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Determinants of Stagnation in Productivity of Important Crops in West Bengal

Executive Summary

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Introduction

In the 60's new seed-water-fertilizer technological package was introduced in order to achieve self sufficiency in food grain production in the country. However, the pace of agricultural development throughout the country was not uniform depending upon varied physical and social resource endowments.
In West Bengal, however, the technological change has had little impact in revolutionizing agricultural production. With increasing marginalization of holding structure posed a serious threat for the tiny holders in terms of their food security.

Need for the Present Study

An important development in later half of 80's was the spread of new technology to the eastern Indian states of Bihar, West Bengal, Orissa and Assam**.** This has, for the first time, extensively increased the productivity and output levels in the densely populated eastern states of India. In the early years of green revolution eastern states like West Bengal did not respond largely to the new technology, apart from a few exceptions like Barddhaman where HYV rice made a breakthrough. But mid 80's started with a high note. Researchers finally accepted that the agrarian impasse (Boyce 1987) in West Bengal that continued till early 80's eventually ended.
Unfortunately this rising trend did not sustain for a long period. Since mid 90's the agricultural output and productivity reflected a plateau.
It is in this context the present study derives its significance. It is time to look into the causes of such stagnation in the agrarian sector.

Objectives

The broad objectives of the study are:

a. To analyse the growth pattern of production and productivity of important crops across the districts and Stat.
b. To study the regional variations in productivity of important crops (specifically bringing out the districts with differentiated growth behaviour) and to map out the regions with acute stagnation.
c. To trace the determinants for changes in productivity and stagnation of important crops.
d. To suggest district level interventions to overcome the problems of stagnation.

Organization of the study

The present study is based on secondary data collected from official sources of Government of West Bengal, Bureau of Applied Economics and Statistics, CSO etc.
In this study, both State and district level analyses have been made to identify the constraints for increasing the agricultural productivity.

Recent Development in Agriculture in the State

West Bengal, historically, has been a state with high population density (it is 903 per square kilometer as per 2001 census) on a fertile land and a large section of population dependent on agriculture for their livelihood. Since independence till date the situation has remained more or less the same with over seventy two percent (72.03%, 2001 census) of total population living in rural areas. The figure can be compared with the percentage for 1991, which were 72.52. It appears that there has been a marginal shift of population from rural to urban agglomerations. Proportion of cultivators and agricultural labours taken together has come down from 54.25 percent in 1991 to 44.15

percent in 2001. But proportion of other workers within total workforce between the time spans has risen from 41.51 percent to 48.48 percent. At the same time the average holding size has declined from 0.9 acres in 1990-91 to 0.82 in 2000-01. The average family income from all sources per farmer household was Rs.2079.00 that was lower than the national average of Rs.2115.00 (Bhalla 2006). And there remain 44.15 percent of population on the whole who are still illiterate (2001 census).
It is in this background we take up the study to identify the factors posing hindrance for a rapid increase in crop productivity.

Rainfall

In terms of annual rainfall the eighteen districts of the state can be categorized into three major segments i.e. High, Medium and Low rainfall areas.
It is observed that there are three districts namely, Jalpaiguri, Darjeeling and Cooch Behar that come under heavy rainfall zone within the state with around 3000mm rainfall per annum on an average. These are the districts within Himalayan and Terai region. The districts of South Bengal mostly come under low rainfall zone.
Fluctuations in annual rainfall give rise to drought situation in different districts of the State. Purulia, Bankura and West Medinipur are supposed to be more prone to drought situation as compared to the rest of the districts as per official sources.

Irrigation Status

So far is irrigation is concerned it is really difficult to get access to secondary source data regarding the status of irrigation in the state. However, it appears that since 1962 the command area under government canals shows over two fold increase. But when one goes in the field level s/he is faced with the reality that supply of water through canals is erratic most of the time. Generally it is during Kharif season i.e. the monsoon, canals are capable of supplying water for Aman Paddy. But in a situation of heavy rain in general these canal play only a supplementary role in irrigation scenario of Kharif season. Moreover, when the rainfall is scanty even during monsoon canals could hardly cater the demands. Even though it is a fact that the canal irrigation is the cheapest among all sources of irrigation in West Bengal, farmers are unable to rely on it as a dependable source. It is far more difficult for the farmers of the bottom end of these canals to get access to surface water. This very nature of irrigation has compelled the farmers to depend of more costly ground water when that is available.
Ground water in the agrarian sector of West Bengal has developed under the auspices of the private sector. Farmers who are capable of installing shallow tube wells have made their own arrangements of assured irrigation exploiting the ground water sources. As this development has almost entirely been by the small entrepreneurs it is difficult to estimate the total coverage of such development And at the secondary level very little data is available. However, in a span of two decades from 1980-81 to 2000-01 the command area under shallow tube wells has increased about ten times. This development in last two decades have had made a breakthrough in agricultural production. The crop which has made a large scale entry in the cropping pattern is the high yielding Summer Paddy.

Land Use Pattern

Land use pattern over the years shows that the gross cropped area has increased significantly over the years while net sown area has remained more or less the same. Hence the cropping intensity has risen significantly. Current and other fallow show a decline, area put to non agricultural uses seem to rise signifying transfer of land from agriculture to other uses while forest area remained constant over the years.

Changing Pattern of Land Holding

Structure of land holding suggests that there has been a continuous marginalization of operated area in West Bengal in last three decades. In terms of number the marginal farmers cultivating area below 1 hectare has more than doubled from 2528485 in 1970-71 to 5462089 in 2000-01. Similarly area under such marginal holdings has also been doubled. At the same time small holders also reflect an increasing trend both in terms of number and area. On the contrary semi-medium and medium farmers reveal a decline in number as well as area under operation quite sharply. However, large farmers though declined in number show increase in area under operation. Average size of holding has declined from 1.2 acres to 0.82 acres.

Changes in Cropping Pattern

In West Bengal agrarian scenario, cropping pattern is dominated by Paddy or Rice. Though over the years the proportion of gross area under Rice seems to decline slightly nonetheless Rice is still the major crop in rural West Bengal. Wheat also shows some increase from early 60's to the new millennium. Area under Jute remained almost the same over the years while Pulses declined sharply.

In a small farm dominant economy like West Bengal, it is obvious that the tiny operators would try to ensure their food security by growing cereals as much as possible. Cropping decision in any region primarily depends on the food habit of the people unless they have alternative avenues for marketing their products at a large scale. Especially in an economy with prevalent domination of small and marginal farmers the crop decision centers around Rice followed by Rice. It is for this very reason that Rice has a clear edge over other crops.

Area, Production and Yield of few crops in West Bengal

In West Bengal the scenario of agricultural production and productivity reflect a mixed pattern. In the early years of 60's (i.e. 1960-61 to 1966-67) compound growth rate for area under Rice was only 0.6, while growth rates for production and productivity was in fact negative. But since then till 2004-05 the compound growth rates for area, production and productivity have always been positive. Area growth has been very low over the years. Only during 80's growth in area under Rice shows an increase. This may have been due to increase in the area under high yielding boro. Because, during this period (i.e. 1980-81 to 1989-90) production and yield of Rice show a phenomenal increase. But since then the rates of growth of production and yield of Rice are found to be lower.

Area increase of Wheat was maximum since mid 60's to late 80's. But yield of Wheat has declined over the years. It was in fact negative during 1980-81 to 1989-90. The situation for the Pulses is very poor in West Bengal. Though Pulses have never been major crops in the State, nonetheless area, production and productivity seem to decline continuously with negative compound growth rates. Only during 80's growth rate for yield was 3.5.

Jute and Potato, the two cash crops of the State show a mixed pattern. Crop decision of these crops depends on the market prices of the previous year. And hence, they reflect wide variability. However, Potato showed an increasing trend in terms of area till 1989-90. But in the last decade and a half the growth rates of area, production and yield seem to decline. Potato cultivation in one hand is price sensitive and on the other it depends heavily on the warehousing facilities. Lately Potato cultivators are going through a tuff time in managing cold storage space for their output. Jute, on the other hand, is sensitive to the support price declared by the government. Moreover, the demand for Jute is faced with severe market competition with polymer products.

Changes in Input Use

West Bengal characterized a state with high population density on a fertile land where average size of holding was unfavourable for such a change in productive forces. Moreover, poverty ridden agrarian society of West Bengal had little to invest for agricultural development in the backdrop of existing production relation. Small farm dominant agriculture was primarily guided by subsistence needs.

But things changed for betterment with Left Front assuming State power in late 70's. Some changes in the production relation in agriculture were brought about by the Left Front with enforcing the land and tenancy reforms act. Since 1982-83 the wheel turned in the agricultural sector of West Bengal. Farmers having surplus came along with investment for improved agriculture. Main investment centered around making provision for water. Shallow tubewells were installed at a large scale that ensured controlled irrigation, which is the key point for high yielding technology. Consumption of chemical fertilizers and pesticides along with the high yielding seeds increased. But the rate of increase slowed down after 1992-93.

The number of tractors and oil engines reflected an appreciable change. It is true that West Bengal started from a low base of agricultural development before 80's. But the pace of development improved in the decade from mid 80's to mid 90's. However, after that sluggishness in the rate of growth is observed.

Changing Cost Structures of Principal Crops

In West Bengal, as we said earlier, that Paddy is the major crop covering 60.7 percent of GCA in 2004-05. Other crops such as Wheat, Mustard, Potato or Jute account for 4.28 percent, 4.80 percent, 3.37 percent and 5.98 percent respectively. Within Paddy Autumn variety accounts for only 3.37 percent of gross cropped area while Winter and

Summer varieties cover 42.91 percent and 14.45 percent of gross cropped area in 2004-05. Hence, any change in productivity of Paddy would naturally have a great impact in the agricultural sector.
The Summer Rice, which is popularly known as Boro, involves high cost for irrigation, chemical fertilizer, insecticides etc. Moreover, it requires intensive labour employment in the process of cultivation. Naturally cost of production in case of Summer Rice is substantially higher than that of Autumn and Winter Rice.
As Paddy is the major crop in West Bengal, we for our purpose have analysed the cost components over time for Paddy only.
It is found that between ten years from 1990-91 to 1999-00 growth of modern inputs like pesticides, chemical fertilizers and machine labour show high rates of growth. In addition to this, traditional inputs like seed and human labour, which are the two key inputs of agriculture, showed equally high rates of growth. Therefore, paid out cost (A1) and total cost (C3) also revealed high growth rates. Bullock labour seems to be replaced by machine labour. But since 2000-01 the scenario seems to change. During 2000-01 and 2005-06 the growth rates of modern inputs declined. Growth rates for fertilizers, irrigation were found negative. Poor growth is observed for machine labour and pesticides. Among the traditional inputs bullock power seems to decline. Seed, manure and human labour experience slow growth rates.

Trends in Agricultural Prices

Compound growth rate of wholesale price for Paddy has increased from 70's to 80's. During 1975-76 to 1979-80 it was 7.3 which increased to 9.0 in the period 1980-81 to 1989-90. But again the growth rate slowed down in 1990-91 to 2004-05. This trend for Paddy is evident also for farm harvest price despite the fact that the minimum support price declared by the government shows an increasing rate of growth. Compound growth rates of WPI, FHP and MSP for Wheat, on the other hand, reveal an increasing trend barring the fact that WPI remained more or less constant in the 80's and 90's. It was rather interesting to find that despite increasing trend of minimum support price for Jute the WPI and FHP are subject to mixed pattern of changes. This might have been due to market fluctuations of which Jute is very sensitive. Compound growth rates of price for Mustard on the whole reflects a decreasing pattern with the only fact that the MSP in 1990-91 to 2004-05 show marginal increment over previous period.

Capital Formation in Agriculture

State budgetary allocation figures reveal that the proportion of development expenditure in the last decade has actually decreased from 60.23 percent in 1995-96 to 45.19 percent in 2005-06. Agriculture and allied activities accounted for 24.17 percent of total allocation in economic activities while the respective proportions as regard to rural development, special area programme and irrigation and flood control were 30.94, 5.77 and 13.40 percent respectively in 1995-96. The share of agriculture and allied sector increased in the period 1996-2000. Proportion of allocation in sector like irrigation and flood control remained more or less same from 1995 to 2006 while special area programme over the years gained importance.
However, when we look into greater details of budgetary allocation it appears that proportion of allocation in crop husbandry has actually increased over the years from 17.31 percent in 1995-96 to 24.8 percent in 2005-06. On the contrary proportion of allocation towards minor irrigation increased marginally with 45.9 percent in 1995-96 to 48.4 percent in 2005-06 while major and medium irrigation remained unaltered with 35.1 percent in 1995-96 and 35.7 percent in 2005-06. It appears that development of irrigation has gained low priority in the last decade. We discussed earlier development of minor irrigation in West Bengal has been under the leadership of wealthier farmers where public participation was rather poor.

District Wise Growth of Production and Productivity

In our previous discussion we have so far discussed that West Bengal has suffered a deceleration in the growth of productivity in the agricultural sector in the 90's. Our analysis reveals that in this period the slowdown in growth is pronounced in respect of almost all the crops, however, with some variation in case of Paddy.
The State of West Bengal reflects a wide variation in agro-climatic specificities. From hilly tracts of Darjeeling to coastal South and North 24 Parganas diversified climatic and soil quality is observed across the state. Districts such as Jalpaiguri, Cooch Behar and Dinajpur come under Terai region while Purulia, Bankura, Birbhum and a part of Medinipur signify semi arid Red and Laterite zone. On the other hand the districts situated in the gangetic plane and

having benefit of alluvial soil are Burdwan, Murshidabad, Malda, Hoogly, Nadia, Howrah and a part of Medinipur. However, in all districts Paddy is the major crop that is being cultivated by farmers.

Burdwan, situated in the alluvial plain, has been one of the areas of IADP launched in 1962. In Burdwan, the productivity of Rice between the two time periods i.e. 1990-91 to 1999-00 and 2000-01 to 2004-05 has increased substantially despite growth in area has decelerated between the two periods. Compound growth rate of production also show an increase. Wheat, on the contrary reflects a marked slowdown. Area, production and productivity of pulses decreased sharply. Total oil seeds, Jute and Potato also follow a similar pattern

Midnapur, however reveals a sharp increasing trend for Rice in respect of yield across all the time periods. Compound growth rate in respect of area seem to decline in the second period (i.e. 2000-01 to 2004-05). Production also decelerated in the same time span but at a lesser degree. Yield of Wheat decelerated very sharply. Growth rate of yield of total food grains in general declined over the years. Situations for Jute and Potato were even worse. It was interesting to find that growth rate of oilseeds was found to accelerate after 2000-01. In a span of fifteen years from 1990-91 to 2004-05 Rice shows a substantial growth rate in terms of production and yield. In case of Potato the yield rate declined.

In Nadia, food grain crops such as Rice and Wheat seem to decline while Pulses reveal an increasing rate of growth. Jute and Oil seeds have also picked up in during 2000-05. It was important to find out that Potato in respect of area, production and yield experienced sharp rising pattern. On the whole Potato appears to perform the best in terms of production and productivity.

Rice in Murshidabad reveals a steady increase over the fifteen year time span. But striking is the growth rate of Potato, which increased at a rate over 12. Other crops such as Wheat, Pulses, Oil seeds and Jute, though exhibit a positive growth rate in respect of yield over a decade and a half have nonetheless decelerated in comparison to their respective growth rates in 90's.

In Malda the rate of growth of production and productivity of Rice was 0.71 and 2.64 in 1990-91 to 1999-00 that increased to 5.5 and 6.16 respectively in 2000-01 to 2004-05. On the whole the rates were 1.12 and 2.98 respectively. Oil seeds, Jute and Potato have also had good performance.

In Hooghly compound rate of growth of productivity of Rice had been 1.07 in 1990-91 to 2004-05. But the rate has increased from 0.99 during 1990-91 to 1999-00 to 1.98 during 2000-01 to 2004-05. Apart from Jute, the productivity growth for other crops has been slow. Oil seeds and Potato reveal a negative growth rate.

Howrah has historically been a district with more industrial enterprises than agriculture. In such a district it was interesting to see a definite increase in the compound growth in respect of productivity for most of the crops barring total Pulses.

Birbhum reveals a marked slowdown in growth rate of productivity in respect of all the crops under consideration. It is evident from the calculated compound growth rates that the slowdown in case of Rice is rather less in comparison to the other crops.

In Bankura, however, the situation remain almost same as in Birbhum barring the fact that total Pulses have a positive increment in growth rate of productivity from –0.76 to 3.88 in the two subsequent periods from 1990-91 to 2004-05.

Purulia, reveals almost the same story. Only the difference is that the growth rate of productivity of Rice seemed to maintain a steady rate over the years. Total Pulses, on the contrary, remained fluctuating and Potato exhibits a decline.

In the coastal districts i.e. South and North 24 Parganas, however, Jute shows a high growth rate in respect of productivity, while Rice seemed to accelerate in Northern part and decelerated in the Southern part of the district. Potato, in general, reveals a marked slowdown in both the districts.

The case for Dianjpur exhibits an increase in the growth rate of productivity of Rice from 1990-00 to 2000-05. Wheat and particularly Pulses have declined between the two periods. Marked increase is observed in case of Jute and potato.

In the districts of Jalpaiguri and Cooch Behar, productivity of the main crop Rice has declined over the years. Wheat shows a little improvement while productivity of Potato declined sharply. In Jalpaiguri Jute declined and in Cooch Behar it improved marginally.

In the hilly tracts of Darjeeling Tea and Timber are two major products that attract attention. Terrace cultivation of Rice here is somewhat secondary. Productivity growth of Rice, however, stagnated since 1990-91.

In West Bengal, however, the food basket is dominated by Rice. It is the staple food for millions of people living in the rural areas. Moreover, in a small farm dominant economy like West Bengal, the crop decision in most of the cases is guided by livelihood requirement of the people involved in cropping. Hence, cultivation of Rice gets the top priority despite recent hike in the cost of production and low market price of output. There has been a slowdown in all-round productivity growth since late 90's. But extent of this slowdown has been lesser in case of Rice as

compared to other crops. In the new millennium productivity of rice is found to accelerate as compared to previous decade.

District-wise changes in Production and Productivity of Rice

Here, in this section we have taken up changes that had occurred since 90's with respect to Rice. In course of our analysis we have taken two time frames, firstly, 1990-91 to 1999-00 the years of deceleration, and secondly, the millennium that followed i.e. 2000-01 to 2004-05. However, the second time span is a bit short for the special analysis, nonetheless it could throw some light to the emerging patterns.

It was found that during the period 1990-00 only Birbhum and Burdwan recorded high growth rates in respect of production of Rice. Midnapur, Purulia, South 24 Parganas, Murshidabad, Bankura and Nadia showed moderate growth rate of production. Rice production in Jalpaiguri and Malda seemed to stagnate while production of rice decelerated in Cooch Behar, Howrah, Hooghly, Dinajpur and Darjeeling. But in terms of growth of productivity none of the districts reflected high growth performance. Birbhum, Purulia, Dinajpur, Malda and Bankura showed moderate growth rate of productivity of Rice. In Dinajpur and Malda in particular withdrawal of area from Rice was sharp during 1990-00. South 24 Parganas, Medinipur, Murshidabad and Burdwan were among the areas that recorded low growth rates of productivity. In Hooghly, Nadia and North 24 Parganas productivity seemed to stagnate. In a word the 90's revealed a poor performance in the areas of production and productivity growth of Rice.

The scenario, however, changed with the turn of the new millennium. Districts like Hooghly, Murshidabad, Howrah came up with unprecedented pace of growth in terms of area, production and productivity of Rice with exception of Hooghly where productivity growth was low. It was followed by Birbhum, Purulia, Malda, Burdwan and Dinajpur where, growth of production of Rice was quite high. However, in terms of productivity, Midnapur led the way followed by Malda, Murshidabad, Dinajpur, Purulia and Howrah. Burdwan, Birbhum and North 24 Parganas reflected a moderate growth rate of productivity while in South 24 Parganas and Bankura it was low. Even under such an environment of growth two districts of North Bengal Terai viz. Jalpaiguri and Cooch Behar seemed to stagnate in terms of growth of productivity.

However, the overall scenario for the time period from 1990-91 to 2004-05 was not so encouraging. It is only Purulia that accounted for a high growth rate of production of Rice. At the same time there has been no district that reflected high or moderate growth performance in terms of area under cultivation of Rice. In Nadia and Burdwan growth of area was low, Murshidabad, Birbhum, Midnapur and South 24 Parganas seemed to stagnate and the other districts recorded negative growth rates. Six districts from South Bengal viz. Birbhum, Nadia, South 24 Parganas, Midnapur, Murshidabad, Burdwan and Jalpaiguri of Terai region had moderate rate of growth of production within the time period from 1990-91 to 2004-05. In terms of growth of Rice productivity Medinipur recorded the maximum followed by Purulia, Nadia and South 24 Parganas. Other districts barring North 24 Parganas had moderate or low growth rates in respect of productivity. In North 24 Parganas the growth rate of productivity was very low. But the important observation lies in the fact that the acute deceleration of the 90's that had its impact on the production and productivity of Rice seemed to be changing for betterment in early years of the new millennium. It is true that the pace of growth has still a long way to go nonetheless it is a good sign for the agrarian sector of West Bengal.

Determinants of Productivity of Rice

Methodology

Certain variables like land area, seeds, human labour, animal labour, pesticides, tractor, irrigated area, hyv area, fertilizer consumption, electricity consumption etc. were identified that may have impact on productivity changes. So the linear regression models could be written as follows:

1. $Y=f(X)$, Or, $Y_i = a + bX_i + U_i$

Where,

Y = Dependent variable productivity

X = Independent variables taken one at a time

2. $Y= a + b_iX_i + U_i$

Where,

b_i = Co-efficients, Y= Dependent variable, X_i = Independent variables,

U_i = Random error, and i = 1 to 25

Results

It was firstly a bivariate and then a multivariate exercise.
Apart from total area under rice and annual rainfall, the other independent variables have a significant impact on changes in productivity of rice though each of the variables explaining partially the variability in productivity.
We carried out multiple regression exercise to assess the impact of the independent variables on productivity of rice.
The results express that independently all the variables have significant impact on productivity but taken together they show some differentiated impact. Nonetheless, these independent variables taken together explain 92.5 per cent of variability of the dependent variable.
There may be two reasons for such behaviour of the explanatory variables. Firstly, as the number of observation is rather small and the degrees of freedom goes down as we go on adding independent variables. Secondly, there exists some degree of multi co-linearity among the explanatory variables.

A few words in the end

In the 90's on one hand the cost of production increased sharply and on the other the product price did not respond to the increasing cost. The result had a severe negative impact on impetus of the farmers.
In over three decades of left governance the wage rate for the agricultural labourers rose steadily giving rise to production cost.
It is a fact that the HYV cultivation which is centered around the Boro Paddy necessitates increased employment of human labour for intensive cultivation.
Non-remunerative output price thus had a withdrawal effect from Boro cultivation. At the same time prices of fertilizer, pesticides also rose substantially. On the contrary the minimum support price for Paddy remained low during 90's that had a negative impact. Till 1996-97 minimum support price and wholesale price index for Paddy remained low and since 1998 it exhibited an increasing trend that continued in the new millennium.
Market led impetus had an effect on increasing the growth rate of productivity of rice in recent period.
It is true that the growth rate needs to be increased further nonetheless the new millennium starts in an optimistic tune for paddy cultivation.

Policy Recommendations

Policy for increasing the productivity has mainly two aspects. Firstly, there may be strategies at the state level to cope up with certain hurdles at the macro level. Secondly, there should be strategies addressed to district level specificities.
At the macro level variables like Minimum Support Price, institutional procurement, marketing channels, surface irrigation etc. to be taken care of.

- Minimum Support Price, as we had discussed earlier, showed an increasing pattern over the years. But the rate of increment in the recent past has been rather slow. Cost A1 for Paddy per hectare increased from Rs.3282.38 in 1990-91 to Rs.12606.70 in 2004-05 which is an increase to the tune of 3.8 fold while the Minimum Support Price for rice for the corresponding years were Rs.205 and Rs.560 per quintal which is around 2.7 times increase. It is thus important that the support price declared by the government should be remunerative to the farmers. At the same time institutional procurement should also be made timely to assist the small and marginal farmers going for distress sale of output.
- Jute and Potato are the two crops that are market sensitive. MSP for Jute exhibits a 2.8 fold increase from 1990-91 to 2004-05. But there were severe fluctuation in WPI during 2002-04. These market fluctuations are to be taken care of to protect the Jute farmers. The market for Potato is mainly controlled by merchants and *Aratdars*. There remains a wide difference between the market price and harvest price of Potato at the grass root level. Government procurement in this sector is insufficient. Policy should be formulated to protect the Potato farmers at the grass root.
- As we all know that surface irrigation is the cheapest one in view of the rising prices of diesel and electricity. West Bengal, on the other hand, has ample avenues to extend canal command area. State

budgetary allocation towards major irrigation remained mostly unaltered from 1995-96 to 2005-06. There is a need for serious intervention in this regard.

- The agrarian sector of West Bengal exhibits an overwhelming predominance of small and marginal farmers who have little to invest for improved agriculture. In view of the rising prices of chemical fertilizers and pesticides a subsidy may be addressed to this section of farmers.

  We have discussed at length that the districts in West Bengal represent varied agro-climatic specificities. Problems in the districts are different and demand special attention. Though non-availability of district level data for certain variables have refrained us from district level analysis as regards to the determinants of productivity of crops nonetheless a few problems are well known and need to be mentioned here. Special attention should be paid for provision of irrigation facility, proper marketing channels for product to facilitate the farmers.

- The geo-morphological situations are so varied in the districts that no uniform measures could be taken to take care of irrigation problem. For example Purulia needs construction of check dams, small water bodies fed by the surface flow water of small streams. Districts like Birbhum and Bankura that are situated in Red and Laterite belt have a large number of tanks and water bodies in villages. Reclamation of such water bodies may facilitate lift irrigation as well as can increase the annual water recharge. On the other hand districts of gangetic plain have ample opportunities of canal and ground water irrigation. In the coastal districts there is acute problem of soil salinity and sippage of saline water. Non-salaine water requires deep boring and hence large capital investment. In Jalpaiguri and Cooch Behar, however, ground water is available in a very shallow boring. Here cheap treddle pumps could be utilized.

- Proper marketing channel is a problem that bothers the farmers of all regions. Particularly for the cash crops like Jute and Potato it remains essential. Potato is a quickly perishable product without a proper storage facility. The cold storages in most of the cases in rural West Bengal have developed under the auspices of private sector and the market being controlled by the merchants. Government intervention to provide warehousing and marketing facility is call of the hour. The village Panchayats can assume an important role in this context.

  An all round intervention to improve crop productivity and livelihood of rural people should be the slogan of the new millennium.