-year plan employed a growth model of the agreegative Harrod-Domer type but with conspicuous absence of an integration between the plan allocations and the macro-economic dimensions, formulated in the growth model and described in the plan. It was more an attempt to consolidate the existing situation rather than introduction of a well-designed growth pattern, as would be obvious from the broad objectives or aims presented in the relevant document. The second 5-year plan, however, by Professor Mahalanobis was really a well-planned design for arriving at a number of decision rules somewhat in the nature of Gosplan and mainly based on Feldmen's models. Undoubtedly, the framework could be described in the form of a model with three equations for output employment and investment and four unknowns, of which one determined by the two-sector model. Komiya[28] made an attempt to develop a

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choice model in the same four-sector framework and reformulated the problem in the form of a mathematical programming problem and showed that Mahalanobis model gave a sub-optimum solution to the problem. In other words, in an alternative formulation, if one released the investment constraint as an inequality sign then the optimum solution yielded a figure of net output (Y) as Rs. 31·5 billion as against Rs. 25·3 billion obtained from the Mahalanobis model. Thus the choice model of Komiya's yielded a figure 24·5 percent higher than Mahalanobis'. Apart from achieving a stipulated growth rate of 5 percent per annum the plan envisaged also reduction of inequalities in income. Both the formulations (namely that of Mahalanobis and Komiya) did not explicitly bring up this most important aspect as an endogenous variable in the structural equations of the models. In a brief note by Professor Ackoff (1 * in Journal of Operations Research one would find such an explicit introduction in the objective function where he has invoked the additional condition of minimising the variance of income. In spite of subsequent controversies known in the planning literature as Ackoff-Hitch debate it is for the first time that model-builders became aware of such a serious omission in Mahalanobis model. In the third plan document we find the approaches used for the macro-economic projections were similar to but less explicit than those used in the second. It is only in the fourth plan document that we find explicit recognition of the need for sectoral balances as a check on overall consistency of plan targets, the backward planning principle with a well-defined objective specified at five yearly and fifteen-to-twenty-yearly intervals and provision for an explicit treatment of the foreign trade sector. For the first time perhaps the Economic Division of the Planning Commission formulated a formal quantitative plan frame, tracing the real flows embodied in the plan alongside the exercise conducted by the Perspective Planning Division. For the first time differential growth rates by sectors (for example, 5 percent in agriculture, 12 percent in industry etc.) can be seen in the plan document. In the fifth plan we find for the first time the use of an inter-industry model along with macro-economic relations in the form of certain equations and the plan targets as solutions of a well defined mathematical programming problem. The mathematical framework for the two subsequent plans, i e., the sixth and the seventh need not be discussed in detail as they can be called as some slight variants of the model used in the fifth plan. The whole purpose of making this detour from the main topic was to highlight the fact that reduction in inequalities of income had not been brought explicitly as an endogenous variable in any of the 7 previous plan models, although certain provisions and programmes can be found to have explicit

* Figures in parenthesis refer to the serial number in the Bibliography at the end of the paper.

mention in the plan documents as poverty alleviation programmes. In this context, and when we are about to launch the 8th five year plan, the subject of rural development, one would normally hope, should receive top most priority to the plan formulators in our country because generation of more income in the comparatively poorer-income sector, which contributes most to the variance in incomes, is likely to reduce the variations in income and thereby lead to reduction in inequalities. But, instead of some adhoc objectives of investing 50 percent or more [Vide Ghosh (23)] or creating more than 50 percent employment opportunities in the rural sector one should actually take into account, at the time of fixing the plan targets, the objectives of minimizing the variance in income explicitly in our objective function so that we may arrive at a series of optima over a specified time period of, say, 15 or 20 years, which the economy can sustain.

3. **The Model :**

In this section we shall make an attempt to review the models that have been proposed by various economists for planned economic development, so that we may have a self-contained account of the topic under study.

3.1. Oscar Lange (32) was the first economist who carefully presented mathematically the planning techniques while Arrow and Hurwicz 4 & 5 gave a formal account of the same.

In our case we begin with a fairly straight forward model (Vide Heal (27) : assume that there are n firms and s commodities, with each firm using some commodities as inputs and producing some as outputs. A firm's production activities will be described by its scale of operation. At a given scale of operation, the vectors of inputs used and outputs produced are uniquely determined, with no scope for substitution. Assume that the jth firm operates at the scale X_j, with $g_{ij}(X_j)$ standing for the amount of good i produced by firm j at scale. Inputs will be represented as negative numbers. Now, the planning excercise constitutes allocation of resources that maximises a function, say, $U(y_1, \ldots, y_s)$, of the amounts of various goods allocated to final demand. The total net output of the ith good will be $\sum_{j=1}^{n} g_{ij}(x_j)$, and if e_i is the economy's initial endowment of good i, then the over-all planning problem can be formally stated as follows :

maximise $U(y_1, \ldots, y_s)$

subject to $-y_i + \sum_{j=1}^{n} g_{ij}(X_j) + e_i \geq 0$, $i = 1, 2, \ldots, s$. .... (1)

If the functions $U(\ )$ and $g_{ij}(\ )$ are concave and satisfy a constraint qualification, the Kuhn-Tucker Theorem can be used to characterise a solution to (1). Under the postulated assumptions, necessary and sufficient conditions for $(y_1, \ldots, y_s)$ and $(x_1, \ldots, x_n)$ to solve (1) are :

$$U_i - \lambda_i \leq 0, \text{ if } y_i > 0, \; i = 1, 2, \ldots, s. \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where $U_i = \partial U(y_1, y_2, \ldots, y_s)/\partial y_i$

$$\sum_{i=1}^{s} \lambda_i (g_{ij}/x_j) \leqq 0, \text{ if } x_j > 0, j = 1, 2, \ldots, n. \quad \ldots \quad (3)$$

$$\sum_{j=1}^{n} g_{ij}(x_j) + e_i - y_i \geqslant 0, \text{ if } \lambda_i > 0, i = 1, 2, \ldots, s. \quad \ldots \quad \cdots (4)$$

where $(\lambda_1 \ldots \lambda_s)$ are the dual variables associated with the constratins in (1)

Now suppose that this simple economy is run by managers of firms, who seek to maximize profits (or surpluses), and by a distributor, who controls the allocation of goods to final uses and determines these allocations so as to maximize the difference between the value of the objective function and the cost of the final demand vector. Thus, if λ_i is the price of the good i, then managers maximize

$$\sum_{i=1}^{s} \lambda_i g_{ij}(x_j), \text{ subject to } x_j > 0, j = 1, 2, \ldots, n. \quad \ldots \quad \ldots \quad (5)$$

The distributor maximizes $U(y_1, \ldots, y_s) - \sum_{i=i}^{s} \lambda_i y_i$

subject to $y_i \geqslant 0$, $\quad \ldots \quad \ldots \quad \ldots \quad \cdots (6)$

Necessary and sufficient conditions for solutions to these problems are

$$\sum_{i=1}^{n} \lambda_i (\partial g_{ij}/\partial x_j) \leqslant 0, = \text{if } x_j > 0, \quad j = 1, 2, \ldots, n. \quad \ldots \quad \ldots (7)$$

and $U_i - \lambda_i \leqq 0$, $=$ if $y_i > 0$, $i = 1, 2, \quad s, \quad \ldots (8)$

It is clear that (7) and (8) are identical in form to (3) and (2), and if the functions involved are strictly concave, (7) and (8) will have unique solutions. Now if managers and the distributor are faced with market prices equal to the dual variables associated with a solution to (1), they will choose consumption and production vectors which solve (1). If all the functions involved are strictly concave, the solution to the resource allocation problem boils down to centre's quoting the appropriate prices.

Arrow and Hurwicz(5) show that the prices may be found by iterative procedure which in a very direct sense imitates a competitive market. Consider the following equations :

$$\dot{y}_i = \begin{cases} 0 & \text{if } y_i - 0, \quad U_i - \lambda_i \leqq 0, \\ a(U_i - \lambda_i) & \text{otherwise} \end{cases} \quad \ldots \quad \ldots (9)$$

$$\dot{x}_j = \begin{cases} 0 \text{ if } x_j = 0, \ \sum_{i=1}^{s} \lambda_i (\partial g_{ij}/\partial x_j) < 0 \\ a \sum_{i=1}^{s} \lambda_i (\partial g_{ij}/\partial x_j) \text{ otherwise} \end{cases} \quad \ldots \quad \ldots (10)$$

$$\lambda_i = \begin{cases} 0 \text{ if } \lambda_i = 0, \ e_i + \sum_{i=1}^{s} g_{ij}(x_j) - y_i > 0, \\ a'y_i - \sum_{j=1}^{n} g_{ij}(x_j) - e_i) \text{ otherwise} \end{cases} \quad \ldots \quad \ldots \quad \ldots (11)$$

The above equations imply the following : Equation (9) stipulates adjustment of the final demand for the good is at a rate dependent on the difference between its marginal constribution to the objective function and its price, equation (10) requires that each firm should alter its operations in such a way as to raise its profits, and equation (11) implies that the price of good should be raised if demand exceeds supply, and vice versa. Arrow and Hurwicz(4) showed that the

process described by equations (9) to (11) converges to a solution to problem (1), thus enabling the central authority to find an optimum resource allocation without at any stage receiving information about the production possibilities open to firms.

3-2. Malinvaud (35*a*) has also analysed a price-guided procedure, but it is quite different in spirit from the one discussed above. According to him we can formulate the planning problem as follows :

$$\left.\begin{array}{l}\text{find a vector } \underset{\sim}{y} \text{ which maximizes } U(\underset{\sim}{y}) \\ \text{subject to } 0 \leqslant \underset{\sim}{y} \leqslant \sum_{j=1}^{n} \underset{\sim}{x}_j + \underset{\sim}{e} \text{ and } \underset{\sim}{x}_j \in X_j \\ \text{for } j = 1, 2, \cdots \cdots n\end{array}\right\} \quad \cdots \quad (12)$$

where $\underset{\sim}{y}$ is once again a vector of amounts allocated to final demand, e is the vector of economy's endowments, $\underset{\sim}{x}_j$ is the firm j's production programme, and X_j is the set of all such programmes feasible for j. At the t th iteration of the planning process, the central authority solves this problem with the constraint $\underset{\sim}{x}_j \in X_j$ replaced by $\underset{\sim}{x}_j \in X^t{}_j$, where $x^t{}_j$ is an approximation to X_j, constructed as follows. At each iteration of the planning procedure, the central authority announces a set of prices : firms are required to calculate their profit-maximizing production programmes at these prices, and inform the centre of these. At the t th iteration, therefore, the centre knows of t feasible plans for each firm. For firm j, let these be $x^1{}_j, x^2{}_j, \cdots x^t{}_j$: firms' production possibility sets X_j are assumed to be convex so that the approximation $X^t{}_j$, defined by

$$X^t_j = [\underset{\sim}{x} \mid x = \sum_{i=1}^{t} \lambda_i x^i_j,\ \lambda_i \geqslant 0,\ \sum_{i=1}^{t} \lambda_i = 1] \text{ is contained in } X_j.$$

Now it is only necessary to define the rule by which the centre chooses the the prices announced at each step. These are simply the dual variables associated with a solution to problem (12) with X_j replaced by $X^t{}_j$. A typical iteration runs as follows :

(i) The centre announces as prices the dual variables of the solution to the problem.

$$\text{Maximize } U(\underset{\sim}{y})$$

$$\text{subject to } 0 \leqslant \underset{\sim}{y} \leqslant \sum_{j=1}^{n} \underset{\sim}{x}^t_j + \underset{\sim}{e},\quad \underset{\sim}{x}^t_j \in X^{t-1}_j,$$

$$\text{where } X^{t-1}_j = [x \mid x = \sum_{i-1}^{t-1} X\lambda_j,\ \sum_{i=1}^{t} \lambda_j = 1],$$

and the $\underset{\sim}{x}^i{}_j$ are firm j's response at earlier iterations.

(ii) Firms inform the centre of the input-output plans that maximize their profits at new prices.

(iii) The centre constructs new approximations $X'{}_j$ to the X_j by incorporating this new observation.

(iv) Step (i) is repeated with X_j^{t-1} replaced by $X^t{}_j$. Malinvaud (1967) has proved that this process converges to a solution to the problem (12). He established that it does so via a sequence of feasible plans y^t having the property that $U(y^t) \geqslant U(y^{t-1}) \geqslant U(y^{t-2})$.

3-3. Besides the above two price-guided approaches some economists have also made some contributions towards non-price approaches, for the simple reason that almost all planned economies have relied heavily on forms of organisation within which the central authorities disperse quantitative input and output targets, supplemented only minimally by prices. The main objective here has been to examine if they are fundamentally misguided or there are some advantages in resource-allocation turns. Heal(27) has considered the following simple non-price approach : With n different firms (in an economy) each producing a good only to supply the final demand let the output of the i th firm be denoted as $Y_i = f_i(X_{i1}, X_{i2} \quad X_{im})$, where X_{ij} (i=1, 2, m) is the amount of resource j used as an input by firm i, the economy has m endowments X_j being that of the jth, so that X_{ij} must satisfy $\sum_{i=1}^{n} X_{ij} = X_j$ for all j, the planning problem may be defined as follows : maximise $U(Y_1, Y \quad , Y_n)$

$$\text{subject to } Y_i = f_i(X_{i1}, X_{i2}, \quad , X_{im}), \qquad (13)$$

$$\sum_{i=1}^{m} X_{ij} \leq X_j, \; X_{ij} \geqslant 0$$

For solving the problem the procedure suggested is : the centre proposes an initial allocation X^o_{ij}, i = 1, 2, n, j = 1, 2, m, of all inputs in all firms and in return is informed of the values of the derivative $\partial y_i / \partial y_{ij}$, for all i and j. It then alters the original allocation according to the equations

$$\dot{X}_{jq} = U_i f_{ij} - Av\,(K_j)\, U_i f_{ij} \text{ for } i \in K_j, \qquad \ldots(14)$$
$$= 0 \text{ otherwise,}$$

where $Av\,(K_j)\, U_i f_{ij}$ is to be read as "the average of f_{ij} for all i in K_j" and K_j, a set of indices, satisfies $K_j = (i / X_{ij} > 0$ or $X_{ij} = 0$ and $U_i f_{ij} > Av\,(K_j)\, U_i f_{ij}$;

Heal has described its construction in detail.

3-4. Heal(27) has also discussed other methods, such as, an amalgam of price and quantity approaches, quantity-quantity approach by Creamer (15 & 16) and finally the elegant methods of planning with public goods developed by Malinvaud (35a & 35b), and those for use in an economy with public and private goods developed by Dreze and Poussin (20a).

4. Applications in Indian planning and Rural Development :

Bhattacharya(6) perhaps first attempted to build plan targets with the help of an available input-output matrix of Indian economy with objective

functions like (i) maximizing the national income (or growth) (ii) minimizing the gap in trade balance for some assumed employment targets and fixed outputs in some key sectors like iron & steel, small scale manufacturing etc. Subsequently we find the use of such methods in our fifth and sixth plans, and the construction of input-output tables has now become almost a regular activity of the Central Statistical Organisation. The latest input-output transaction table for Indian Economy prepared by CSO refers to the year 1983-84., the latest year for which the detailed information in the respect of registered manufacturing was readily available from the Annual Survey of Industries.

4-1. It has already been mentioned that the aspect of reduction of inequalities in income has so far been taken care of in our national plans rather indirectly through poverty alleviation programmes, and some investments in the rural sector, but no effort has been made so far to introduce the aspect of minimizing the variance in income (or concentration ratios) directly in our plan models. Despite deliberate efforts towards rural development as are now being made in our annual plan schemes no doubt achieve the objective of reduction of inequalities in income (as the zero-income groups or unemployed people are to be found largely in rural areas), we should have to fix some targets towards such reduction over a period of say five or ten or twenty years. In other words, what we need is not merely to maximize, as the statisticians would say, the mean but simultaneously minimize the variance of the income as far as practicable within a specific period.

4.2. A careful study of the technical note on the Seventh Plan of India (1985-90 shows that the Seventh Plan used a Model Frame which was an extension of the one used in the Sixth Plan formulation incorporating three basic objectives vig., food, work and productivity, and the strategies chosen to achieve the same were (i) a faster growth of agriculture in the Eastern Region with a large percentage of small and marginal farmers using largely a labour-Intensive technology along with high incidence of poverty, and (ii) a significantly high priority in investment allocation to human resources development, infrastructure and science and technology with their implications for improvements in productivity and technology. The basic model structure and its working were the same as in the Technical Note on the Sixth Plan (1980-85) of India. The Seventh Plan model comprised a "Core" model and seven major "sub-models" viz., agriculture, industry, consumption, poverty, export and import, financial resources and demography and employment. The core model consisted of (i) a macro-economic model, (ii) and input-output (I-0) model and (iii) an investment model. The macro-economic model consisted of a number of national income and expenditure identities, and, in combination with the I 0 model determined investment in the terminal year endogenously. With a given target rate of growth and

base year GDP saving and investment decisions of public and private sector and certain other exogenous variables the macro-economic model determined resources available for investment. The I-O model used was the one updated from the 115 × 115 sector model with reference year 1973-74 and prepared by the Central Statistical Organisation (CSO). Capital coefficient matrix and incremental capital-output ratios (ICOR) were borrowed from the findings of the Working Group for Seventh Plan, materials supplied by the CSO as also some past observations.

4.3. Thus even in the formulation of the Seventh Plan we find no mention of maximizing of a suitable objective function, nor minimizing of income variance directly. Indirect inclusion of the latter via poverty sub-model leaves much to be desired. It is well known that countries which perform badly with regard to poverty eradication relative to their per capita income level also have a high degree of overall inequality. Poverty eradication, it is said, goes hand in hand with reduction in income inequalities. In our Seventh Plan document we find from the Poverty sub model that by 1989-90 the poverty ratio (i.e., percentage of population below the poverty line would be 25.8 (28.2 for rural areas, 19.3 for urban areas) but no use has been made of the variance of the underlying income distribution, which could have been derived from the figures of Lorenz ratios (vide table 3.6, p 16 of the Technical Note). As it is now fairly well-established from the data thrown up by the National Sample Survey Organisation from the 2nd round to 43rd round that the underlying distribution of consumer expenditure (x) is log normal [with E $(\log x) = \theta$, and Var $(\log x) = \lambda^2$] and the parameten λ can alone summarize the entire information about the inequality of distributions and the Lorenz curve in the case solely depends on λ

[Lorenz ratio $L = 2\phi\left(\frac{\lambda}{\sqrt{2}}\right) - 1$, where ϕ is the normal probability integral]

while the various other measures of inequality are all, necessarily, monotone increasing functions of λ, we can work out the estimates of λ as 0.646 and 0.586 respectively from the figures of Lorenz ratio given in the aforementioned table of the Technical Note. In other words, in the subsequent rounds of NSS (i.e., 32nd round with reference period 1977-78 and 38th round with reference period 1983 the expenditure data (a proxy for income data) did

N. Bhattacharya and N.S. Iyenger (7) in their paper studies the data from the 2nd to 14th rounds and gave the estimates of both θ and λ by subsamples (to give and idea of standard errors) for each of the rounds separately for rural and urban households. In the rural areas the estimates of λ fluctuated around 0.56 to 0.64, while in the urban areas the same were between 0.646 and 0.746. They concluded that for either sector (rural or urban) there was no definite trend in the movement of concentration ratios over rounds for either of the two sectors, the adjusted distributions remained more or less stationary and finally, the inequality was somewhat greater in the rural. The first conclusion could also be reached without any assumption of log normality by means of a graphical approach.

not show any improvement over what was noticed by Bhattacharya and Iyenger (vide footnote 1 infra) from the 2nd to the 14th round. But, in the Technical Note percentage of population below the proverty line (i.e., a measure of head counts in which the same weight is given to a person a household which is 1% below the poverty line as to another which is 90 percent below the poverty line) has been favoured postulating an over-all figure of 25.8% below the poverty line at the terminal year (i.e., 1989-90). It would have been more satisfactory if poverty gap measures were taken into account a la Sen (45, 47) by postulating some decrease in the estimated λ values.

4.4. Determinats of Income Distribution and Poverty :

Practically all economic factors in one way or another contribute to the determination of income and thus also to poverty. Bigsten (8) presented the evidence that had been gathered in empirical studies under the ten following headings :

Institutional Determinats : 1. Type of economic system

Determinants of functional income distribution :

2. Factor proportions
3. Technology

Determinants relating to both functional and size distribution :

4. Sectoral structure
5. Regional structure
6. Factor markets
7. Commodity markets

Determinants of size distribution :

8. Ownership of assets
9. Possession of human capital
10. Social stratification

Our main concern is to explain the size distribution of income, and in the last group all the factors listed above affect size distribution directly, that is, distribution of factor incomes over households or individuals, although the other factors which influence primarily the functional distribution of income exert an indirect influence on the size distribution of income.

The amount of land and capital available to the economy relative to the amount of labour available is a vital determinant of the functional income distribution. The countries that have managed to combine growth with a relatively equitable income distribution, such as Taiwan, South Korea, Costa Rica have often been characterized by equal distribution of land (Francs,[21] Gonzales-Vega and Cespedes[25] ; Lee(23) ; Rao(42). This had led to large segments of the rural inhabitants sharing in the increased agricultural incomes. It should also be pointed out that introducing land reforms we do not normally face the conflict between growth and distribution, since small

farms have been found to be at least as efficient as large farms in their resource use (Yotopoulos and Nugent(50) ; Lipton(34) ; Singh(46).

The distribution of human capital over the labour force is paral el to the distribution of asset ownership. Bigsten (8) showed, in a study in Kenya, that the rates of return on educational investment had gone down in the face of rapidly increasing supply of skilled labour, and during the seventies market forcees seemed to have become increasingly important in the labour market in Kenya. In such a situation educational policy may be an efficient policy for equitable growth.

As regards social stratification it may be said that there are many causes apart from the economic ones. The most recent example seems to be the Chinese in South East Asian countries such as Malayasia, where a policy aimed at helping the underprivileged Malays (Bumiputra policy may have reduced their disadvantage as a group, but instead increased inequalities within the group. With a pronounced social stratification inequality is often transferred from generation to generation.

4.5. Economic Policy and Inequality : It was Kuznets(30),(31), who first advanced the hypothesis of the "inverted-U", according to which inequality first increases and then decreases with rising per capita income. But a policy which maximizes growth may be deemed quite undesirable for poverty iradication in the short run.

4.5.1. Chenery et al., were the first to powerfuly discuss the need of equityoriented development strategies in their book entitled "Redestribution with Growth" and argued that policy should be aimed at certain terget groups of the poor (like small farmers, landless, urban unemployed and the working poor). A more direct approach to poverty eradication was suggested by the ILO in 1976, when it proposed the basic needs strategy whose aim was to raise the standard of living of the poor directly by making available private goods such as food, shelter and clothes, and certain public goods such as health services, education, water, and transport. The main point in the strategy outlined by ILO was thus that there should be a direct effort at improving the lot of the poorest without waiting for the "trickle down" process to do the job. The policy measures discussed in relation to the basic needs strategy were changes in relative prices, direct transfers of resources to the poor for consumption and investment and redistribution of the stock of assets and land in favour of the poor. These kinds of policies have already been tried out in some countries including India and even where they have functioned best they seem to have affected poor people, but not the poorest of the poor (Lipton(35), the effects having trickled up rather than down. In regard to achieve poverty alleviation we may note the categorization of policy proposed by Selowsky (1981) such as (i) elimination of distortions that inhabit the trickle down (say, by increasing thc employment content of growth , (ii) investment

policies aimed at increasing human and physical capital endowments of the poor and (iii) pure basic needs policy aimed at improving the health status, literacy etc., of the poor.

4.5.2. In order to study the impact of policies on income distribution and poverty we should perhaps carry out the analysis within the framework of a general equilibrium model, in which indirect effects may also be taken into account. In this spirit we find in the literature models advocated by Adelman and Robinson (1978), Anker & Knowles, Rodgers et al.(43) and Taylar et al(49). Analyses through social accounting matrices (which are no doubt more restricted but capable of capturing some interdependencies have been done by Chandler et al. (1980 , Defourny and Thorbecke(13), Hayden and Round(26), Pyatt and Roe(40), Pyatt and Round(39), and Round(44). Adelman and Robinson identified two potentially useful strategies for equitable growth, one is export-led and skill-intensive growth, the pre-conditions of such a strategy being (1) a large proportion of the labour force having already attained a good level af education and skill, and (2) ability to find some way of controlling the development of agricultnral terms of trade (vis-a-vis the rest of the economy). The second strategy emphasizes *rural development*. The preconditions of such a strategy are : existence of (1) a relatively equitable distribution of land and 3) control of the agricultural terms of trade. The other models cited above also show crucial importance of urban-rural links for income distribution. malnly urban-rural terms of trade and migration.

4.5 3. As the majority of the people are to be found in rural areas in LDCs, minimizing the gap between agriculture and the rest of the economy is likely to result in reduction of inequalities in income. We may either envisage improvement of the agricultural terms of trade or enhancement of agricultural productivity or both. But this has to be done in conjuction with the assured growth of certain other sectors of the economy so that a harmonious development of the economy can be assured. Thus, along with the agricultural policy, robust industrial and trade policy, prices and income policy and fiscal policy will have to be pursued so that income distribution may not be affected negatively.

In the light of what has been dicussed above let us now examine what has been achieved in our country. The strategy of rural development was adopted by the Govt. of India right from the beginning of the sixth plan period (1980-85) poverty alleviation programmes like Integrated Rural Development Programm (IRDP), National Rural Employment Programme (NREP), Rural Labour Employment Guarantee Programme (RLEGP) etc. were launched. From 1988-89 that last two programmes were subsumed under Jawahar Rojgar Yojna (JRY). Although some positive results have been claimed by the Government of India with the help of macro data, it has been recently observed by Dreze (1990) that such macro data, though

capable of capturing broad contours regarding the impact of the poverty alleviation programmes on the development and general welfare of the people for which they are intended, are quite incapable of providing insights and critical information for which only micro data of detailed field investigation as have been done by Dreze are necessary. Actually the core of Dreze's findings consists of the discovery of IRDP's and similar other programme's implementa tion failure. Dantwalla (18) has advocated the extension of Maharashtra's Employment Guarantee Scheme which, according to him, has proved successful through trial and error. But even macro data can indeed give an idea about the impact of these programmes on development and welfare if, as we have mentioned above, we also examine the estimates of a suitable measure of dispersion (say standard deviation) of the income (or its proxy like expenditure) distribution as well, obtained from the relevant data obtainable of various rouuds of NSS. We have already noted the near constancy of the variance over long periods, as is evident from the results of the various round of the NSS. Table 1 below sets out the relevant figures. It may be noted that between 1952-53 and 1958-59 average per capita monthly expenditures and their standard deviations remained aln ost static in both the rural add urban areas. The averages recorded some appreciable changes in 1972-73 but standard deviations were almost constant. The constancy of standard deviations continued till 1983-84. It is only in 1988-89 we find an appreciable increase in the average per capita monthly expenditure and a decrease in standard deviations in both the rural and urban areas, and the changes have been found to be even statistically significant. In rural areas this significant change perhaps reflects the result of massive outlays in rural areas. But the significant change in urban areas along with the rural areas is to be particularly noted. But it should also be noted that the estimates obtainable from NSS 44th round (1988-90) data show that the postulated in the 7th plan per capita expenditures of Rs. 249.60 in urban areas and Rs. 166 70 in rural areas (both at 1984-85 prices) are not likely to realised in 1989-90. It is in this context that observations of Dreze (op. cited) perpahs become relevant. It may be recalled (vide Technical Note on Seventh Plan of India : 1985-90) that in arriving at the targets of the seventh plan no objective function was optimized but a sort of material balance was struck with the help of an input-output model, resources available for investment (investment model) and a macro-economic model by means of an iterative process till a convergence in regard to the investment level and its asset composition was reached.

4.5.5. In our eighth plan with high expectation from the people and much repeated promises from the politicians about quick eradication of poverty, inequality and unemployment on top of acute balance of payment position a set of clearly defined objectives and a plan strategy achieving the optimum level of the same are imperative.

Table 1. ESTIMATES OF PARAMETERS OF LOG NORMAL DISTRIBUTION FITTED TO N.S.S. EXPENDITURE DISTRIBUTION BY ROUNDS.

srl. no.	N S.S. round no.	refe ence year	mean (log x)		standard deviation (l. g x)		lorenz measure	
			rural	urban	rural	urban	rural	urban
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	4th	April–Sept. 1952	2.878	3.133	0.626	0.673	0.340	0.365
2.	5th.	Dec. '52—March '53	2.805	3.090	0.603	0.738	0.330	0.397
3.	7th	May—Sept. 1953	2.661	2.938	0.610	0.685	0.334	0.371
4.	8th.	Oct. 1953—March 1954	2.499	2.946	0·642	0.721	0.350	0.390
5.	**8th.	July 1954 to April 1955	2.497	2.947	0·642	0.721	0.350	0.390
6.	9th.	May—Nov. 1955	2.535	2.993	0.610	0.681	0.335	0.371
7.	10th.	Dec. '55—May '56	2.670	2.999	0.630	0.677	0.344	0.368
8.	11th.	Aug. '56—Feb. '57	2.661	2.940	0·583	0.746	0 319	0.402
9.	12th.	Mar.—Aug. '57	2.667	3.013	0.607	0 725	0 331	0 393
10.	13th.	Sept. 1957 to May 1958	2.739	N.A.	0·607	N.A.	0.333	N.A
11.	14th.	1958—59	2.808	N.A.	0·599	N.A.	0.378	N.A
12.	27th	1972—73	4.337	4.618	0.545	0.683	0.301	0.371
13.	32nd.	1977—78	N.A.	N.A.	0.655*		0.365*	
14.	38th.	1983	N.A.	N.A.	0.556*		0. 318*	
15.	44th.	1988—89	5.022	5.369	0·437	0.591	0·244	0.328

* Rural and Urban combined (vide Technical Note on Seventh Plan)

**For this and subsequent rows Jammu & Kashmir has been included

Note : Rows No. 1 to 11 have been taken from Bhattacharya & Iyenger.

Rows No. 13 and 14 have been taken from the Technical Note on Seventh Plan.

Rows No. 12 and 15 were estimated from NSS data (viz. 27th & 44th rounds).

4.5.6. In order to do so we have to bear in mind that we are required to use the technical language, solve a mathematical programming problem with several objeetive functions i.e., a vector maximum problem of the form : Max $\{Z(x) \mid x \in X\}$, wherc $Z(x) = \{z_1(x_1), \cdots\cdots, z_n(x_n)\}$ is a vector-valued function of $x \in R^n$ into R^k. The set of all "efficient" solutions" (complete solution) plays a central role in this theory. This set is defined as the set of all solutions $x \in X$ while, with respect to the objective function $z_i.(\lambda)$ satisfy the condition that any ("optimal") compromise solulion, whichever way it has been determined, has to be a member of the "complete" solution. Now that CSO's 1983-84 input-output table is available the same may conveniently be used in an aggregative form While constructing the objective functions one should take special care to see (i) output in the rural sector is maximized so that an assured employment is generated in the so-called zero-income group and thus expenditure variations are substantially reduced, (ii) adverse balance of payment is minimszed, (iii) a steady flow of employment from the urban informal sector to the formal sector is assured, as far as practicable. One may think of other types of objective functions also. Algorithms to solve such problems of multiple objective functions [vide Zimmerman(52)] are. available.

4.5.7. Considerabel simplification in the model can be introduced by obtaining a preference distribution of the population by monthlay expenditure level, just by trial and error or computer simulation, with the contributions of the lowest two or three expenditure levels (using the base year data of 1989-90 i,e. 45th round of NSS) pushed up to higher levels as a desired level of expenditure variance (assuming the well-establisled validity of log—normality to continue) which would eusure the extent of necessary reduction in ineqalities of expenditure over a space of five or ten or fiften yearly intervals along with output necessary, consistent with the available investments, in the rural sector including not only agriculture but also rural industries and infrastructure (or other asset) creation activities evisaged under JRY. The targets arrived through the rural (or agricultural) sub-model may, of course be set as equalities instead of inequalities, if necessary.

5. Summary and Conclusions :

After reviewing briefly the methodologis adopted in our seven previous plans and pointing out how planners can choose a course of action yielding optimal values (which may be simultaneous maximization of output growth, employment, positive trade-balance) an attempt has been made here to show how another very important objective viz, reduction of inaqualities in income (or its most natural proxy like expenditure), hitherto not directly included in the planning models, can also be fulfilled by applying some available modern techniques and economic calculations, Instead of taking some ad hoc measures like 50 per cent investments in the rural sector the importance of application of these techniques and calculations have been highlighted with the object of arriving at more satisfactory results.

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LAND REFORMS IN WEST BENGAL
AN EVALUATION IN ALL-INDIA PERSPECTIVE OF RURAL POVERTY

Sachinandan Sau*

The most pressing problems in rural India today are those of poverty[1] unemployment, malnutrition and ill-health and these are often ascribed among others, to inadequate implementation of land reform measures in India in the perspective of not inconsiderable economic growth achieved by India during the post-independence period[2]. Prior to independence there was also massive poverty in rural India and that was explained in terms of the exploitative land tenure system and adverse trade and commercial policy of the British Government. The peasantry including the tenants of the Zamindars were poorer than the rest of the rural population and were intolerably oppressed. One of the first measures of the Government of independent India was the abolition of all intermediary tenures. The abolition of intermediaries started in 1948 with the enactment of legislation in Madras. Legislation was passed in all other states. West Bengal, the state wrost affected by the ravages of absentee landlordism, was among the late comers to adopt legislation in 1954-55. Efforts were also made to legislate ceiling limits on landholdings and to distribute the surplus land to the landless along with the provisions for security of tenancy and fixation of fair rents.

The overall progress of land reforms in India has been tardy with differential performances in states of India. West Bengal is the leading state in India in respect of land reforms. This state accounts for 3.2 percent of total agricultural area of India but its share in total surplus land declared was 16.1 percent in 1981.[3] The state of West Bengal indeed exhibits to unique feature of having seized more land than was originally estimated to be surplus.[4] Also, in the matter of distribution of vested land the state now stands head and shoulders above the rest of the country. In respect of recording of bargadars the state's performance has also been spectacular. Share-croppers and landless labourers are at the bottom end of the agrarian class heirarchy and the two land reform measures referred to are meant to benefit them. The questions that may arise in this context are : What's the impact of these land reforms on rural poverty ? Have land reform measures helped in improving agricultural production and productivity ? What has been their impact on savings in the rural areas ? The present study makes an attempt for finding out answers to these and other related questions and makes an economic evaluation of land reforms in West Bengal. The two specific measures which will be discussed at length are : (1) redistribution of

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lands appropriated by the government in accordance with various ceiling laws, (2) Operation Barga, designed to protect the interests of share-croppers. Since two measures, although specific, are important in the broader perspective of land relations which, by their very nature, are embedded in the specificities of the history of a country or a region, a proper evaluation of contemporary changes demands a brief review of the evolution of land relations in a historical perspective.

The situation before 1947

In the traditional land system of India before British rule the land belonged to the peasantry, and the Government received a portion of the produce. When the British established their dominion on the ruins of the Mogul Empire, they transformed the land system of India. Different forms of exploitations came to play a great part, outweighing the role of direct government land revenue, through the development of landlordism and enhanced rents, commercial penetration, etc. By the introduction of the English landlord system a new class was being built up on the basis of the previous tax-farmers. In 1793, the Zamindary system through the introduction of Permanent Settlement was introduced in Bengal with a view to securing a stable state share as the first share on the land and to create a class of landlords as the social buttress of English rule.[5] From propeitor of land the cultivator was reduced to the status of a mere tenant. Fixity of tenure that the cultivator enjoyed earlier was lost. He was denied even the advantage of fixity of rent. As the demand for rent increased in Bengal, and the competition for it among cultivators became intense, rents were screwed up and the landlord's profits grew rapidly.[6] Landlordism prevailed in the 49 percent of the area of British India covered by the Permanent Settlement and spread extensively and at an increasing pace in the Ryotwari areas of Bombay and Madras through the process of sub-letting and through the dispossession of the original cultivators by money-lenders and others securing possession of their land. The insecurity of tenure, the fear of eviction, the uncertainty which accompanied tenant-cultivation and the rates of rent being high in relation to the value of output per acre became an added reason for the cultivators to live from hand to mouth, exploit the land unduly and avoid permanent improvement through investment in land. In terms of productivity per acre India could be classified on the eve of her Independence among the countries of the world very close to the bottom of the productivity ladder.[7] Both agriculture and agriculturist languished in the country.

The outcome of all this, among others, has been that after two centuries of imperialist rule India presents a spectacle of squalid poverty and misery of the mass of the people without equal in the world. Even British government

in 1929-30 states that 70 to 80 percent of the inhabitants in India were still beset with a poverty of the kind which had no parallel in Western lands. They were living on the verge of subsistence.

The Post-Independence Period

Land reforms programme in independent India has got the stated objective of achieving growth with social justice. It has, however, been observed that even after 39 years of planning era for agrarian reform, abolition of intermediary tenures could not be achieved. No doubt, most of the intermediary tenures have been abolished ; yet, there are quite a few states, namely Andhra Pradesh, Gujarat, Karnataka, Maharastra and Meghalaya, where legislative provisions are either inadequate for abolishing all kinds of intermediaries or are not being implemented in letter and spirit.

As regards tenancy reforms it has been observed that security of tenures and conferment of ownership rights concern only those tenants whose names have been recorded. But thousands of landless labourers (in states, namely Andhra Pradesh and Kerala) who work on informal or oral tenancy basis under Landlords holding vast tracts of land in the names of self and others have no security of tenures and perhaps under the socio-economic situation prevailing in most of the states, they cannot dream of becoming the owners of the land they till. Though no reliable data are available on the percentage of the area operated on informal arrangements or number of total informal agricultural holdings, it is believed that 30 to 40 percent of the land owned by large land holders might be under informal tenancies.[8]

The objective of land reforms programmes at fixing ceiling on land holdings and distribution of the surplus to the landless has had an almost identical fate. The performance regarding declaration of surplus under circumstances of highly skewed pattern of land holdings in India as well as distribution of land is disappointing.[9]

There are evidences of the perpetuation of the highly skewed character of land distribution. According to Reserve Bank of India data the concentration ratio of assets (mainly agricultural land) owned by rural households was 0·65 in 1961-62 and increased to 0·66 in 1971-72. The poorest 10 per cent rural households owned only 0·1 per cent and the richest 10 per cent owned more than half the total assets in 1971-72 as well as 1961-62.

In India, there was worsening of the economic situation, particularly, in the rural areas during the first two decades of her planning era, in spite of the growth in the national economy. There is a new awarness. The manner in which growth is obtained is of crucial importance from the point of view of employment generation and amelioration of the rural poor.[10]

Land Reforms Debate

In this context we may refer to the debate on the usefulness of land reforms in India. There is one school of thought which believes that land reforms are helpful to improve the production and productivity in agriculture. The case in favour of land reform in addition to considerations of social justice and equity, has based on the statistically supported argument that, in developing countries, there exists an inverse relationship between farm size and output. Small holdings are having higher cropping intensity implying higher output per unit of land as well as greater labour absorption. IBRD Report, 1973 observers, "The higher the distributive equality, the larger the role of those smaller farm sizes on which production per area unit is larger because of more intensive land use systems and more intensive cultivation practices". Breaking up of large holdings would catch two birds with one stone ; equity with development would follow.[11] The inverse relationship, assuming homogeneous land, has been established in the Indian case, although not always at a significant level and not for all crops.[12]

On the other hand, Dandekar and Rath point out that "the new uneconomic holdings which may be created will be worse still because the surplus land which will be surrendered and redistributed will in general be of much inferior quality" which calls for heavy investment to make it cultivable. It is argued that the distributive land reform measures, which lead to break up of large farms, would discourage savings in the rural areas and that hampers agricultural growth and stability. The higher output on smaller farmers should not be construed as an argument for land distribution. Labour productivity can be extremely low, and family income, despite the intensive labour application will often be forced to starvation levels.[13]

It may be noted, however, that land reforms are now viewed as a strategy for rural development embodied in the perspective of growth with social justice. Land reform is likely to have the desirable effect of raising the productivity of agricultural workers through extended employment and higher income and consumption and thus impact on rural proverty. The social justice aspect is related to these aspects of poverty removal.[14]

Since large farms gain the benefits of new technology they would progressively tend to adopt labour saving devices and, in the long run, there will be substantial displacement of labour. Besides, a large farmer who produces primarily for the market, is more likely to stop putting in additional labour into agricultural operations the moment the marginal return is less than the marginal cost.

The labour absorption on the small family farm in a labour surplus economy, with high levels of unemployment and under-employment in the rural sector is not affected by the MR-MC equation as the family labour has

very low, almost zero, opportunity cost. An equally important consideration is the desire to own land, particularly among the landless agriculturists and the effect of ownership of land operates to "convert sand into gold". The problem of lack of resources in the hands of these beneficiaries is an altogether different issue that needs to be solved by suitable follow-up actions, instead of finding excuses for not distributing the land to the landless. Again, the evidence suggests that there is no difference in marginal savings behaviour among farming households in different size-groups and hence a redistribution of land would not curtail the volume of savings. In addition, the benefits of larger income securing in a large number of hitherto landless persons would ensure higher level of consumption and improve the level of living of a large number of persons, which can not be achieved by any other conceivable monetary or fiscal measures in a sharply dichotomous economy.[15] With increase in family employment, income and improvement of level of living, marketed surplus of foodgrains would rise and savings generated would be utilised productivly in land and other assets.

World Development Report 1990 while focusing on poverty observes, "large scale redistributions of land have sometimes been successful. In Japan and the Republic of Korea, for example, land redistribution was central to the reduction of rural poverty and laid the basis for the other policies advocated for poverty alleviation. Where it can be done, redistribution of land should be strongly supported."

Implementation of land reforms in so far as it has succeeded in breaking feudal relations and generating capitalist or semi-feudal relations, has led to greater agricultural production.[16]

The sixth and seventh plan documents also recognise that land reforms constitute a vital element both in terms of the anti-poverty strategy and for modernisation and increased productivity in agriculture. However, the implementation of the programme is far from the objective mainly on account of lack of meaningful and strong political will. In spite of inclusion of land reforms in the 20-point programme the progress had been still unsatisfactory on account of lack of the same political will at the state level. Political parties in power in India do not have either the sincerity or the will to provide a permanent asset base, to the millions of landless families.[17]

Case of the West Bengal

In this perspective one may note that West Bengal has achieved a commendable success in respect of land reforms. The West Bengal Government has been endeavouring to improve the economic condition of the rural poor through a comprehensive programme of rural development in which land reforms play an important role.[18] The West Bengal Estate Acquisition Act, 1953 provided the necessary legislative infrastructure for elimination of

intermediary interests. The West Bengal Land Reforms Act, 1955 which complements the earlier Act provides for further ceiling on family basis and distribution to the eligible persons of the lands declared ceiling surplus under both the Acts. The vigorous implementation of land reforms (including redistribution of land and providing security of tenure to sharecroppers) has been one of the success stories of West Bengal.[19] The performance of the state indeed stands out in sharp contrast to the results achieved in the rest of India. While more land than was originally estimated to be surplus was seized in this state, there has resulted in the preponderance of small holdings (Table 1).

Table 1 LAND SURPLUS AND LAND REFORMS IN WEST BENGAL VIS-A-VIS THE REST OF INDIA

(Amount in Lakh hectare)

	Surplus Estimated 1971		Surplus Declared 1981		Land Ownership Percent 1980 81			
					Below 2 ha		10 ha and above	
	Total	Percent	Total	Percent	No.	Area	No.	Area
West Bengal	2·14	1 8	4.79	16·1	89	60	0.02	4
Rest of India	118·91	98.2	25.97	83.9	69	24	2·4	22.8
All India	121 05	100	29.76	100	74.5	26 5	2.4	22.8

Source : Bandyopadhyay (1986).

In this state 3·52 lakh hectares of land have been distributed till June 1989 among 18.28 lakh of landless cultivators out of whom, as many as 10.24 lakh belong to the scheduled castes and scheduled tribe communsties.[20] The effect of land reform programme on the structure of landholdings in the state has been that the number of holdings in the marginal groups of less than 1 hectare increased from 2·5 million in 1970-71 to 4.1 million in 1980-81. This is a substantial increase of around six percent per year. The all-India increase during the same period was 4 percent. While in the state around three fourth of the additional households in the smaller size category is accounted for by new landowners (beneficiaries of land reforms) and the rest by the rate of growth of the rural population, in the country as a whole the beneficiary accounted for only one-fourth of the small peasant increment.[21] The trend in West Bengal appears to be towards re-peasantisation. The average size in the size class of less then 1 ha has actually remained more or less static at 0·40 ha[22] and as such is an indication of the fact that the growth in the number of small peasant households was not due to parcellisation but due to the induction of new households into the peasant class.[23]

Operation Barga

According to the section 50(e) of the West Bengal Land Reforms Act, 1955, name(s) of the Bargadar(s) should be recorded in the village record-

of-rights. In 1974 this work had been started, but till the end of 1977 the performance was not at all satisfactory. Typically bureaucratic method of recording the names of sharecroppers failed to achieve any significant success. In May 1978, two 'reorientation camps' were held in the districts of Midnapore and Hooghly where a group of sharecroppers, agricultural labourers and poor peasants had free and frank discussions with the Government Officials for three days. The whole procedure of the 'Operation Barga' (O. B.) as followed at present was suggested by the actual beneficiaries. Operation Barga is nothing but a massive drive to register the names of the share croppers with the collaboration of the groups of beneficiaries and with the active assistance of the peasant organisations.

Till December 1988, names of 13·94 lakh bargadars have been recorded, out of whom 5·84 lakh belonged to the Scheduled Tribes and Scheduled Caste communities. The Left Front Government has also made the right of barga cultivation heritable bringing about further stability in the agrarian structure.

The programme of O. B. has been subjected to serious criticism by many scholars. While many of the criticisms questions the justification of such a programme from economic point of view, others raise doubt against the whole strategy of agrarian transformation being pursued recently in West Bengal.

The most mormidable criticisms against O. B. have been voiced by Rudra (1981) and Khasnabis (1981) From the economic point of view Rudra argues (i) that barga recording has not led to any gain in the income of the bargadars ; (ii) that the recorded bargadars have not been able to use much of modern inputs than before ; (iii) that recording of names by the bargadars has choked the flow of production advances from the landlords to the tenants and (iv) that sharing of cost by the land owners which was gradually emerging as a normal phenomenon in West Bengal has been replaced by the non-participation in cost by them. He also argues that operation barga does not aim at abolition but perpetuation of tenancy.

Khasnobis praises the genuine political will of the government to promote the interests of the bargadars. At the same time he argues that while O. B. tries to record the right of tenants, it approves the intermediary rights of the landowners too. Thus the rent-earning authority of non-cultivators, condemned by the bourgeoise democratic revolution, gets a communist sanction.

Dutt (1981) doubts how long the bargadars can sustain their strength in the absence of economic viability. Bereft of institutional finance and marketing facilities, he argues, the bargadars are bound to the landowner-cum-userer.

The results of surveys conducted in West Bengal have shown that the distribution of surplus land to the landless agricultural labourers and the

recording of bargadars have provided the most basic input and created necessary conditions in which they could improve their socio-economic conditions. Land being the most important factor given economic strength and social status, allotment of a piece of land however bad it might be, and the security of tenure, gave them a new lease of life and an overall improvement in their lands cultivated by tenants or labourers, their position in the rural society. Dasgupta (1987 : 24) has shown, assuming that those owning more than 10 acres of land are basically landlords and, therefore, get their portion declined from 5·35% to 2·42% during the period 1954-55 to 1971-72[24]. At the other end, the proportion of landless families declined from 20·54% to 9·79%. The gini co-efficient is estimated to decline from 0·6944 in 1961 to 0·6472 in 1962.

The state government has been implementing since 1979 a scheme for institutional finance to bargadars and assignees of vested land for providing institutional finance to them. The coverage under the scheme was Rs. 0·59 lakh in 1979, which has cumulatively risen to Rs. 16·8 lakhs in June 1989. The number of beneficiaries reached a peak figure of 370071 in 1982-83. It has been observed that the recovery of those loans was not unsatisfactory.[25] The state government is also giving priority to assignees of vested lands and bargadars in the matter of selection of beneficiaries for various rural development such as IRDP, etc. All these measures have greatly reduced the dependence of the most vulnerable section in the agrarian sector on loans advanced by jotedars and money lenders and have thereby rendered a very handy lever of exploitation ineffective.[26]

As regards the question of impact of operation barga on output one case study undertaken by the Socio-economic Research Institute (SERI) covering the share-croppers of Patna-Bhairabpur village of Hooghly district reveals that out of 20 recorded bargadars 13 have recorded their yield after recording. Majumdar (1990) in a study of Kirnahar village in Birbhum had the similar finding. Both these studies show increase in expenditure on non-land inputs like fertiliser, irrigation etc. end the bargadars' less dependence on moneylenders and jotedars on account of the availability of institutional finance. Majumdar (1990) also shows that the increase in land productivity and bargadars' income have resulted from the investment by both landowners and bargadars in seed, fertiliser and pesticides, the receipt of minikits from panchayet, and the use of HYV seeds and growing importance of Boro Cultiv..tion. Thus Rudra (1981)'s arguments have not come true. The study shows some of the bargadars are now in a position through their savings to purchase Barga-land if such offers comes from landowners and the relation between them is now good with regular payment of rent in kind.

Another study of the Agro-economic Research Centre of Viswa-Bharati concerned with the assignees of vested land in two villages in Malda and

Midnapore districts shows yield in land was low on account of its poor quality though that in Midnapore district was somewhat higher. A study by Department of Economics with Rural Development, Vidyasagar University, has shown that in Belmula village of Danton Block of Midnapore district the Pattaholders, most of whom were landless labourers, have converted the waste land into a highly Productive Soil to ganerate one of the best productivities and diversified ropping pattern which is remunerative in the district by means of their generation of minor irrigation and the Proverty Ratio Among the hitherto land less has been considerably reduced. The needy households have been able to repay their old debts and some of them score and also invest in productive assets. From the survey of 84 sample benificiary households along with a dozen of relatively big farmers in 9 randomly selected villages of this district it is observed that the land productivity, employment and increase in gross earnings in relatively small farms of bargadars and pattaholders are higher than those in relatively big farms.[27]

With greater distribution of land among small-holders and the security of tenure, the productivity per hectare of net area sown in a West Bengal as a whole has gone up by more than 108% during 1965-66 to 1988-89. Cropping intensity increased from 1969-79 (=100) to 115·80 in 1986-87 and current follow as percentage of total land area declined from 43% in 1960-61 to 0·7% in 1985-86.[28]

As an impact of land reforms and allied measures adopted in West Bengal the poverty ratio is observed to decline in the state during 1977-78 to 1983-84 at a higher rate than in many other states and the whole of India (Table 2).

It may be noted that the emphasis on land reforms in West Bengal has not been any exercise in charity, but is essentially a productive move on the basis of hard evidence of superior production performance on the part of the working peasants.[29]

Table 2 : CHANGE IN POVERTY RATIO (RURAL) IN SOME STATES OF INDIA.

States	Poverty-Ratio		Absolute Decline	Percent Decline
	1977-78	1983-84		
1	2	3	4	5
West Bengal	58·31	43·84	14·47	24·8
Bihar	57·82	51·35	6·47	11·2
Uttar Pradesh	49·79	46·48	3·31	6·6
Rajasthan	33·48	36·63	(−) 3·15	(−) 9·4
Tamil Nadu	56·26	44·08	12·10	21·6
Madhya Pradesh	61·23	50·30	11·33	18·4
Andhra Pradesh	45·45	38·67	6·78	14·9

Source : Rao (1986).

Concluding Observations

In the colonial days the reasons for poverty in rural areas of India were attributed to British rule and British introduced exploitative land tenure system. In the post-independence period land reform programmes have been adopted but with differential performances across the states of India. There are debates on the usefulness of land redistribution programme. It is, however, recognised that land being the basic input the distribution of ceiling-surplus land to the land-less agricultural labourers and the provision of security of tenure would improve the socio-economic condition of the poor.

West Bengal performed well in respect of surplus land declaration and distribution among the 'weaker' sections of the society and provision of security of tenure by means of 'Operation Barga' over which there are also debates. The West Bengal experience shows that given the political will, panchayat and people's involvement, the land reform programmes coupled with the provision of non-land inputs can achieved positive impact on agricultural production, productivity and returns from agriculture and make a successful dent on rural poverty, as evidenced in the success of the state in achieving the higher rate of decline of poverty ratio in recent years.

The percellisation of limited land resources may, however, cause an under-utilisation of the new technological possibilities and in the face of increasing population may result in neither an increase in production nor equitable development. The historical record of output changes is rather mixed (Gersovitz, 1976). The land reforms, in order to be successful, should be accompaied not only by credit and irrigation facilities and extension services, but also by market support and co-operative farming, etc. Besides expansion of non agricultural activities should also get priority. A multi-pronged approach including land reforms would serve as a meaningful and useful strategy for elimination of rural poverty.

NOTES

1. As per World Development Report 1990 the rural poor in the 1980's constituted 79 percent of the total poor in India. In 1985, 250 million people of India were extremely poor, which constituted 38 percent of the total population of the country and 4.0 millions are poor (including extremely poor) which the head count index (percent) being 55, the poverty line for the extremely poor is $275 and for the poor is $370 per capita a year in 1985 ppp dollars (The head count index is defined as the percentage of the population below the poverty line).
2. See, Dastwala (1975), Khanna (1987), Sau (1990).
3. See, Bandyopadhyay (1986).
4. See, Leiten (1990).

5. Dutt (1989).
6. See, Bhatia (1965).
7. See, Khusro (1965).
8. See, Basu (1988).
9. See, Report of the National Commission of Agriculture (RNCA), Part-II.
10. See, Locke (1977).
11. See, Leiten (1990).
12. See, Patnaik (1972), Bharadwaj (1974), Chattopadhyay and Sen (1988).
13. Utsa Patnaik (1981) in her flambovant style, thus wants to know "how viable" is a holding when the producers semi-strave ; presumably more "viable" than when they are dead.
14. See, Despande (1989).
15. See, George and Rao (1979).
16. See, Despande (1989).
17. See, Basu (1988).
18. See, Government of West Bengal (1989).
19. See, Sen (19 8).
20. See, Government of West Bengal (1990).
21. See, Bandyopadhyay (1986).
22. See, Agricultural Census, 1980-81 : 16.
23. Leiten (1990).
24. The said percentage declined to 1.30% in 1982.
25. Dasgupta B. (1987).
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METHODOLOGICAL APPROACHES IN ECONOMICS : A REVIEW

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Empricists, wrote Bacon, "are like the ant, they only collect and use ; the reasoners resemble spiders, who makes cobwebs out of their own substance. But the bee takes a middle course : it gathers its material from the flowers of the garden and of the field, but transforms and digests it by a power of its own. Not unlike this is the true business of philosophy, for it neither relies solely or chiefly on the powers of the mind, nor does it take the matter which it gathers from natural history and mechanical experiments and lay it up in the memory whole, as if finds it, but lays it up in the understanding altered and digested." (Novum Organum, p. 93)

This paragraph from Francis Bacon's magnum opus published in 1620 about sums up the consensus on what should be the methodology in a discipline like Economics, if, of course, there is any such consensus. What is important is the fact that Bacon's view on the proper methodology of "philosophy" had been expressed almost four hundred years ago, but the debate continues unabated even today. Indeed, this is primarily due to the nature of the subject itself. Social scientists are torn between the somewhat diametrically opposed desires to resemble the physical scientists on the one hand and the realisation that their subject matter is man, and not inert matter.

After Bacon, the next important step to define the subject matter as well as the methodology of Economics, was taken by Sir William Petty (1623-1687) in the 1670s. What may be described as the departure from the subjectivism and logico-deductivism of the ancient Greek philosophers and the medieval scholastics and the movement towards empiricism and objectivism, Petty's view became an integral part what ultimately came to be unknown as the British tradition of political economy. An early pioneer in Quantitative Economics, Petty adopted the positivist method long before positivism became the accepted methodology of the social sciences in the nineteenth century. His methodological position is clear.

"The Method I take .....is not very usual, for instead of using only comparative and superlative word, and intellectual Arguments, I have taken the course (as a specimen of the Political Arithmetic I have long aimed of to express myself in terms of Number, Weight or Measure ; to use only Arguments of Sense, and to consider only such Causes, as have visible foundations in Nature ; leaving those that depend upon the mutable Minds, Opinions, Appetites and Passions of particular Men, to the consideration of others". (Economic Writings, p. 244).

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The tradition of positivism and quantification in Economics laid down by Petty was continued by Richard Cantillon (16.0 ?-1734) and Francois Quesnay (1694-1774).

This is one aspect of what Joseph Schumpeter described as the Petty-Cantillon-Quesnay sequence in his classic "History of Economic Analysis." The emphasis of all these great economists was on facts or the economic reality and their theories were built on these facts and to describe these facts.

However, it cannot be said that logico-deductionist and subjectivist approaches to Economics were laid to rest in definite sense by the first half of the eighteenth century. As Mark Blaug admirably puts it "since the days of Adam Smith, economics has consisted of the manipulation of a priori assumption, derived either from infrospection or from casual empirical observations, in the production of theories or hypothesis yielding predictions about events in the real world".[1] Even if some of these observations involved non-observable variables, the deductions from these assumptions were ultimately related to the observable world. As Blaug further remarks "economists wanted to explain economic phenomena as they actually occur".[2] One can agree with Blaug's view that economicst have always regarded the care of their subject as 'Science' in the modern sense of the term. In this connection, one is reminded of Anguste Comte's dicfum : "Savoir pour prevoir and prevoir pour pouvoir" ("From science comes prevision ; from pre'vision comes action).

In other words, economists accepted that the goal was to produce accurate and interesting predictions which were, in principle at least, capable of being empirically falsified. However, it cannot be said that economists have always followed this principle in practice Economists have frequently used fantological definitions and theories which defy any attempt at falsication.

Blaug's classification of methodological approaches to economics into two basic types is somewhat simplicist. According to him there are two extremes of (a) "radical apriarism and (b) "ultra-empiricism" Radical apriorism holds that economic theory is simply a system of logical deductions from a series of postulates derived from introspection, which are not themselves subject to empirical verification. On the other hand, ultraempiricism refuses to admit any postulates or assumptions that cannot be independently verified. This approach asks economists to begin with facts, not assumptions.

It is quite clear that these two approaches represent extreme positions. Blaug himself notes that "apriorists" sometimes agree that the predicted results deduced from subjective assumptions, if not the subjective assumptions themselves, should be subject to empirical posting. As we shall see later,

1. Mark Blaug : Economic Theory in Retrospect, 3rd Edition p. 697.
2. Ibid, p. 697.

this is exactly the methodological position of Milton Friedman Again, ultra-empiricists, even when they insist that all scientifically meaningful statements must be falsifiable by observations do not always deny the role of tantologics and identities in scientific work.

In classical Economics, we find, there was an emphasis on the fact that the conclusions of economics ultimately rest on postulates derived as much from the observable laws of production as from subjective introspection. Consider Adam Smith's ideas. These ideas were based on observation as well as introspection. His theory of division of labour emanated from the observations be made in a pin-manufacturing factory. One may object that this not observation in the proper sense of the term as the experience of a single pin-manufacturing factory was generalized by Smith. This objection is quite a valid one as he generalized on the basis of casual observation. Still, here is an example of how observation of facts can lead to hypothesis in our science. Adam Smith, however, depended for the greater part of his ideas OK instrospection. His philosophy regarding the nature of man and the sources of human conduct are at the root of all his major ideas.

After Adam Smith, his methodological approach was accepted by Thomas Robert Malthus in the sense that Malthus built his theories equally on induction and introspection. In contrast, Ricardo paid scant attention to observation and depended mostly on subjective introspection. If we consider the classical economists as a whole, we would find that there was considerable disagreement over the realism and relevance of the underlying assumptions. There was, however, hardly any attempt to check the predictions of the logical, deductions against experience. Initially, there was not sufficient information for testing the theories of classical economists. But as the nineteenth century went on, more and more economic and demographic data became available. But even with the accumulations of data, hardly anybody attempted to test the debatable issues of classical political economy. For example, the validity of the main conclusion of the Ricardian model depended on the relative weight of forces making for a historically diminishing and increasing returns in the production of wage-goods (primarily corn). This question could easily tested empirically as considerable evidence regarding money-wages and the composition of working class budgets had accumulates by the middle if the eighteenth century. It was clear that population was no longer pressing upon the food supply and that agricultural technology was improving substantially. As a result, the rise of productivity in agriculture was steadily reducing the real cost of producing wage-goods. But classical economists still clung to their basic man-versus-nature faith.

As Blaug demonstrates the failure on the part of classical economists to change their ideas has been explained by their tendency to attribute every contradiction to the strength of the "counteracting tendencies". Classical

political economy included many exogenous variables in its analytical frame-work. The rate of technological progress in agriculture, the attitude of the labourers towards family size, and the supply of entrepreneurship was exogenously determined variables in classical political economy. But classical economists did not have any knowledge about these. Exogenous variation and made sweeping generalizations about their probable variation through time.

However, there cannot be any question that despite this general shortcoming, classical political economists had been able to identify the subject-matter of economics and to develop their techniques of analysis in a much more sophisticated way than ever before. Ricardo, in particular, put his distinctive stamp on his professional successors and it was in developing a new technique of economic analysis. Phyllis Deane comments that Ricardo was, in effect the first specialist economist.[3] Most of the other leading economists had been philosophers students of society in general. "Their economics was embedded in philosophical disquisitions and long historical digressions……Ricardo. however started and finished with, the economic problem, and refused to be side-tracked by philosophical, sociological, and historical considerations".[4]

Schumpeter has analysed vividly the methodology developed by Ricardo. According to him, Ricardo's interest was "in the clear-cut result of direct, practical significance. In order to get this he cut that general system to pieces, bundled up as large parts of it as possible, and put them into cold storage so that as many things as possible should be frozen and 'given". He then piled one simplifying assumption upon another until, having really settled everything by these assumptions, he was left with only a few aggregative variables between which, given these assumptions, he set up simple one-way relations, so that, in the end the desired results emerged almost as tantologies".[5]

Ricardo's technique of abstract reasoning from a Prior postulates and his propensity for logical-mathematical rather than philosophical theories had quite an important impact on the methodology of economics. First, it helped to draw theoretical economics away from the real world by encouraging the analyst to depend on a type of theory which called for logical refutation rather than empirical verification. Malthus objected to this. According to him it failed to pay sufficient attention to the facts of experience. He wrote, "The tendency to premature generalization among political economists occasions also an unwillingness to bring their theories to the test of experience. The first business of philosopher is to account for

3. Phyllis Deane. The Evolution of Economic Ideas, 1984, p 75.
4. Ibid, p. 75.
5. J. Schumpeter, History of Economic Analysis, pp. 472-3.

thing as they are etc. A comprehensive attention to facts is necessary, both to prevent the multiplication of theories, and to confirm those which are just."[6] Malthus was basically correct and we have noted above that the failure or unwillingness to take into account facts greatly circumscribed the usefulness of most of the important conclusions of Ricardo. But, and this is the second implication of Ricardo's methodology for the subsequent growth of economic theory, the use of the Ricardian technique permitted economics to develop independently of other social sciences. The stylized facts adopted as starting assumptions of economic theroy no doubt contained very often an element of social psychology or sociology. But there was no longer an incentive to require that these, any more than the economic facts, were empirically verified in any scientific sense. Exceptions to the starting postulates were put aside in a *ceteris paribus* clause and subsequently ignored by the practitioners of the Ricardian methodology which was *aprioristic* in its essence.

Nassau William Senior (1790-1864) was the first major economist to exploit this technique consciously after Ricardo. He started his "Outline of the Science of Political Economy" published in 1836 by defining the boundaries of economic inquiry, Political economy, Senior argued, is "The Science which treats of the nature, the production, and the distribution of wealth". He noted that other writers had used the term "political economy" in a much wider sense—to include government, for example—but the result of their exercises had been definitely unscientific. Economic inquiry must be essentiaally *positive* or free from value judgements. Since the area of the economist is not "happiness, but wealth".[7]

Senior explained his methodological position in the following passage of his "Outline" (pp. 2-3).

"The economist's premises consist of a very few general propositions, the result of observation, or consciousness, and scarcely requiring proof, or even formal statement, which almost every man, as soon as he hears them, admits as familiar to his thought, or at least as included in his previous knowledge, and his inferences are nearly as general, and, if he has reasoned correctly, as certain, as his premises."

"But his conclusions, whatever be their generality and their truth do not authorize him in adding a single syllable of advice. The privilege belongs to the writer or statesman who has considered all the causes which may promote or impede the general welfare of those whom he addresses, not to the theorist who has considered only one, though among the most important, of those causes. The business of a Political Economist is neither to

6. T. R. Malthus : Principle of Political Economy.
7. N. W. Senior : Outline of the Science of Political Economy, 1836, p. 2.

recommend nor to dissuade, but to state general principles, which it is fatal to neglect, but neither advisable, nor perhaps practicable to use as the sole, or even the principal, guides in the actual conduct of affairs·····To decide in each case how far these conclusions are to be acted upon, belongs to the act of government, an act to which Political Economy is only one of many subscrivient sciences".

This long quotation from Senior clearly establishes his claim as the first classical economist to have deliberately chosen positivism as the foundation of methodology. The aprioristic character of this methodology is evident from his four propositions or "postulates". Thase postulates are as follows :—

1. "That every man desires to obtain additional wealth with as little sacrifice as possible."

2. "That the population of the world, or in other words, the number of persons inhabiting, it is limited only by a fear of deficiency of those articles of wealth which the habits of the individuals of each class of its inhabitants lead them to require."

3. "That the powers of labour, and of the other instruments which produce wealth, may be indefinitely increased by using their products as the means of further production."

4. "That, agricultural skill remaining the same, additional labour employed on the land within a given district produces in general a less proportianate return, or, in other words, that, though, with every increase of the labour bestowed, the aggregate return is increased, the increase of the return is not in proportion to the increase of the labour."

According to Senior, these postulates on which the entire science of political economy depended were not derived by observation (as in the natural sciences) or by hypotheses (as in the logical-mathematical sciences) but by a process of introspection. Senior wanted "mental sciences" (including political economy) to be based on positive premises despite the fact that it was not open to them to verify that hypothesis by formal experiment "when we direct our attention to the workings of our own mind, that is to say, when we search for premises by means of consciousness instead of by means of observation, our powers of trying experiment are much greater".

John Stuart Mill formalised the Ricardian methodology and wrote the systematic treatise on political economy with the intention of bringing Adam Smith's "Wealth of Nations" up-to-date. John Stuart Mill, in effect, "fashioned a new paradigm out of the Ricardin innovations." He divided the whole of human knowledge into two divisions—physical science and moral or psychological science-and set economics firmly in the later division. Mill further defined economics as one the social seiences.

However, it is different from other social sciences in that it starts from the premise that men are motivated solely by the desire to acquire and consume wealth. On Mill's definition, political economy was characterised as essentially an abstract science, reasoning from "assumptions not facts" analogously to other abstract sciences like geometry.

Mill agreed that facts open to observation or introspection of any edveated observer provide the basis for some of the fundamental postulates of economics. Empirical evidence, in addition, was relevant to the science of political economy as defined by Mill only for the verification of theories. It played no part in the discovery of scientific truth in economics because experimentation is simply not possible and because real life is too complex to give rise to "general laws". Nevertheless, Mill's work was more in the traditlon of Adam Smith than of Ricardo.

Approaches to the methodology of economics underwent profound modifications with the emergence of the Marginalist Revloution. The Marginalist Revolution involved a wide-ranging transformation of the characteristic methodology of economics. The means adopted for this transformation was essentially a mathematical tool derived from the calculus. In the words of W. S. Jevons "The Theory of the Economy thus treated pressnts a close analogy to the Science of Statical Mechanies, and the Law of Exchange are found to resemble the Laws of Equilibrium of a lever as determined by the principle of virtual velocities. The nature of wealth and value is explained by the consideration of indefinitely small amounts of pleasure and pain, just as the Theory of Statics is made to rest upon the the equality of indefinitely small amounts of energy."[8]

We also find in Leon Walras this conscious analogy with physical science and the central concept of equilibrium. For Walras, there were essential features of a new kind of methodology which determined not only the techniques of analysis appropriate to economic theory but also the kinds of questions to be focussed by economics. According to him, pure economics (that is, theoretical economics as distinguished from applied or social economics) is an ideologically neutral, "physico-mathematical" science primarily concerned with the "theory of the determination of prices under a hypothetical regime, of perfectly free competition".[9] Walras carried the marginalist apparatus to its logical-mathematical conclusion by applying it to markets in general and thus linked the markets for commodities with the markets for inputs in a mutually dependent system of equations relating prices and quantities. Menger, the third member of the marginalist triumvirate, also tried to evolve a *general* economic theory based on marginal

8. W. S. Jevons, Theory of Political Economy (1871), 4th Edition, 1911, p. vii.
9. L. Walras : Elements of Pure Economics, translated by W. Jaffe, 1954, p. 40.

analysis and stressed the problem of price determination in competitive markets. But he rejected the artificial construct of a unique and determinate market equilibrium and was primarily concerned with consumer goods markets.

The marginalist analysis, as Boulding has pointed out, was no more than a "detailed spelling out of the theory of maximisation, that is, the theory that the optimum position of the variable of any economic organisation is that given by the maximum position of that variable which measures desirability or preference."[10]

The marginalist analysis, as Phyllis Deane notes in her stimulating work "The Evolution of Economic Ideas" had significant implications for both the scope and methodology of mainstream economic theory. It provided the theorist with a convenient set of analytical tools, that were easily and effectively applied over a wide range of uses. In this way, it changed the problem orientation of conventional or mainstream economics and implied significant philosophical and ideological tendencies.

John Neville Keynes, father of John Maynard Keynes, published in 1890 the first ever work on the methodology of economics in the English language. Entitled "Scope and Method of Political Economy", his work summed up the marginalist position on methodology. Neville Keynes made a distinction between three concepts of political economy in order to stress the fundamental character of the discipline. These concepts are :

(1) a positive science or a body of systematised knowledge concerned purely with what is—the whole province of which is to establish economic laws or uniformities. Neville Keynes indentified this to "economic science" ;

(2) a normative or regulative science : "a body of systematized knowledge relating to criteria of what ought to be and concerned therefore with the ideal as distinguised from the actual" ;

and (3) "an art, a system of rules for the attainment of a given end".

Neville Keynes did not have much to say about the second and dismissed the third concept from the scope of the discipline. In other words, he refrained from drawing exclusive boundaries and admitted that the line between political economy and other social sciences is difficult to draw. But he stressed again and again the *positive* character of political economy.

The other methodological point made by Neville Keynes was concerned with the appropriateness of inductive or deductive techniques to political

10. K. Boulding : The Skills of the Economist, p. 34.

economy. It was generally accepted at the time that the natural scinces relied largely on inductive techniques and that economic laws could achieve scientific validity only to the extent that they were originally derived from, as well as verified by, empirical observation. This was a reaction against the deductive method of Ricardo who had deliberately reasoned *a priori* in basing his theory on a limited number of assumptions about the propensities guiding human behaviour. Neville Keynes recognised the usefulness of both the methods in economics. He categorized economics both as quantitative science heavilly dependent on mathematical tools in its abstract, deductive methods and or statistical methods in its concrete, inductive aspects.

Aprioism gained wide currency in economics during the first half of the twentieth century through the work of Ludwig Vod Mises and Lionel Robbins. Before coming to an examination of the ideas of these writers, we may form some idea about the methodlogical approach of Vilfredo Pareto who may be considered to belong to the aprioristic School in his economic analysis. Pareto made important contributions to economics and sociology. According to him, sociology dealt with the non-logical action of people, leaving the analysis of logical actions to economics, technology and military science.

Pareto argued that logical behaviour is logical both subjectively and objectively. An action is logical if the end is objectively attainable and if the means employed are objectively united with the end within the framework of the best knowledge available. For an action to be logical, the logical connection between the means and the end must exist in the mind of the actor who performs the act and in objective reality, that is "from the standpoint of other persons who have a more extensive knowledge".

Non-logical action for Pareto means simply that all human action not falling within the scope of the logical, Non-logical action takes upon itself a residual character, Generally speaking, logical actions are those motivated by reasoning while non logical actions are those that involve, to some degree at least, a motivation by sentiment.

Pareto points out that although it is fruitful to apply the rationalistic approach to the explanation and prediction of economic actions, we should recognise that a great deal of our everyday behaviour is not rational in the sense postulated. At the same time, Pareto points out that we do tend to correct our actions mainly through learning by trial and error and as we repeat the same type of decision or action over and over again we tend to reduce the gap between our actual and optimal decisions. That is, our series of decisions converge to rationality or optimality, and it is this last element in the series of economic decisions that economic theory seeks to analyse. It is not correct to maintain that learning and decision processes

are ignored because neoclassical partial equilibrium analysis predominantly considers static models. It is rather because neoclassical analysis considers a model of the last in a series of decision processes converging to optimality that the learning and decision processes themselves may be left out of theoretical consideration.

According to the aprioristic approach of Ludwig von Mises, the fundamental propositions of economic science are "true" or "hold" independently of the vagaries of experience. Indeed, they are means which allow us to experience economic actions and economic phenomena. No meaningful action can be performed without them and therefore no action would contradict them. Thus, for von Mises, the fundamental *a priori* category is that of purposeful action. "Human action is one of the agencies of bringing about change. As it cannot be proceeded back to its cause, it must be considered an ultimate given."

Eevery attempt to prove *a priori* categories must presuppose their validity. It is impossible to explain them to a being who does not possess them on his own account. They are ultimate, unanalyzable categories. The human mind is utterly incapable of imagining logical categories at variance with them.

The rationalistic approach developed by von Mises and others takes for granted that the actions of an economic agent are not to be viewed as random or haphazard, or as not capable of being explained. Rather, it assumes that economic actions, like other events, follow general principles. For this school, the fundamental category of action is telcology and that it does the job that causality does in physical sciences. Behaviour, according to von Mises, becomes action when it is teleological, i.e., goal-directed. The criterion of purpose-fulness of behaviour closely mirrors the rationality principle. Whether an action is purposeful or not depends on whether or not it aims 'at the attainment of definite ends'. "Ludwig von Mises and his followers therefore want to distinguish social from natural sciences. There is thus some sort of methodological dualism involved here".[11]

This methodological approach is generally known as "radical apriorism". It holds that economic theory is simply a system of logical deductions from a series of postulates derived from introspection, which are not themselves subject to empircal verification.

Lionel Robbins published his important book "An Essay on the Nature and Significance of Economic Science" in 1932. He was to a great extent influenced by the Austrians like von Mises. Robbins' starting point is the statement that "Economics is the science which studies human behaviour as a relationship between ends and scarce means with ulterior uses". For

11. Method and Appraisal in Economics, ed. by Spiro Latsis, pages 4—5.

Robbins, it follows that economics is entirely neutral between ends, that is insofar as the achievement of any end is dependent on scarce means, it is relevant to the preoccupation of the economist.

Robbins argues that neither historical experience nor controlled experiment provides ground for asserting the general propositions of economics. "The propositions of economic theory like all scientific theory, are obviously deductions from a series of postulates. And the chief of these postulates are all assumptions involving in some way simple and indispensable facts of experience relating to the way in which the scarcity of goods which is the subject matter of our science actually shows itself in the world of reality."[12]

What are these postulates ? Robbins tells us that the main postulate in the theory of value is the fact that individuals can arrange their preference in an order, and in fact does so. Again, the main postulate in the theory of production is the fact that there are more than one factor of production. Finally, the main postulate of the theory of dynamics is the fact that we are not certain regarding future scarcities. According to Robbins, these are not postulates the existence of whose counterparts in reality admits of extensive dispute, once their nature is fully realized ; No controlled experiment is necessary to establish them.

Robbins then combines these universally acknowledged facts of experence with a number of subsidiary postulates (i.e., the condition of the markests, the number of parties to the exchange, the state of the law etc.) to deduce the more complex applications of the theory.

The subsidiary assumptions are historico-relative and consequently great care must be taken in their application. But Robbins rejects the claim of the historicists that all the generalizations are historico-relative as unconvincing and politically motivated. Similarly, he rejects the behaviourist claim that science should only deal with phenomena that are directly observable. The reason for rejection is that the explanations which economists offer ultimately must refer to an individual's subjective valuation process, which is *understandable*, but not observable. This is why procedures of a social science like economic can never be completely assimilated to the procedure of the physical sciences. The similarity between the approach of von Mises and that of Robbins is quite striking here.

For Robbins, rationality does not imply the consistence of choice, means and ends. Ends may be inconsistent (imperfect knowledge, expectations about the future).

Robbins believed that empirical studies in economics attempt to give

12. L. Robbins : An Essay on the Nature and Significance of Economic Science, pp. 78—79.

quantitative estimates of scales of relative valuations existing at any given point in time. Any such study may be of use for the short run prediction of possible trends. But these studies provide no ground for discovering empirical laws. There are for Robbins, three proper uses of empirical studies : (a) to check the applicability of theoretical constructions, (b) to suggest auxiliary postulates to be used with the fundamental generalization ; and (c) to bring to light areas where pure theory can be reformulated or extended. Robbins thus emphasized the heuristic role of empirical studies in suggesting new problems for theory to solve rather than using empirical studies to test theories.

Robbins, von Mises, Hayek, and Knight all agreed that the fundamental axious of economics are obvious and self-evident facts of immediate experience. But there is an important difference between, for example, the approach of von Mises and those of Robbins and Knight. For von Mises economic science is praxeological—the basic postulates of the discipline are necessary and unquestionable truths about the human condition. In other words, the status of the fundamental axious is that of synthetic statements that are *a priori* true.

Robbins and Knight do not agree that these are *a priori* (i.e., known intuitively). Nor are they prepared to accept that these axioms are known by one-sided deduction of data of sense observation. Although the universal acceptability of the fundamental generalizations cannot be denied by anybody, there may still be room for dispute as to the best mode of description of their exact logical status.

T. W. Hutchison reacted to several important ideas of Lionel Robbins in a book entitled "The Significance and Basic Pastulates of Economic Theory", published in 1938. He was critical of what he called the "pseudo-scientific "methodology of Robbins. Hutchison's critique of the Robbins position on methodology was based on four arguments. First, he stressed the "emptiness" of the propositions of pure theory. Secondly, Hutchison emphasized the necessity of the assumption of "perfect expectation for the rationality postulate." Thirdly, Hutchison wanted a more extensive use of empirical techniques in economics. Finaliy, he wanted to demonstrate the illegitimacy of using the "psychological method" (or introspection) as grounds for asserting the fundamental postulates.

The purpose of Hutchison was to make clear the foundations of modern economic theory, Economics is a science and as such it must appeal to fact or it will be "pseudo-science". Empirical propositions of science are based on their testability, the facts and their truth or falsity must make a difference.

Hutchison argued that the finished propositions of all sciences except

logic and mathematics must conceivably be capable of empirical testing or be reducible to such propositions by logical and mathematical deduction.

For Huthison, there are three types of propositions in economic theory : (a) All statements having the form "if p then q" in which q follows p by logical necessity—q may be inferred deductively from p. Propositions of pure theory belong to this group. (b) All statements following the pattern "since p then q"—in these cases p is asserted empirically as true. In propositions of pure theory no empirical assertion as to the truth of p or q is made, individually. (c) All propositions which make inductive inferences—"if p then q" is asserted but is conceivably falsifiable, even if such falsifications would be "miraculous".

Hutchison next notes that science contains statements which are either conceivably falsifiable by empirical observation or are not. Those propositions which are not so falsifiable by empirical observation are tautologies and are devoid of empirical content. If follows, then, that the propositions of pure theory have no empirical content. This is primarily because they are posed in the form of deductive inferences.

This lack of empirical content does not mean that propositions of pure theory are of no use. It is true that they cannot tell us anything new about the world. But they can call our attention to implications of our definitions and offer us a "sharp, clear-out language with which to approach the problems of economics. They also enable us to pass from one empirical synthetic statement, if asserted as true, to another. Thus, though they are devoid of empirical content, the propositions of pure theory serve a pragnatic purpose in economic science.

Hutchison argued that scarcity alone is unsufficient for establishing the rest of the deductions of economic theory. Postulates concerning rational conduct, expectations and equilibrium are also needed "The fundamental concept of maximizing behaviour as well as the concept of market equilibrium are stripped of their force and significance unless they are accompanied by a further assumption of perfect expectation—the truth of this assumption is open to question".

It is thus clear that Hutchison's methodologicol position was a compromise between apriorism and empiricism. This brings up to the justly acclaimed paper of Milton Friedman, originally published in 1953. The paper entitled "The Methodology of Positive Economic" is a part of Friedman's book "Essays in Positive Economics", Economics as a positive science is a body of tentatively accepted generalizations about economic phenomena that can be used to predict the consequence of changes in circumstances. Friedman further says : "the necessity of relying on uncontrolled experience rather than on controlled experiment makes it difficult

to produce dramrtic and clear-cut evidence to justify the acceptance of tentative hypotheses. Reliance on uncontrolled experience does not affect the fundamental methodological principle that a hypothesis can be tested only by the conformity of its implications or predictions with observable phenomena ; but it does render the task of testing hypothesis more difficult and gives greater scope for confusion about the methodological principles involved. More than other scientists, social scientists need to be self-conscious about their methodology,"[13]

Friedman went on to say that economists are permitted to make whatever assumptions they like, It is not the reality of the assumptions that is important. It is rather the prediction made on the basis of these assumptions which are of significance and they must conform to facts.

So far we have restricted ourselves to the methodological positions taken by different economists and schools of economics. However, in the recent decades considerable influence has been exerted by developments in the methodology of natural and physical sciences. In what follows, we shall take note of three major developments in this field : (a) Karl Popper's falsificationism, (b) Thomas Kuhn's structure of scientific revolution and (c) the methodology of scientific research programme (MSRP) as developed by Lakatos.

We begin with Popper, a physicist. In his well-known "The Logic of Scientific Discovery", Popper tried to establish a logical demarcation rule for distinguishing seience from non-science. He argued that the principle of falsifiability would better serve than the principle of verifiability as the universal, *a p iori* test of a genuinely scientific hypothesis. According to him, a single refutation is sufficient to overthrow a scientific theory. Popper has been criticised for suggesting such "naive falsificationism". This criticism is, however, not valid. Popper was perfectly aware of the so-called "principle of tenacity"—the tendency of scientists to evade falsification of their theories by the introduction of suitable *ad hoc* auxiliary stratagems in certain circumstances.

Popper maintains that scientists should not only empirically test their hypothesis, they should construct hypothesis which make bold predictions, and they should try to refute those hypothesis in their tests. What is equally important is that scientists should tentatively accept only confirmed hypothesis and reject those which have been disconfirmed.

Three questions have been asked regarding the applicability of Popper's falsificationalism to economics. These are :

(1) *Should* it be used in economics ?

13. M. Friedman : Essays in Positive Economics, Ch. 1, pp. 33—34.

(2) *Is* it being used in economics ?

(3) *Can* it be used in economics ?

Blaug and Hutchison think that economics should follow a falsificationist methodology. But neither thinks falsificationism is or has been given sufficient consideration by economists.

Regarding the question of the applicability of falsificationism to economics, a number of insurmountable obstacles have been noted. In his book "Knowledge and Ignorance in Economics" published in 1977, Hutchison notes that a true test of hypothesis (a la Popper) requires both a finite number checkable initial conditions and well-established general laws. But in economics in many cases neither criterion is satisfied. Certain of the initial conditions in economics are inherently uncheckable (i.e., tastes, information, expectation). Therefore, instead of general laws, economics must use "trends, tendencies, pattern of temporary constancies.

Thomas Khun presented an elegant thesis of scientific change in his book first published in 1962 (revised edition in 1970) entitled "Structure of Scientific Revolution', Khun primarily discussed how physical sciences progressed. But his approach has been applied to social sciences including economics. Crucial to Khun's approach his concept of a "paradigm". According to him, the practices of "normal" science are regulated by a "paradigm" implying a "network of commitments" and "puzzles". Spelt out in greater detail, a pardigm implies (i) a "disciplinary matrix" consisting of "symbolic generalizations", "shared commitments to beliefs in particular models" and "Shared values concerning judgements to be used in regard to accuracy of prediction and even whole theories and (ii) shared examples which provide to the practitioners of science "tacit knowledge" by doing science rather than by acquiring rules for doing it. The paradigm provides a framework for extending the knowledge of "relevant facts, and for improving the articulation of the paradigm itself."

When anomalous or unexpected results, which appear in the course of normal research, become numerous and intractable, the inadequacy of the ruling paradigm becomes increasingly apparent. The period of "crisis" results in a "scientific revolution" in which an older paradigm is replaced, in whole or in part, by an incompatible new one. Kuhn argues thus that the usual developmental pattern of normal science is "the successive transition from one paradigm to another *via* revolution rather than a process in accretion or development by accumulation.

Kuhn's examples are mostly drawn from Chemistry and Physics—development of quantum mechanics in reaction in Newtonian physics, for example. But the development of economics can be interpreted in terms of this fascinating hypothesis.

Thus, it may be argued that neoclassical analysis emerged in the period between 1830 and 1870 as a result of the bankruptcy of classical economics as a set of interrelated principles. In this argument, the breakdown of the "wages fund" doctrine is important in paving the way for a new paradigm based on the idea of marginal productivity, for example.

Similarly, Keynesian economics, emerging in the 1930s, may be regarded as a reaction to the classical and neo-classical paradigms.

The explanation is satisfactory only superficially. Keynes argued that the earlier paradigms gave answer to the question "How is full employment achieved ?" which were at variance with experience. Keynes, therefore, developed a new paradigm with his model But some problems have to be worked out even if accept this approach. For example, how is a paradigm in economics to be properly identified ? What exactly is a "body of inter-related principles" that constitutes a paradigm ? Some economists have interpreted the development of imperfect competetion theory as a reaction to a contradiction in Alfred Marshall's theory of value. This interpretation is entirely reasonable from one point of view. But the question of identifying a paradigm is still unanswered. If a paradigm is identified by method, then one could conceivably lump classical, neo-classical, Keynesian, and imperfect competition theories together as *one* paradigm, that of equilibrium economics. Similarly, the contemporary concern with macrodisequilibrium and microdisequilibrium could be interpreted as a reaction to the paradigm of equilibrium economics. Are there paradigm within paradigms ? How is an interrelated system to be interpreted ? These questions have to be answered befare Kuhn's thesis can be applied to economic theories.

This survey of methodological approaches in economics may now be concluded with a brief reference to the method of scientific research programme (MSRP) approach developed by Imre Lakatos. Lakatos is critical of both Kuhn and Popper. For Lakatos "methodology" has nothing to do with laying down standard procedures for tackling scientific problems. It is concerned with the "logic of appraisal". But it is also a historical theory, implying that scientists in the past did in fact behave according to the methodology of falsifiability. As such, it is perfectly refutable. Lakatos theory of "scientific research programme" is an attempted synthesis between Popper's logic and Kuhn's sociology of knowledge. "Naive falsificationism" regard every scientific theory in isolation and demands its rejection when it does not accord with reality. But a scientific research programme is the configuration of interrelated theories. So no single one of these theories can be considered as being completely autonomous. Since a research programme is a collectivity of interdependent theories, it follows that the rejection of each single theory will address itself to the entire programme.

It is difficult to discard individual theories without reference to the programme as a whole. Yet, in contrast to Kuhn's idea, this does not mean that no theory would be rejected by the process of falsification. It will all depend on the position and status of the theory within the programme. Here Lakatos divides a theory into the parts : "The negative heuristic and "the positive heuristic". A programme's negative heuristic is its "hard core" or the very basic statements which hold the entire structure. It is this *hard core* which is not normally subject to the Popperian process of falsification, and which shows paradigmic resistance to change a la Kuhn. By contrast the positive heuristic makes up the research content of the programme. It is more readily testable and it leads to the formulation of further concepts and theories described as the "prospective belt". Hence, the hard core may survive piece-meal refutations, but the rest would be open to rejection and improvement. In substance, the negative heuristic is the Kuhnian and the positive heuristic is the Popperian element of this "synthesis", except that even the hard core can change with less resistance than Kuhn has described for paradigms. Lakatos here makes a distinction between progressive and degenerative research programmes. A progressive programme gives way to an alternative programme which has a greater (empirical) truth content or explanatory power. A degenerative programme resists change, even when it is legitimately challenged, by resorting to *ad hoc* procedures to defend itself.

The overview of methodological approaches in economics attempted above indicates the variety of positions taken up by economists and a general lack of agreement or what *should* be the correct methodology. This, however, is to be expected in a discipline which is a basically social in character.

Suggested Reading

1. Frank Knight : On the History and Method of Economics, 1956
2. S. Latsis (ed.). Method and Appraisal in Economics, 1976.
3. M. Friedman : Essays in Positive Economics, 1953.
4. M. Blang : The Methodology of Economics, 1980.
5. F. Machlub : Methodology of Economics and Other Social Sciences (1978).

GROWTH AND INSTABILITY IN RICE PRODUCTION IN (UNDIVIDED) BENGAL AND DECAY OF BENGAL IRRIGATION, 1900-1940 : A NOTE

Alok Bandyopadhyay*

Section 1. Introduction

This paper examines growth and instability in production of the main cereal crop, rice, of (undivided) Bengal during the period, 1900-1940. The objective is to explore certain hypotheses regarding interrelationship of production of rice and water control, which, in this part of the sub-continent, are still relevant and crucial.

Section 2 gives estimates of growth and instability, at the regional level, in the production of rice in Bengal for the period 1900-1940. Section 3 depicts the decay of Bengal irrigation system during the period. Section 4 relates the findings of Section 2 to those of Section 3 and, finally, Section 5 draws the conclusions

Section 2. Growth and Instability in Production of Rice

2.1. Data

Following are the data sources :

(i) Rice production series for Greater Bengal (Bengal, Bihar and Orissa), for the period 1900-1940, from Blyn[1].

(ii) Rice production series for Bengal and its Divisions, for the period 1920-1946, from Islam[2].

(iii) Area and production of rice for a number of districts in Burdwan, Presidency and Rajshahi Divisions, for the period : 1900 to 1940, from official sources[3].

2.2. Methodology

The usual linear fit has been tried on annual output of rice. The regression coefficient, which gives the absolute change per unit of time, has been expressed as percentage of the harmonic mean to get the average linear growth rate.

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In order to identify fluctuation arrround the trend, we have sorted out : (i) observed values which are higher (i.e., having positive deviations) than the corresponding trend values and similarly (ii) observed values which are lower (i.e. having negative deviations) than the corresponding trend values. A trend line through each of these pairs of sets of observed values, higher or lower than the corresponding trend values, is fitted. Thus, for each original trend line we have similar pair of trend lines on both sides of the trend line—one through the observed values higher than their respective trend values (hereafter 'positive' trend line), and the other through the observed values lower than their respective trend values (hereafter 'negative' trend line).

For each of the trend lines, all usual test of significance and goodness of fit have been administered, F-test has been administered to test the hypothesis that 'positive' and 'negative' trend lines are parallel. using the statistic :

$$F=\frac{(R^{**}_{yy}-R_{yy})/(\gamma^{**}-\gamma)}{R_{yy}/\gamma}$$

Where, R^{**}_{yy} = Residual sum of squares due to linear fit on observed values.

R_{yy} = Residual sum of squares from 'positive' deviation trend line *p'us* residual sum of squares from 'negative' deviation trend line.

$\gamma^{**}=n-k-1$. $\gamma=n-2k$ where n = number observations and k = number of parameters estimated.

If $F>F_{k-1,\ n-2k}(\alpha)$,

then the hypothesit is rejected at the level of significance

we have obtained value of 't' at the point of inter-section of 'positive' and 'negative" deviation trend lines :

$$Y(+)=a''+b''t \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$
$$Y(-)=a'+b't \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

At the point of interaction :

If $t>0$, then (1) and (2) converge in the positive quadrant.
If $t<0$, then (1) and (2) diverge in the positive quadrant.

Again, $|\tan(\theta^{+}-\theta^{-})| = \left|\frac{b''-b'}{1+b''.b'}\right|$ gives the rate per unit of time at which (1) and (2) converge/diverge.

2.3. Results

2.3.1. Greater Bengal : 1900 – 1940

Following are the estimates for rice production in Greater Bengal (Production in '000 tons) :

(i) $Y_t = a + bt$: $a = 16585.32$, $b = -100.92$

(Harmonic Mean = 14164.31 tons)

$Y_t\ (+) = a'' + b''t$: $a'' = 19397.54$, $b'' = -152.39$

$Y_t(-) = a' + b't$: $a' = 14613.86$, $b' = -80.37$

(ii) t-value at the point of intersection of "positive" and "negative" deviation trend lines = 66.42

(iii) $|\tan(\theta^+ - \theta^-)| = 0.006$

All these would mean, for rice production in Greater Bengal during the period 1900-1940, diminishing fluctuations in a declining set-up.

2.3.2. Bengal and its Divisions

Table 1 gives, for Bengal and its Divisions, estimates of growth and fluctuation of rice output for the period 1920-45. Bengal recorded negative growth rate, the average decline, for rice production, being 0·03 percent per annum for the period. This stood in consonance with the estimates for Greater Bengal for the period 1900-1940. The positive rates of growth of output in the two regions, Dacca end Presidency, could not jointly outweigh the decline in rice output in the remaining three regions (Chittagong, Burdwan and Rajsahi) during the period. It is to be noted that autumn rice, during the period, recorded, on the average, an increase in area as well as production, in all the regions except Chittagong, while the production of winter rice had declined in all except in Presidency Division.

The positive value of 't' at the point of intersection of "positive" and "negative" trend lines for all-Bengal indicates diminishing year to-year fluctuations in rice output for the period 1920-46. Bengal proper, then also registered stability in production in the declining set-up, though, comparing the results of Gerater Bengal, the average decline in rice output in Beagal was less sharp compared to Bihar and Orissa components of Greater Bengal. It is to be further noted that the diminishing fluctuations in riee output in three Divisions : Dacca, Chittagong and Rajshahi, had, during the period 1920-1946, neutralised the widening year-to-year fluctuations in output in Burdwan and Presidency.

2.3.3 Selected districts of Bengal—Area and Production of Rice

The following twelve districts, spread over three regions of Bengal have been selected :

I. Presidency Division : 24-Parganas, Nadia, Murshidabad.

II. Burdwan Division : Burdwan, Birbhum, Bankura, Midnapore, Hooghly, Howrah.

III. Rajshahi Division : Jalpaiguri, Malda, Dinajpur.

These districts roughly correspond to the present-day West Bengal (excluding Darjeeling).

Table 2 gives normal yield (five-year average), by district, of winter rice autumn rice for two periods : 1912-13 to 1916-1917 and 1937-38 to 1941-42. It is seen that yield of winter rice had declined in as many as seven districts—4 out of 6 districts in Burdwan Division ; 2 out of 3 districts in Rajshahi Division and one out of two districts in Presidency Division. Yield of winter rice had increased, over the two periods, in 24-parganas, Murshidabad, Birbhum. Howrah and Dinajpur. Yield of autumn rice, on the other hand, over the two periods, had declined in all, but three districts. The districts of 24-Parganas, Hooghly and Malda registered increase in average production of autumn rice.

Table 3 gives. districtwise, number of years, for the period 1919-20 to 1938-39, in which outturn per acre was less than 80 per cent of normal yield of winter and autumn rice. 24-Parganas, Howrah and Jalpaiguri had only 2 to 3 years, out of 18 years, in which average yield of winter rice was below 80 per cent of normal yield. The remaining districts had more than seven such years, Nadia being the worst with 14 out of 18 such years for winter rice The plight of autumn rice, in this respect, was much more gloomy. In Jalpaiguri outturn of autumn rice per acre was below 80 per cent in only 3 out of 18 years. Burdwan, Birbhum and Bankura had 7 to 8 such years ; Midnapur, Hooghly and Dinajpur had 10 to 11 years and in 24-Parganas, Nadia, Murshidabad, Howrah and Malda average output of autumn rice fell below 80 per cent of normal yield in 12 to 15 years out of 18 years.

Table 4 given districtwise area and production of rice for the periods 1930-32 to 1937-39. In 5 districts 24-Parganas, Murshidabad, Birbhum, Hooghly and Dinajpur both area and production had increased. Burdwan, Bankura and Malda registered decline in area and production of rice. Of the remaining districts, while Nadia and Dinajpur witnessed fall in output despite increase in area under rice, Midnapur and Jalpaiguri registered increase in production albeit in area during the period.

3.1. Irrigation in Bengal : Story of Neglect and Decay

The picture is gloomy throughout the period. It was a story of decay, negligence and mistake that transformed the once glorious irrigation system of Bengal to a more relic of the past. The number of productive (major) irrigation projects, from 1907-08 to 1937-38, remained more or less the same—initially the number was three and at the end of the period of Bengal had only two productive works. It is to be noted that none of the Bengal projects remained in the "productive" list throughout the period-often

shifted to the list of "unproductive" or "protective" works. The total capital outlay, gross receipt and the area irrigated—all decreased during the period. All of them were losing projects[4].

Sir William Willcoks[5] identified the decay of Bengal irrigation with the process of decay of the system of "overflow irrigation". Bengal was traversed by a system of canals, long and fairly parallel to each other, carrying the crest water of the river floods and irigation was performed by the cuts in the bank of canals[6]. This flood water when mixed with the rainfall, so abundant in this region, greatly improved the soil.

The effective running of this system called for regular clearing of the canals and the repairing of the banks with slit so cleared[7]. The negligence in this respect by the zamindars began during the troublous Maratha-Afghan war and continued throughout the British period. The uncleared canals refused to take flood water, impounding more water in the river and resulting in a menace to the country. This led to the construction of 'Zamindari Banks' to protect the country from flood. The irrigation was still performed, though at a much lower scale, by making breaches in these banks. When the Government took over the charge of the Damodar works, it strengthened the left bank of Damodar for the purpose of the E. I. Railways, and thus helped impoverish the soil further. Thus, instead of "clearing out ot the 'ancient overflow' canals and the strengthening of her banks of the making of new banks with the excavated material, and providing the overflow canals with regulating heads and sluices", this process of embankment was repeated in each project in this region.

The new canals were, however, dug and water was supplied to the peasants on condition that they would pay for irrigation. It was alleged that the water rate was very much lower in this part of the country and this was fully the occupiers' rate. The owners of the soil were completely outside the purview of the water tax[8]. The occupiers were, therefore, often reluctant to use water. The low water rate and the refusal to use water on the part of the occupiers, were the twin reasons resulting in steady loss from the projects. The suggestion to solve the first was to introduce owners' rate.[9] This needed, of course, a separate legislation. The introduction of canal irrigation brought immense prosperity to the owners of the soil, enhancing their income from three to six times for which they paid nothing[10]. The whole amount of the tax was shouldered by the tenants who were squeezed to the extreme by a series of layers of intermediaries between them and the actual owners of the soil. Thus the beneficiaries of the new irrigation system were a few protected zamindars at the expense of the poor tenants. The poverty of the tenants was reflected in their inability to pay water taxes in time. In fact, they did not have enough surplus to meet three demands at a time—money and levies to the zamindars, interest

payments to the moneylenders and the taxes to the Government. They sometimes used the technique of first come, first serve—"money kept for payment to the landlord is at once paid to the government agent when he happened to come to the village before the zamindars' people made their appearance there, and the zamindars' agent, always left the village in despair[11]. The zamindars in such cases prohibited their tenants from using the canal water. In fact, the zamindars who refused to carry out their responsibility to keep the canal in use, were apathetic towards spread of irrigation. They did not encourage their tenants to dig wells and tanks for their own use on the plea that these would develop the consolidation of peasants' occupancy rights[12]. Thus, the property relations in this "permanently settled" are also dictated the decay.

3.6. Bengal : Districtwise Irrigation

The districtwise irrigation data are not available for most of the years and for the whole set of items. Moreover, the available data, a close look will tell, suffer from inaccuracies. So it is difficult, if not impossible, to trace the actual picture of irrigation in Bengal during the period of this study, districtwise. An attempt however, is made below which gives a very rough idea.

The same twelve districts have been selected for the study. These are : 24-Parganas, Nadia, Murshidabad, Burdwan, Birbhum, Bankura, Midnapur, Howrah, Hooghly, Jalpaiguri, Malda and Dinajpur. These districts correspond very roughly to the present day West Bengal. Except the last four northern district, which are high-rainfall and flood-prone areas, all the districts lie in the Ganges and the Damodar deltas. However, the shift of the main Ganges flow from the Bhagirathi-Hooghly Cannel to the more eastern coursing river created a region of drying up, the "moribund delta", which includes Nadia and Murshidabad. The construction of dikes and embankments for the rail roads and highways also accentuated the drying-process[43]. The Damodar delta cover Burdwan, Hooghly, Howrah, part of Midnapur, part of Birbhum. The remaining region is drought prone.

Tables 5 and 6 have constructed from the data compiled from the Season and Crop Reports, Bengal, The first gives the percentages of crop area irrigated in three periods-average of 1917-18 and 1918-19, average of 1931-32 and 1932-33, and average of 1937-38 and 1938-39 ; and the percentage changes of these percentages. Table 6 shows the percentage of irrigated area under 'other than Government Canals' for the same periods as above, and the percentage changes of the percentages. The following observations can be made from the tables :

(1) The districts in the "meribund delta" witnessed fall in the area irrigated ; among the other districts the percentage of irrigated area increased in Midnapur, Burdwan and Bankura ; the area decreased in

Hooghly ; and Birbhum remained stable during the period 1917-18 to 1938-39,—most of the districts, however, registered absolute fall in the area irrigated in the middle of the period.

(2) Irrigation depended on the minor works in all districts. Only Burdwan, Midnapur and Hooghly enjoyed canal irrigation to a small extent.

(3) Since minor irrigation, and also the major irrigation in the districts under study, depended on rainfall, all of them were exposed to large fluctuations in irrigation coverage and benefits.

4. Area and Output of Rice and Irrigation : Selected Districts of Bengal.

One may, now, be tempted to establish relationship, if any among area and output of rice and area irrigated during the period. Variables are defined as follows :

(A) average of 1937-38 and 1938-39 over average of 1930-31 and 1931-32 (Col. 4, Table 4).

(B) Percentage change in rice output for the period : average of 1937-38 and 1938-39 over average of 1930-31 and 1931-32 (Col. 7, Table 4).

(C) Percentage change in % of irrigated area under "other than Government canal" for the period : average of 1937-38 and 1938-39 over average of 1930-31 and 1931-32 (Col. 6, Table 6).

The Spearman's Bank Correlation Coefficients (excluding 24-Parganas, Howrah and Dinajpur) are given below :

1. $(A) \times (C) = 0.738$, significant at 5% level.
2. $(B) \times (C) = 0.476$, not significant
   $= 0.786$ (excluding Nadia), significant at 5% level.

The kendall's concordance coefficient W $[(A) \times (B) \times (C)]$. When transformed into x^2 - Statistic yields the value 14.868 which is significant at 5% level. The hypothesis that the rankings according to the above mentioned variables agree among themselves is validated.

This dependence of area and production of rice on minor irrigation ("other than government canal"), as confirmed by the significant Spearman's rank correlation coefficients, and the kendall's concordance coefficient, expose the characteristics of backwardness in agriculture—fluctuation and decline —of the districts of Bengal.

5. Conclusion

The objective of this brief discourse is to discern the extent of year-to-year fluctuations in production of the main cereal crop over the regions of Bengal during the British period. This note also highlights the basic weakness of the water control system in this part of the country. In a poor country people with low-income, their diets already inadequate, have to

carry much of the burden of fluctuations in food supply. Landlords and merchants together, in these economics, generally exercise monopolistic and monopolistic hold over the supply of food (and other) crops. All this would mean that, with the decline in output, speculative price rises and inflationary pressures are set off followed by sharp reduction in the real income of the people who spend most of their income on food.

Table 1

BENGAL · GROWTH AND FLUCTUATION OF RICE OUTPUT, 1920-1945.

Division	Growth rate (per cent per annum)	$t = \frac{a'' - a'}{b' - b''}$	Convergence (C)/ Divergence (D)	$\tan(\theta^+ - \theta^-)$
Dacca	0.46	−70 87	D	0.03
Chittagong	−0.93	39.75	C	0.05
Burdwan	−1.03	−99.26	D	0.02
Presidency	0.88	−24.55	D	0.03
Rajshahi	−0.13	−356.75	D	308.71
All Bengal	−0.03	−30.14	D	0.08

Table 2

BENGAL : QUINQUENNIAL AVERAGE YIELD (MDS/ACRE)

District	Winter Rice : Period ending 1916-17	1941-42	Autumn Rice : Period ending 1916-17	1941-42
(1)	(2)	(3)	(4)	(5)
24-Parganas	12.82	16.99	10.51	12.00
Nadia	12.97	10.52	11.18	9.94
Murshidabad	12.41	13.30	13.51	10.50
Burdwan	14.79	11.96	12.70	11.84
Birbhum	10.50	13.83	14.16	11.89
Bankura	14.83	14.62	12.29	10.55
Midnapur	12.34	10.65	11.50	10.89
Hooghly	14.24	11.48	10.00	10.43
Howrah	12.20	12.70	12.70	9.20
Jalpaiguri	12.38	11.63	11.63	9.39
Malda	11.81	9 29	7.89	11.22
Dinajpur	11.16	13.83	10.39	9.42

Source : Quinquennial Report on the Average Yield of Principal Crops in India, Directorate of Economics and Statistics, Govt. of India.

Table 3

BENGAL : NO. OF YEARS IN WHICH OUTTURN PER ACRE WAS LESS THAN 80 PER CENT OF NORMAL YIELD (1919-20 TO 1938-39)

Total No. of year = 18

District	Winter Rice	Autumn Rice
(1)	(2)	(3)
24-Parganas	1	14
Nadia	14	12
Murshidabad	9	13
Burdwan	8	8
Birbhum	7	7
Bankura	7	7
Midnapur	7	10
Hooghly	8	11
Howrah	3	13
Jalpaiguri	2	3
Malda	9	15
Dinajpur	9	11

Table 4

BENGAL : RICE-AREA AND PRODUCTION

District	Area (acres)			Production (tons)		
	Av. of 1930-31 and 1931-32	Av. of 1937-38 and 1938-39	% Change	Av. of 1930-31 and 1931-32	Av. of 1937-38 and 1938-39	% Change
(1)	(2)	(3)	(4)	(5)	(6)	(7)
24-Parganas	766800	892150	116.35	346686	517199	149.18
Nadia	681950	905000	132.71	259704	243115	93.61
Murshidabad	584300	689500	118.00	215825	262388	121.57
Burdwan	649600	562350	86.57	361868	217274	60.04
Birbhum	630900	672150	106.54	265607	363782	136.96
Bankura	684900	567900	82.92	377355	235530	62.42
Midnapur	1792100	1549600	86.47	489899	618371	126.22
Hooghly	221400	302500	136.63	59713	100588	168.45
Howrah	102200	108150	105.82	49900	91066	182.50
Jalpaiguri	515150	512400	99.47	218619	367223	167.97
Malda	489300	287400	58.74	172144	61820	35.91
Dinajpur	903550	964700	106.77	415829	380585	91.52

Note : Production figures have been calculated by the following :

Output = Normal yield (obtained from the *Quinquennial Report on Average Yield of Principal Crops in India*, Govt. of India)

X Percentage of the normal in the year under report

X Shown Area (Last two figures from the *Season and Crop Report*, Dept. of Agriculture, Govt. of Bengal).

Table 5

BENGAL : % OF CROPPED AREA IRRIGATED

Districts	Av. of 1917-18 & 1918-19	Av. of 1931-32 & 1932-33	Av. of 1937-38 & 1938-39	$\frac{(3)}{(2)} \times 100$	$\frac{(4)}{(3)} \times 100$
(1)	(2)	(3)	(4)	(5)	(6)
1. 24-Parganas	—	—	—	—	—
2. Nadia	0.12	0.1	0.1	83.3	100.0
3. Murshidabad	25.3	12.4	14.4	49.0	116.1
4. Burdwan	40.2	24.4	45.0	60.7	184.4
5. Birbhum	39.1	20.1	40.1	51.4	199.5
6. Bankura	7.5	48.6	64.2	648.0	132.1
7. Midnapur	10.1*	14.5	21.2	143.6	146.2
8. Hooghly	39.9	23.0	19.3	58.5	83.9
9. Howrah	—	—	—	—	—
10. Jalpaiguri	50.3	35.9	37.9	71.4	105.6
11. Darjeeling	—	—	—	—	—
12. Malda	14.5	26.4	38.2	182.1	144.7
13. Dinajpur	—	—	—	—	—

* relates to av. of 1921-22 & 1922-23.

Source : *Season and Crop Reports, Bengal*, Department of Agriculture, Government of Bengal.

Table 6

BENGAL : % OF IRRIGATED AREA UNDER "OTHER THAN GOVT. CANALS"

Districts	Av. of 1917-18 & 1918-19	Av. of 1931-32 & 1932-33	Av. of 1937-38 & 1938-39	$\frac{(3)}{(2)} \times 100$	$\frac{(4)}{(3)} \times 100$
(1)	(2)	(3)	(4)	(5)	(6)
1. 24-Parganas	—	—	—	—	—
2. Nadia	100.0	100.0	100.0	100.0	100.0
3. Murshidabad	99.6	99.6	96.8	100 0	97.2
4, Burdwan	92.3	90.8	66.3	98.4	73.0
5. Birbhum	100.0	98.1	97.8	98.1	99.7
6. Bankura	98.7	94.4	91.7	95.6	97.1
7. Midnapur	61.71	79.3	68.1	129.6	85.9
8. Hooghly	87.9	87.2	86.8	99.2	99.5
9. Howrah	—	—	—	—	—
10. Jalpaiguri	67.6	50.9	49.7	75.3	97.6
11. Darjeeling	—	—	—	—	—
12. Malda	100.0	100.0	100.0	100.0	100.0
13. Dinajpur	—	—	—	—	—

Note : 1. Belates to av. of 1921-22 & 1922-23.
Source : Same as in Table.

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Notes :

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