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A TEST OF THE PERMANENT INCOME HYPOTHESIS FOR INDIA

SUKLA SAHA* AND DEBASISH MONDAL**

1. Introduction :

In his book, **A Theory of the Consumption Function,** Friedman (1957) divides income and consumption into permanent and transitory components and hypothesises that the theoretical relation between consumption and income exists only between permanent consumption and permanent income and the relation is a proportional one. The relevance of this hypothesis with respect to time series data can be symbolically expressed as $Y_t = Y^P_t + Y^T_t$, $C_t = C^P_t + C^T_t$, $cor(Y^P_t, Y^T_t) = cor(C^P_t, C^T_t) = cor(C^T_t, Y^T_t) = 0$, where Y_t, Y^P_t and Y^T_t are respectively observed, permanent and transitory income and C_t, C^P_t and C^T_t are respectively observed, permanent and transitory consumption for the period t. To examine the hypothesis he estimates permanent income as a weighted sum of present and past observed incomes. Transitory income is estimated by subtracting permanent income from observed income. Assuming that average values of observed and permanent consumption are equal, he regresses observed consumption on permanent income to establish the validity of his hypothesis. This paper follows the method developed by Friedman and his followers to examine the validity of the permanent income hypothesis for an underdeveloped country like India.

2. A Brief Review of the Relevant Literature :

To estimate permanent income, $Y^P(t)$, from a continuous series of observed income, $Y(t)$, in an economy Friedman uses an expression as given below.

$$Y^P(t) = \beta \int_{-\infty}^{t} e^{(\beta-\alpha)(i-t)} Y(i)\, di \quad \ldots \quad (1)$$

The exepression shows that permanent income of any period is a weighted sum of present and past incomes with exponentially decreasing weights as one moves to the past. The sum of the weights is equal to $\frac{\beta}{\beta-\alpha}$ where α is the average exponential rate of growth of $Y(t)$ and $\frac{1}{\beta}$ is the average time between the estimated permanent income and the observed income. "Twice this time lag may be called the 'effective weighting period' ".

As Friedman observes, equation (1) can not be fitted directly to annual data. 'For application, $Y(t)$ is treated as a step function having the same value throughout each year. This is equivalent to converting the integral into a summation of annual terms, weight for each year being the integral of the weight function over the corresponding period'. Thus

$$Y^P_t = \frac{\beta}{\beta-\alpha}\left[1 - e^{-(\beta-\alpha)}\right] \sum_{i=0}^{\infty} e^{-(\beta-\alpha)i} Y_{t-i} \quad \ldots \quad (2)$$

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The authors are grateful to prof. A.K. Banerjee of the Dept. of Economics, University of Calcutta for his helpful comments.

SOME UNRESOLVED ISSUES IN THE INDUSTRIAL POLICY OF THE PEOPLE'S REPUBLIC OF CHINA

RAKHAL DATTA*

The economy of the People's Republic of China has recorded spectacular achievements in the Post-Mao period. The first phase of this period, as is well-known, was mainly concerned with the rural sector. From 1978 to 1984, family farms were given back much of their pre-revolution rights. With the exception of the right to sell land virtually all other rights associated with ownership of land were restored to farm housholders. This meant almost total demolition of the rural commune structure so meticulously constructed over two decades. The impact of this change on the rural economy was dramatic and agricultural output grew by leaps and bounds. However, there was little modification of China's industrial structure with its overwhelming emphasis on the State sector. The shortcomings of public sector undertakings were recognised but hardly any comprehensive policy was adopted to improve things.

The early 1990s have been remarkable for spectacular growth rates in industrial output, exports and gross domestic product. It is generally acknowledged that this was largely fuelled by massive investment coming mostly from the non-resident Chinese living in Hong Kong, Taiwan and other South-East Asian countries. The extent of foreign direct investment coming to China could be better understood if a comparison is made wilh the foreign direct investment that India received during the same period. The table below shows the foreign direct investment received by these two countries from 1991 to 1995.

Foreign Direct Investment

	People's Republic of China	India
1991	$ 4.733 billion	$ 153 million
1992	$ 12.159 billion	$ 165 million
1993	$ 30.746 billion	$ 305 million
1994	$ 37.056 billion	$ 680 million
1995	$ 36.279 billion	$ 1,316 million

This table shows the massive foreign direct investment coming to China during the years 1991 to 1995. Compared with these figures, foreign direct investment coming to India appears to be paltry.

Apart from this fact, one of the main reasons for China's remarkable success in the industrial sector was its decision to make the world's sunset industries its main engine of growth. These labour-intensive industries, shed by the United States and Japan, have now become Chinese monopolies. China today supplies products from these industries—products for everyday use and household goods like dolls, torches, shoes, staples and low technology products to the entire world. Western countries have found in China a great source of cheap labour.

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This labour is cheap because the labourers work in absymal conditions and are paid low wages. Reports are now available showing that most foreign invested companies in China have "three-in-one" factories in which workers work, eat, and sleep. In other words, in these factories, the workshops, warehouses and dormitories are all located in the same building. Even American companies like the shoe and apparel giant Nike are under tremendous pressure in their *home* country (the United States) to raise wages in China, give Chinese workers better working conditions, or face boycotts.

Whatever it may be, China is the biggest success story in the last two decades. China followed the Japanese model of development almost totally. The key to China's economic success was the bold step to get a comfortable trade surplus by restructuring imports and undervaluing its currency. The Chinese effectively and actively used the exchange rate and trade policy as a mojor tool of its growth strategies. China, unlike India's "Swadeshi" policy, opened up almost all sectors to foreign investment. China's industrial policy currently imposes an export obligation into every foreign investment or joint venture. These extra-market, extra-regulatory steps have secured China a lot of exports. As much as 57 per cent of foreign direct investment in China is export-related. This is against India's 3.1 per cent. The other key factor is the level of government savings. Compared to India's negative government savings, China's government saving ratio is almost 9 per cent of gross domestic product . During 1993-97 the annual GDP growth rate in China was 11 per cent, fastest in the world (3 per cent higher than the world average growth rate,

As a matter of fact, China occupies now the tenth position among the world's trading nations with an annual turnover of $ 325 billion.

But the current year is remarkable for a reversal of China's economic situation. Standard and Poor's rating of four of China's largest financial institutions is from stable to negative. Both GDP growth rate and foreign direct investment have slowed down perceptively. There is galloping unemployment, falling productivity and rising prices. China's legal system is almost non-existent. There are rising economic tensions between the cities and the countryside, between industry and agriculture, interior provinces and the wealthy coastal areas. There is an unprecedented urban migratron today–farmers are coming to cities to look for work. Almost 300 million farmers are today looking for alternative employment.

The banking sector is almost bankrupt. The Bank of International Settlement's required capital adequacy norm of 8 per cent of risk-weighted assets is not maintained by any other bank in China than the Bank of China, China's central bank. Some China experts maintain that almost 80 per cent of bank loans are non-recoverable and it could cost China 30 per cent of its GDP to write off these non-performing assets.

The Chinese Academy of Social Sciences has calculated that the GDP growth rate will miss the targeted 8 per cent this year and will be somewhere around 5 per cent. The slowdown is mainly attributed to the stagnant State sector in the industrial area.

Zhu Rongi, the new premier , has set a stiff three-year deadline to bring the Chinese economy back on the rails. His suggested measures are : (i) abolition of forced or directed credit quotas for banks (banks to lend only on commercial merit), (2) Central Government's workforce to be pruned by 50 per cent to 4 million. There will also be similar reduction in work force in provincial and local governments, (3) thirty million employees to be sacked virtually without any compensation from state-owned enterprises.

However, doubts are being expressed over the feasibility of the programme. Both the GDP growth rate and export growth rate have declined substantially in 1998. Export growth rate has come down to eight per cent on an annualised basis from the average of plus 20 per cent in the immediately preceding years. This low growth scenario may deter the Chinese leadership from their attempt to restructure 300,000 state enterprises.

II

It is argued here that the proposed measures to tide over the difficulties being faced by the People's Republic of China cannot he successful unless the more fundamental problems of privatisation and agency are resolved. One should note that privitisation in the Chinese economy has followed a path very different from the non-Marxist Leninist developing countries as well as in capitalist countries. Some of the major differences between the Chinese experience and that of other countries may be pointed out. First, China emphasised "Control" property rights or rights concerning control over the disposition of products of enterprises, and not ownership property rights. Second, the size and extent of state ownership and control in China is much larger than in other cases. Third, until recently, large-scale state-owned industry and financial enterprises were not the principal objects of privatisation. And finally, China's privatisation is taking place in an environment in which a true national market does not exist, where many prices are set administratively , where the legal system has not yet been institutionalized, where a complex political environment affecting managers undermines their abilily to maximise economic gain, and where the single channel of upward mobility in the society is still controlled by the Communist Party of China.

Chinese leaders talk about reform frequently , referring to change to a more efficient system or policy, Seldom do they use the term "privatisation" and they deny that they are privatising the economy. Reforms can be restoration in the sense that they can rehabilitate procedures that were common in the past but came under a cloud during the Cultural Revolution. Reforms can also be incremental or fundamental. These varieties of reforms are not all equivalent to "privatisation" meaning "policies designed to stimulate the substitution of private for public provision". Reform policies, for the Chinese leaders, are designed to make the economy work better ; they do not presume that the private sector is the only way to do this. In China, many reform policies are aimed at improving and/or rationalising state control through such mechanisms as improving managerial skills, insulating the economic from the political realm and refining the tools of (state) macroeconomic control. In other cases, the reletionalship between reform and privatisation is unclear. This is evident in the case of increased managerial autonomy. The appointment of managers to important state-owned enterprises remains under the control of the Chinese Communist Party (CCP). In fact, even after substantial reforms in the personnel system, the party secretaries and managers of twenty-four largest enterprises remain in the Central Commmittee's "nomenklatura". The state still owns these enterprises and controls appointments of their leading personnel, not just their managers. But at the same time, the state is telling these people to act autonomously and giving them greater freedom in determining the economic activities of state-owned enterprises including some degree of control over assets. This policy is clearly designed as a reform. But it is not a case of privatisation.

Discussions of privatisation have focussed on selling off state-owned assets and of turning activities under state control over to the private sector. In other words, ownership rights are being transferred in many countries. In China too, there have been some changes in the structure of ownership since1976. But while the relegitimisation of private enterprises, the encouragement of

collective enterprises, the formation of joint ventures, and even the existence of 100 per cent wholly-owned foreign subsidiaries have been important developments in recent years, all but collective enterprises have failed to affect industrial production significantly. Moreever, privatisation is not the goal for large state-owned enterprises. State-owned enterprises, until recently, produced about two-thirds of aggregate industrial output of China, and in high-technology and capital-intensive sector the proportion is even higher. Althouth some experiments with shareholding and other aspects of ownership change have been made (China now have two stock exchanges), very few top leaders are on record as supporting ownership reform for the state-owned industrial sector.

Instead of concentrating on ownership questions, Chinese enterprise reform policies in the last few years have been concerned with the separation of ownership and managment State ownership remains a largely unquestioned parameter of the industrial economy, but since 1978 efforts have been under way to expand enterprise autonomy. Particularly since 1986, the Factory Manager Responsibility System has been the most important reform in Chinese industry, and it is likely to reduce the role of enterprise party committee in the governing and administration of the enterprise. Today, again in theory, managers have much greater power to decide on such things as how large the work force should be, what is to be produced, how it is to be marketed, where raw and semifinished materials are to come from, who will occupy mid-level management positions, and so on. There has also been a change in the state-enterprise financial relations coupled with the manager responsibility system, Managers and the State arrive at an agreement as to how much profit and tax the enterprise is to turn over to the state treasury. The enterprise is allowed to keep either all above-contract profits or an increasing rate of above-quota profits.

For smaller state-owned enterprises, several proposals to "lease" management rights have been reported. Potential managers are supposed to bid on state enterprises , promising to deliver to the state a set amount of money over a fixed period. The successful bidder and his guarantors are allowed to retain all earnings after paying the contracted amount. If the enterprise fails to produce the required amount , the manger and his guarantors are responsible for making up the difference. A more extensive version of this system applies not only to profit contracting or leasing but also to assets within the industry.

Chinese industrial reforms in recent years thus have focused on increasing the "control property rights" of enterprise managers. Expanded shareholding has been considered and tried in a number of cases, but the apparent rights of shareholders are more similar to those in Japan than in the United States. Consequently, stock and share ownership essentially has been a way of mobilising capital rather than a means of influencing managerial behaviour. But expanding management control rights will not fundamentally transform China's political economy, nor will they likely have a major impact on productivity, profitability, and technological innovation.

The point made above may be elaborated further. The fundamental problem raised by the reform concept is to which degree the beneficial effects of the market mechanism can be set free in an environment which is still characterized as a socialist economy , and which despite all reforms retains many feautures of the old systtem. In fact, Chinese reformers insist that the market mechanisms will not change the fundamental character of a socialist economy, but will only serve as an instrument to solve certain problems in the preliminary phase of socialism with the final goal of perfect socialism, and lastly, communism.

For the reorganization of firms under the reform a number of questions arise. The first one

is whether the proposed and on-going reforms of industrial firms is feasible in a political environment where strong and influential groups of governments and party officials will be reluctant to abandon their authority over industrial enterprises. It must, also, not be overlooked that firm management is closely linked to these groups probably not in all cases eager to take the opportunities and risk of the new responsibility system mentioned above. The second question is closely related to the first one. Can managers be expected to take the responsibility for results, while the activity of firms is restrained by numerous regulations and instructions concerning output, prices, materials and employment of labour? Will not bad results be attributed to such constraints, thereby rejecting responsibility and giving arguments in support of subsidies? There is a third question, again related to the two others. If managers are free to make their own decisions in the firms, which institutional arrangenment can be made to create incentives for decisions which are in accordance to the long-term interest of the owner, i. e., lastly with general economic welfare?

"Separation of management from ownership" sounds very much like "separation of ownership and control", a concept widely discussed since the seminal study of Berle and Means. But while "separation of ownership and control is generally regarded as a threat to the functioning of a market economy, the Chinese reformers advocate "separation of management from ownership" as a measure to stimulate market forces. This apparent contradiction is due to the fact that in the present situation in China priority is given to the relief of firms from bureaucratic control. But it may have serious consequences for the success of the reform process in China, if the incentives of management behaviour do not receive sufficient attention.

A modern approach to the analysis of owner-manager relations is the economic theory of agency. Agency can be described as a relationship between two persons or groups of persons. The first one, the Principal, entrusts the second, the agent with the control over certain assets. The agent decides about the use of these assets. The economic results are somehow shared between agent and principal. The principal's objective is to have his own wealth maximised ; but he also knows that the agent's decisions aim at maximising his own utility. Moreover, the principal has less information than the agent ; he does not know clearly to which degree the economic results are due to the agent's activities or to uncontrollable external influences. The agent, therefore, has a certain scope for discretionary decisions which he may use to optimise his own positions, possible at the expense of the principal. This kind of behaviour is called opportunistic.

In which way and to what extent opportunistic behaviour is possible depends largely on the contract between the agent and the principal. The principal and the agent will try to avoid inefficient solutions benefiting one at the cost of the other. They will make all efforts to find a form of contract which is advantageous to both.

In private firm the typical agency relationship is that between management and financiers. There are many forms of this relationship. Two typical forms are equity and debt financing. With equity financing the manager of the firm is the agent, who holds no or only a small share of stock while the majority of shareholders are principals and have no direct control of the firm. In this case, the contract normally provides a fixed manager's salary and, in addition, a small share of the firm's profits for the agent, while the principals receive the major part of profits. With debt financing principals receive interest as a fixed recompense, while the agent as owner and manager may retain the residual.

Each of these two types of contracts may create incentives for the agent to choose a course of action by which principals are affected adversely.

In a market ceremony principal agent relationships are established because entrepreneurs who are able and willing to promote risky investments are not identical with financiers who have control over capital funds. As principals are aware of the inherent risks of the relationship, they will not hand over their funds to agents unless they are sufficiently protected by adequate contractual stipulations. Agents as well as principals are interested in coming to an agreement, and therefore will jointly strive to take precautions against possible activities of the agent with adverse effects for principals. The agent who needs the principals' fund will himself offer to provide for appropriate measures in order to satisfy principals.

The control of agents is facilitated in a market environment. The market for financial titles is at the same time a market for corporate control. Firm managers who neglect the interests of owners run the risk that somebody buys a majority of shares with the intention to replace management and to change the firm's policy. Further, there is a market for managers, the managers of a firm compete with each other and with outsiders for leading positions. They will fall back in this context, if they fail to convince principals of their qualifications and their loyalty.

Also, competition in the sales market will reduce the firm's ability to attain easily excess profits which might be dissipitated for the benefit of agents without attracting the attention of principals.

But in an economy like the Chinese, all means of production belong to the people (state). Firm managers are agents who should always have in mind the welfare of the principal. A fundamental problem in socialism is how the principal-agent relationship can be organised. In practice, we find a long line, sometimes several parallel lines of intermediaries linking principals and agents; party leaders and government claim to be the people's agent, but their control over firms is not direct ; they avail themselves of the services of a bureaucracy. The result is that large numbers of government and party official at the national and at the regional level are invloved in the control of firms, each of which acts as the agent of some superior authority and takes the role of the principal's representative towards some subordinate who is nearer to the firm. The shortcomings of this system, which underline the necessity of reforms, are lack of communication and coordination and fuzziness in the delimitations of competence and responsibility. This may be seen as a faulty organization of the agency relationship. Agents have no well-defined field of responsibility with appropriate incentives to act in the equally well-defined interest of the principal.

Chinese reforms have tried to separate management from ownership to limit the influence of certain agents, namely government and party efficials, upon managerial decisions of the firms. Management will thereby attain more freedom for discretionary decisions. Chinese reformers expect that they will use this freedom to increase the efficiency of firms, to improve products, and to reduce costs, However, there are some obvious flaws in this argument. One point is that managers have no guidance for decisions which are conducive to economic efficiency without a system of prices which reflect scarcity and utility of goods. Another point is that the separation of management from ownership leaves the question unsettled by which incentives the behaviour of management will be determined and which controls it will be subject to. This second point deserves more attention than it has received so far. The starting point of the reform process is that the chain of intermediaries connecting principal (the people) and agents (managers) does not

work satisfactorily. But the solution of the problems cannot be to give up any control of the principal over agents. It is not sufficient simply to abolish inefficient bureaucratic intermediation ; it must be replaced by some other type of control which works better.

The fundamental problem is that adherence to state ownership is one of the indispensable constraints in the reform process. Private ownership, by which the principal's functions would be decentralized, is beyond question. So there is no alternative to bureaucratic institutions as intermediaries between the people as principal and managers as agents. The meaning of the separation of management from ownership cannot be that the state retires from any control of firms. Reasonably it only means abstaining from direct intervention and reliance upon certain forms of indirect control.

China has been trying to introduce some systems of indirect control in which managers enter into some form of contractual relation with the authorities representing ownership. The role of the authorities representing principals in this system is to design appropriate contracts, to appoint and to dismiss managers, and to watch over the observance of contracts. However, recent experience of China in this regard shows that there is no easy solution to the agency problem.

What emerges from this brief discussion is that there are eventually two lines along which Chinese industrial reforms may proceed. First, there is privatisation of the industrial sector. However, the privatisation infrastructure is not present in China. A true national market is yet to be formed. China's transportations and communication systems are so overloaded that they cannot ensure adequate distribution of products. The result is a fragmented, regionally based series of markets. Again, markets in China are not impersonal and they have much less legitimacy in China than they do have in developed capitalist economies.

Another critical shortcoming in China's reform is the lack of a price system that reflects true costs of production. Some progress has been made in this area, but much remains to be done.

The legal system has not yet been fully institutionalised and that again inhibits full-fledged privatisation. The overall political environment in which enterprises exist, and party control over mobility are also serious bottlenecks in privatization.

In the absence of privatization, the only other way by which the Chinese industrial structure may become efficient is through the solution of the agency problem which again is a difficult task.

To conclude, the present crisis of the Chinese economy may be to some extent due to the melt down in South-East Asia. But more fundamental problems are still there requiring quick solutions.

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CHANGES IN RAINFED RICE PRODUCTION SYSTEM IN WEST BENGAL

NIRMAL KUMAR SAHA[1]

INTRODUCTION

West Bengal is the highest densely populated State in India. The State is divided into two broad agro-ecological zones and seven sub-regions on the basis of differences in soil characteristics, topography, rainfall and temperature (Table 1).

West Bengal is the largest rice producing and consuming State in India. It accounts for nearly 14 percent of the national rice area (of which nearly 59 percent are rainfed) and more than 15 percent of the national production. Rice alone accounts for 92 percent of the total foodgrains produced in the State compared to 42.47 percent for India as a whole. The average rice yield is 3179 kg. / ha. But the yield for rainfed rice is much lower and is 2682 kg. / ha. Rice covers nearly 67 percent of the total cropped area of which nearly 39 percent are rainfed (Tables **2a & 2b**). The present paper analyses the changes in rainfed rice production system in West Bengal during recent years.

RICE GROWING ENVIRONMENTS

Rice is grown in diverse ecological situation from saline affected coastal areas in the south to terraced land in the Hills in Himalayan range in the north in an altitude of 1300 m. It also grows in sub-humid plateau region in the south-west with an annual precipitation of 1100 m. m. and extends to humid alluvial plains in north-east with an annual rainfall of 3600 m. m. Rice is grown round the year in three seasons. The pre-monsoon rice, known as Aus, covers April to July in the northern region and May to September in the southern region, and accounts for 8-10 percent of the total rice area. This is a low yielding relatively drought tolerant upland crop with yield ranging from 1.5-2 tons / ha. The area under Aus is declining in recent years with the expansion of irrigation facilites. The monsoon rice, known as Aman, is grown in July to December and accounts for more than 75 percent of the rice area. It is grown in rainfed conditions in medium - deep - flooded land (mostly traditional varieties) and in the flood - free shallow lands in irrigated conditions (mostly modern varieties). The remaining rice area (15 - 18 percent) is covered by dry season rice known as Boro. It is grown in irrigated conditions and the entire area is covered with modern varieties. The growing season of boro overlaps with aus. With the expansion of irrigation facilities farmers are releasing land from aus and deep-water aman for raising boro. Trend in area, yield and production of rice by season is shown in Tables 3-5.

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* Paper presented in the workshop on "Economic Aspects of changes in Rice Production Systems in Eastern India" organised by the Social Sciences Division, International Rice Research Institute, Manila, Philippines and the National Centre for Agricultural Economics and Policy Research, New Delhi, India from 2-4 April, 1997 at New Delhi.

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** The views expressed in this paper are those of the author and not necessarily represent the views of the Government of West Bengal.

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CHANGES IN RAINFED RICE PRODUCTION SYSTEM

The distribution of rice harvested area by eco-system / agro-climatic zones is shown in Table 6. Rainfed rice is nearly 59 percent of the area - 39 percent in low lands, 9 percent in the uplands and 11 percent in deep-flooded areas. 47.82 percent of the rainfed rice area is in the lower Gangetic plains of which 6.45 percent in uplands, 31.33 percent in lowlands and 10.04 percent in flood-prone areas. The remaining rainfed rice areas (nearly 11%) is in the eastern hills and plateau region of which 2.53 percent in uplands, 7.47 percent in lowlands and 0.92 percent in flood-prone areas.

Rice yield varies widely across seasons and across eco-systems / agro-climatic zones (Table 7). Rainfed rice yield is the lowest in the flood-prone areas (1.5 tons / ha.) and in uplands (2.4 tons / ha.). In the uplands farmers still grow direct seeded aus rice, particularly in the eastern hills and the plateau region, which depends on vagaries of monsoon resulting in frequent droughts and crop failures. For traditional varieties that are resistant to drought farmers get an yield of 1.5 - 2 tons / ha. Some farmers now-a-days grow transplanted modern varieties by irrigating the crop during the transplanation and early vegetative stage and depending on monsoon rains during the later stages, particularly in lower Gangetic plains including coastal saline part and get higher yield up to a maximum level of 4 -5 tons / ha. In the flood-prone environment farmers grow mostly traditional aman varieties that are tall and can elongate with rising flood-water. In normal years it gives an yield of 2.5 -3.0 tons / ha. But crop failures are common due to abnormal flooding and uneven distribution of rainfall. In the rainfed low lands rice is mostly transplanted. Farmers choose traditional or modern varieties depending on the elevation of individual parcels of lands, the duration of the monsoon season and the availability of supplementary irrigation facilities. The traditional varieties give yield 2.5 - 3.0 tons / ha. and the modern ones 3.5 - 4.5 tons / ha. A late season drought with early recession of monsoon rains (in October) frequently reduces the yield of both traditional and modern varieties. The average rainfed rice yield achieved in the State is the result of the compostion of the area in different eco-systems and growing seasons as well as the rate of adoption of modern varieties and the yield for traditional and modern varieties for specific eco-systems and seasons.

Trend in rice area, yield and production by eco-systems during 1980-81 to 1994-95 in rainfed and irrigated condition is shown in Tables 8-10. Rainfed rice area in all the eco-systems (upland, lowland and flood-prone) has declined to a considerable extent over the years. This is mainly due to expansion of irrigated area by way of large-scale private investments in shallow tubewells as well as major infrastructural development in irrigation system. Rainfed rice yield in both upland and lowland situations have increased considerably over the years resulting in enhancing production, more in uplands (72.38%) compared to lowlands (45.47%). This is mainly due to cultivation of transplanted high yield varieties in the uplands in Kharif season with the availability of supplementary irrigation. In the flood-prone environments no significant change could be achieved in raising the yield, rather the total production has declined to some extent. Since the farmers in the flood-prone areas grow mostly traditional varieties that are tall and can elongate with rising flood-water the yield level has not increased in the desirable extent. Moreover, a considerable area in the flood-prone environment falls in the coastal saline zone where both salinity and inundation problems are acute. In order to make a breakthrough in the productivity level in the flood-prone environment suitable salt tolerant and submergence resistant varieties are to be expanded. In this environment changes took place in the land use pattern over the decade. Explotition of surface and groundwater through shallow tubewells and using back feed river

tide waters through canals contributed rapid shift to boro rice cultivation with brackish water aquaculture followed by transplanted deep water rice. In some parts boro is grown late, leaving the land fallow for a short period, thereafter deep-water rice is grown. Taking the advantage of early break of pre-monsoon shifting to late boro has given stability in boro field. This practice also minimizes the irrigation cost. In the low lying areas adjacent to river beds floriculture is adopted with land shaping device. Diversification has also taken place through cultivation of seasonal vegetables, particularly the chillies, fruits like watermelon and perennial crops like betel leaves (in uplands). It not only has strong demand both in domestic and international markets but also ensures high rate of return and changes the economy of the farmer.

Percentage contribution of rice area and production (rainfed and irrigated) by eco-systemes to total rice area and production during 1980-81 to 1994-95 is shown in Tables 11-12. Contribution of rainfed rice area and production has considerably declined over the years compared to irrigated rice in different eco-systems. This is mainly due to cultivation of traditional rice varieties in a considerable area, particularly in low lands and flood-prone areas, and expansion of irrigation facilities.

IMPLICATIONS FOR RESEARCH

The magnitude of risk in rice cultivation as measured by the variability of yield is higher for the rainfed eco-system compared to the irrigated. This is due to the frequent crop failures from droughts and floods. Hossain and Laborte (1993) estimated the co-efficient of variation of yield at the State level, which varies from 10 to 14 percent. Pandey and Singh (1996) estimated from two village studies in eastern Uttar Pradesh the co-efficient of variation of yield, which varies from 40 to 60 percent depending on elevation of land. In West Bengal the degree of risk is higher for uplands and flood-prone environments compared to medium / lowlands. The farmers having limited resources are not in a position to cope up with the risk of such magnitude. As a consequence, they are not very much enthusiastic in adopting input-intensive technologies. Appropriate modern varieties that can withstand with salinity, prolonged droughts and submergence not only enhance the utilisation of growth - argumenting inputs but also give rise to a stability of yield in rainfed rice.

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Table 1 COVERAGE OF DISTRICTS BY AGRO-CLIMATIC ZONES IN WEST BENGAL

Agro-climatic zones / Sub-regions	Districts covered
Eastern Hills and Plateau	
Hills	1. Darjeeling
Terai	1. Jalpaiguri
	2. Cooch Behar
Plateau	1. Purulia
Lower Gangetic Plains	
Old Alluvium	1. North Dinajpur
	2. South Dinajpur
	3. Malda
New Alluvium	1. Murshidabad
	2. Nadia
	3. 24-Parganas (N)
	4. Hooghly
	5. Burdwan
Lateritic	1. Birbhum
	2. Bankura
	3. Midnapur (W)
Coastal Saline	1. 24-Parganas (S)
	2. Midnapur (E)
	3. Howrah

Table 2a RICE SCENARIO OF WEST BENGAL

1. Geographical area (in million ha.)		8.88
		(2.70)
2. Population (in million)		68.07
[Population Census, 1991]		(8.12)
3. Rice area (in million ha.)		5.77
		(13.66)
a. Rainfed (in million ha.)		3.39
b. Irrigated (in million ha.)		2.38
c. Percentage contribution of Rainfed rice area		58.75
d. Percentage contribution of Irrigated rice area		41.25
4. Rice yield * (kg./ ha.)		3179
a. Rice yield (kg. / ha.)	(rainfed)	2682
b. Rice yield (kg. / ha.)	(irrigated)	3887

Notes : Figure in parentheses indicates percentage to All India

** In terms of paddy*

Table 2b RICE SCENARIO OF WEST BENGAL.

1. Rice Production	(in million tons)	18.35
		(15.07)
a. Rainfed	(in million tons)	9.10
b. Irrigated	(in million tons)	9.25
2. Percentage contribution of rice to total foodgrains production		92.09
		(42.47)
3. Percentage contribution of rice area to total cropped area		66.22
a. Percentage contribution of rainfed rice area to total cropped area		38.91
b. Percentage contribution of irrigated rice area to total cropped area		27.31

Notes : Figure in parentheses indicate percentage to All India

** In terms of paddy*

Sources : Economic Review, 1995-96, Government of West Bengal and Agricultural Statistics Agriculture, Government of India.

Table 3 TREND IN RICE AREA BY SEASON DURING 1980-81 TO 1994-95 IN WEST BENGAL

Season	Area ('000 ha.) during				
	1980-81	1985-86	1990-91	1993-94	1994-95
Autumn (Aus) Rice	615.1	483.1	610.3	539.6	518.8
Winter (Aman) Rice	4214.6	4083.3	4306.5	4290.9	4210.6
Summer (Boro) Rice	346.5	512.3	896.1	1045.0	1043.3
Total Rice	5176.2	5078.7	5812.9	5875.5	5772.7

Source : Directorate of Agriculture, Government of West Bengal.

Table 4 TREND IN RICE PRODUCTIVITY BY SEASON DURING 1980-81 TO 1994-95 IN WEST BENGAL

Season	Productivity * (kg. / ha.) during				
	1980-81	1985-86	1990-91	1993-94	1994-95
Autumn (Aus) Rice	14 05	1678	2227	2524	2422
Winter (Aman) Rice	2144	2212	2391	2783	2986
Summer (Boro) Rice	3745	4178	4460	4653	4332
Total Rice	2163	2360	2693	3092	3179

*Note : * In terms of paddy*
Source : Directorate of Agriculture, Government of West Bengal.

Table 5 TREND IN RICE PRODUCTIVITY BY SEASON DURING 1980-81 TO 1994-95 IN WEST BENGAL

Season	Production * ('000 tons) during				
	1980-81	1985-86	1990-91	1993-94	1994-95
Autumn (Aus) Rice	864.1	810.9	1359.4	1362.2	1256.8
Winter (Aman) Rice	9035.5	9033.8	10298.1	11941.2	125.76.8
Summer (Boro) Rice	1297.7	2140.7	3996.4	4862.1	4519.3
Total Rice	11197.3	11985.4	15653.9	18165.5	18352.9

*Note : * In terms of paddy*
Source : Directorate of Agriculture, Government of West Bengal.

Table 6 RICE AREA BY ECOSYSTEM AND AGRO-CLIMATIC ZONES IN WEST BENGAL, 1994-95

Agroclimatic zones	Area (million ha.) by rice ecosystem / agro-climate zones					
	Irrigated		Rainfed			
	Wet season	Dry season	Upland	Lowland	Floodprone	Total
Eastern hills & plateu						
Hills	0.039	—	0.006	—	—	0.045
Terai	0.108	0.015	0.133	0.207	0.053	0.516
Plateau	0.063	0.002	0.007	0.224	—	0.296
Lower Gangetic plains						
Old Alluvium	0.198	0.133	0.062	0.295	0.018	0.706
New Alluvium	0.401	0.502	0.184	0.545	0.182	1.814
Lateritic	0.322	0.166	0.107	0.663	0.095	1.353
Coastal Saline	0.206	0.226	0.019	0.305	0.284	1.040
West Bengal	1.337	1,044	0.518	2.239	0.632	5.770
	(23.1)	(18.1)	(9.0)	(38.8)	(11.0)	(100.0)

Note : Figures within parentheses are percent of total rice area
Source : Directorate of Agriculture, Government of West Bengal.

Table 7 RICE YIELD BY ECOSYSTEM AND AGRO-CLIMATIC ZONES IN WEST BENGAL, INDIA 1994-95

Agroclimatic zones	yield* (tons per ha.) by rice ecosystem / agro-climate zones					
	Irrigated		Rainfed			
	Wet season	Dry season	Upland	Lowland	Floodprone	Total
Eastern hills & plateu						
Hills	2.2	—	2.0	—	—	2.2
Terai	2.1	3.4	1.5	1.7	1.7	1.8
Plateau	2.8	2.8	2.0	2.5	—	2.6
Lower Gangetic plains						
Old Alluvium	2.6	4.6	2.0	2.6	1.4	2.9
New Alluvium	2.9	4.7	2.8	3.8	1.8	3.8
Lateritic	4.1	4.0	3.0	3.1	1.7	3.4
Coastal Saline	3.4	3.7	3.4	3.5	1.3	3.0
West Bengal	3.5	4.3	2.4	3.1	1,5	3.2

*Note : * In terms of paddy*
Source : Directorate of Agriculture, Government of West Bengal.

Table 8 RICE AREA BY ECHOSYSTEM DURING 1980-81 TO 1994-95 IN WEST BENGAL

Eco-system		Area ('000 ha.) by eco-system during				
		1980-81	1985-86	1990-91	1993-94	1994-95
Rainfed	Upland	615.1	483.1	610.3	539.6	518.8
	Lowland	2516.1	2385.7	2424.6	2220.6	2240.6
	Floodprone	717.7	638.9	635.6	629.2	632.7
	Total	3848.9	3507.7	3670.5	3389.4	3392.1
Irrigated	Wet season	980.9	1058.7	1246.2	1440.9	1337.3
	Dry season	346.5	512.3	896.1	1045.0	1043.3
	Total	1327.4	1571.0	2142.3	2485.9	2380.6

Source : Directorate of Agriculture, Government of West Bengal.

Table 9 RICE YIELD BY ECHOSYSTEM DURING 1980-81 TO 1994-95 IN WEST BENGAL

Eco-system		Yield* (kg. / ha.) by ecosystem during				
		1980-81	1985-86	1990-91	1993-94	1994-95
Rainfed	Upland	1405	1676	2227	2524	2422
	Lowland	2107	2185	2443	2666	3065
	Floodprone	1554	1421	1707	1859	1540
	AVERAGE	1891	1976	2280	2494	2682
Irrigated	Wet season	2669	2752	2639	3366	3540
	Dry season	3745	4178	4460	4653	4332
	AVERAGE	2950	3217	3400	3907	3887

*Note : * In terms of paddy*
Source : Directorate of Agriculture, Government of West Bengal.

Table 10 RICE PRODUCTION BY ECHOSYSTEM DURING 1980-81 TO 1994-95 IN WEST BENGAL

Eco-system		Production* ('000 tonnes) by eco-system				
		1980-81	1985-86	1990-91	1993-94	1994-95
Rainfed	Upland	864.1	810.9	1359.4	1362.2	1256.8
	Lowland	5300.7	5211.8	5924.5	5921.3	6868.0
	Floodprone	1115.1	908.1	1084.9	1169.5	974.5
	Total	7279.9	6930.8	8368.8	8453.0	9099.3
Irrigated	Wet season	2618.4	2913.9	3288.7	4850.4	4734.3
	Dry season	1297.7	2140.7	3996.4	4862.1	4519.3
	Total	3916.1	5054.6	7285.1	9712.5	9253.6

Note : * *In terms of paddy*

Source : *Directorate of Agriculture, Government of West Bengal.*

Table 11 PERCENTAGE CONTRIBUTION OF RICE AREA UNDER DIFFERENT ECHOSYSTEMS DURING 1980-81 TO 1994-95 IN WEST BENGAL

Eco-system		Percentage of area by eco-system during				
		1980-81	1985-86	1990-91	1993-94	1994-95
Rainfed	Up land	11.9	9.5	10.5	9.2	9.0
	Lowland	48.6	47.0	41.7	37.8	38.8
	Floodprone	13.9	12.6	10.9	10.7	11.0
	Total	74.4	69.1	63.1	57.7	58.8
Irrigated	Wet season	18.9	20.8	21.4	24.5	23.2
	Dry season	6.7	10.1	15.5	17.8	18.0
	Total	25.6	30.9	36.9	42.3	41.2
West Bengal		100.0	100.0	100.0	100.0	100.0

Source : *Directorate of Agriculture, Government of West Bengal.*

Table 12 PERCENTAGE CONTRIBUTION OF RICE PRODUCTION UNDER DIFFERENT ECHOSYSTEMS DURING 1980-81 TO 1994-95 IN WEST BENGAL

Eco-system	Percentage contribution of Production* by eco-system during				
	1980-81	1985-86	1990-91	1993-94	1994-95
Up land	7.7	6.8	8.7	7.5	6.8
Lowland	47.3	43.5	37.8	32.6	37.4
Rainfed					
Floodprone	10.0	7.5	6.9	6.4	5.4
Total	65.0	57.8	53.4	46.5	49.6
Wet season	23.4	24.3	21.0	26.7	25.8
Dry season	11.6	17.9	25.6	26.8	24.6
Irrigated					
Total	35.0	42.2	46.6	53.5	50.4
West Bengal	100.0	100.0	100.0	100.0	100.0

*Note : * In terms of paddy*

***Source** : Directorate of Agriculture, Government of West Bengal.*

INSTITUTIONAL ASPECTS OF AGRICULTURAL AND ALLIED DEVELOPMENTS IN RURAL AREAS : A STUDY OF DROUGHT PRONE AREA PROGRAMME IN WEST BENGAL

MANAS ADHIKARI*

Economic growth and removal of hunger and poverty are the primary concerns of the developing coutries like India. To combat these two major problems planned intervention in the rural poverty situation has started in the early fifties. The major thrust of policy was to intervene indirectly, hoping that poverty would practically diminish through the expected 'trickle-down' effect of the growth strategies.[1]

Limitations of General Institutional Measures

Several general institutional measures like Community Development Programme, National Extension Service etc. (which were introduced in the first two decades of India's Independence) had not been effective either in increasing farm productivity substantially or in removing rural poverty, unemployment or in reducing socio-economic inequalities.[2] The much-applauded new agricultural development strategy known as Green Revolution has also resulted in tremendous pressure being put on the ecology, which reflects itself on the growing regional as well as ecological imbalances.

Rationale for Special Institutional Measures

No doubt, to remedy the problems of chronic food deficits and large food imports, the green revolution technology was adopted in the 1960s. Whilt it caused a high rate of growth of agricultural production that occured at the cost of stability. A review of crop performance during the Pre-Green Revolution (Pre-GR) period (1955-56 to 1964-65) and Post-Green Revolution (Post-GR) Period (1967-68 to 1988-89) made by Ninan and Chandrasekhar (1993) reveals that at the all-India level except coarse cereals and pulses all crops registered a significant growth. Table 1 shows the performance of different crops. Wheat, rice and sugarcane had the benefit of irrigation and fared better than other crops. For most crops, yield rather than area has been the major source of output growth in this period.

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Table 1 GROWTH AND INSTABILITY OF AGRICULTURAL PRODUCTION (DURING PRE- AND POST-GREEN REVOLUTION PERIOD)

Crops	Percent of Crops Area		Growth Rate		Instability (CVT/CV in percent)					
	To Gross Sown Area	Under irrigation (1986-87)	Pre-GR		Post-GR		Pre-GR		Post-GR	
			P	Y	P	Y	P	Y	P	Y
Rice	23	43	4.0*	2.4*	2.6*	2.0*	5.0	5.1	8.5	7.0
Wheat	13	77	3.3*	2.3**	4.9*	3.1*	8.2	7.2	7.1	5.8
Coarse Cereals	23	9	2.6*	1.6*	0.5	1.4*	3.1	3.5	9.8[a]	7.3
Pulses	13	10	0.4	–0.01	0.6	0.3	9.1[a]	8.3[a]	10.5	8.5[a]
Food–grains	72	33	3.0*	2.2*	2.5*	2.3*	4.4	3.8	6.7	5.4
Groundnut	4	15	3.4*	neg	1.3**	1.2*	5.6	5.5[a]	8.6	12.1
Cotton	4	31	3.2*	3.0**	1.8*	2.1*	9.9	8.8	11.3	8.9
Sugarcane	2	82	7.0*	4.1*	2.6*	1.4*	9.4	5.2	8.3	4.4

Notes : *(1) Pre-Gr : Pre-Green Revolution, 1955-56 to 1964-65*
Post-GR : Post-Green Revolution 1967-68 to 1988-89
(2) CVT / CV. are coefficient of variation around trend and mean respectively expressed CV_t, the rest are CVT_s. P : Production Y : yield per acre.
(3) *,* * = significant at 1 and 5 percent levels of significance, remaining growth rates are not significant at the above levels of significance.

Source : *Ninan & Chandrasekhar (1993) "Green Revolution, Dryland Agriculture and Sustainability Insights from India", **EPW**, March 20-27.*

The level of instability has increased for most of the crops except wheat and sugarcane. The causes of this instability are climatic factors, extension of cultivation to marginal lands or riskier regions, factors associated with new technology etc. Other than these, changed price policy, commercialisation of agriculture, environmental degradation etc. also have contributed to this instability.[5]

There are widespread doubts regarding the effectiveness and sustainability of green revolution [See, eg., Hafell (1982), Rao (1983), Nadkarni (1988)]. From the study of Ninan and Chandashekhar (1993) it is also seen that the cost of production of both irrigated and dry crops have increased. The green revolution belt as well as other areas are afflicted by malady of increasing costs. The input-output ratios show positive signs in most cases. Wheat and rice which benefitted the most from the green revolution have reported substantial increases in these ratios in a number of states. For rice, not only the traditional rice-growing areas like West Bengal but also new area like Haryana have witnessed sizeable increase. The dry crops, e.g. sorghum and and maize too reported a short upward swing in these ratios.

The intensification and chemicalisation of agriculture associated with the green revolution have also brought serious ecological problems such as salinity and soil erosion, declining water-table and desertification in the dry or semi-arid regions. The rotation of soil exhaustive crops followed by the soil enriching crops has been given up. Over the greater parts of Punjab, Haryana, Uttar Pradesh and Madhya Pradesh, millets and maize (summer crops) used to be followed by grain (winter crop), the previous being soil-exhaustive and the latter soil-enriching crops. Now after the installation of tubewells and development of land irrigation, farmers are largely devoting their arable lands to rice and to wheat in summer season, which are both soil exhaustive.[6] Such a practice is depleting the natural fertility of land at an accelerating rate which again has increased the cost of production.

The diffusion of HYVs has accelerated the growth of market-oriented economy, resulting into the destruction of traditional agriculture. This has resulted in a serious problem of demand for assured supply of irrigation, especially in the areas of deficient rainfall areas.[7]

Thus, the strategies for promoting sustained agricultural growth laid bare the diverse environmental constraints under which agricultural growth was taking place. It was progressively felt that in the dry and semi-arid regions where water, apart from land, the over-riding constraint, the policy goals should aim at soil and moisture conservation, less water and land-intensive cropping. Area-specific schemes for drought prone or desert areas came to be formulated to intervene in poverty-perpetuating inhospitable environment.

Before the droughts of the mid-60s isolated efforts for identification of drought-prone areas were made by the state governments. The Second Irrigation Commission appointed by the Govt. of India first, and then in 1970, the Govt. of India Task Force, tried to identify the drought-prone areas. Both of them identified the areas on various criteria.[8]

In the Fifth Plan, on the recommedations of the Task Force, the D.P.A.P. was initiated in 74 districts spreading over 13 states.[9] In the Sixth Plan, it covered 557 blocks spread over 74 districts as was in the Fifth Plan[10]. In the Eighth Plan, it covered 615 blocks of 91 districts in 13 states.[11] This shows that more and more areas are coming into the perview of drought.

At present D.P.A.P. is treated as an integrated area development programme in agricultural sector and aims at optimum utilisation of land, water and livestock resources, restoration of ecological balance and stabilising the income of the people, particularly of the weaker sections of the society. The important elements of the programme are :

(i) Development and management of water resources ;
(ii) Soil and moisture conservation measures ;
(iii) Afforestation with special emphasis on social justice and farm forestry ;
(iv) Development of pasture lands and range management in counjunction with develoment of sheep husbandry ;
(v) Livestock development and dairy development ;
(vi) Restructuring of cropping pattern and changes in agronomic practices, and
(vii) Development of subsidiary occupation.[12]

Thus, the rationale for adopting D.P.A.P. came to be explained from two points of view. First, it is a strategy to reduce regional disparity and to restore ecological balance. Secondly, it is taken as an anti-poverty programme.

D.P.A.P. is being implemented since the early 1970s to achieve ecological balance and to achieve eco-based development and ultimately to reduce the regional disparity through promotion of standard of living and improvement of socio-economic conditions of the people.

Scope of the present study :

Against this perspective the present note makes an attempt to examine the performances of D.P.A.P. in West Bengal.

OBJECTIVES OF THE STUDY :

The major objectives of the study are set as follows :

(1) To review the growth performances of D.P.A.P. ;

(2) To examine whether there have been significant changes in cropping pattern that may be ecologically sound and sustainable for drought-prone areas. Besides, it examines the adequacy of this programme in improving the development indicators like literacy rate, workers participation rate etc. and in alleviating the problem of rural poverty ;

(3) To examine the impact of D.P.A.P. on rural poverty.

HYPOTHESES :

The following are the hypotheses to be tested in our study :

(1) Growth performances of D.P.A.P. in West Bengal are not significant.

(2) SC and ST people are mostly the inhabitants in the DPAP area and their socio-economic conditions have changed insignificantly after the D.P.A.P.

(3) Cropping pattern of these areas has not changed substantially.

(4) Yield rate of major agricultural crops has increased in the D.P.A.P. period compared to that of the earlier period.

(5) The DPAP has significant impact on poverty.

PLAN OF THE PAPER :

The plan of the rest of the paper is as follows. Section 2 analyses the performances/progress in respect of DPAP at the All India, state as well as district level. Secion 3 analyses the socio-economic conditions of the districts of India which are cent percent drought-prone. Section 4 studies the impact of DPAP on net agricultural income and rural poverty. Section 5 summaries earlier discussion and makes concluding observations.

II

PERFORMANCE OF D.P.A.P.

Organisation of D.P.A.P.

The planning and implementation of the programme is not the concern of one single government department. Several departments, namely agriculture, animal husbandry, forests, irrigation etc. are involved in this programme. On the recommendation of the Task Force, three broad level organisations for planning and implementation of DPAP have been set up, namely the central DPAP division, state level DPAP organisation and DPAP organisation at the district level.[14]

The programme is financed by the Central Governments as well as the State Governments on an equal basis.[15] In the Sixth Plan and Seventh Plan, funds were allocated on the basis of number of

blocks covered under the programme in each district at the rate of Rs 15 lakh per block with a geographical area upto 500 sq. kms, Rs 16.5 lakhs with an area between 500 and 1000 sq. kms per block and Rs 18.5 lakh per block with area exceeding 1000 sq. kms.

Physical and Financial Achievements in India

Details of sectorwise allocation and expenditure pattern for each state are not available, which restricts the present study. However, from the available data for the 5th Plan and the 7th Plan some observations can be made. In Table 2, financial targets and achievements during the 5th, 6th and 7th Plans, sectorwise physical targets and achievements for the 5th Plan and the physical achievements for the 6th and 7th Plans are shown.

Table 2 PHYSICAL AND FINANCIAL ACHIEVEMENTS OF DPAP DURING THE FIFTH TO SEVENTH PLAN PERIOD

Items	Fifth Plan	Sixth Plan	Seventh Plan
A. Financial :			
1. Total Plan Allocation (in Rs crores)	258.37 (100)	350.00 (100)	462.76 (100)
2. Total plan expenditure (Rs crores)	188.97 (73.14)	310 (88.57)	461.86 (99.8)
B. Physical :			
1. Soil Conservation ('000 ha)	1076	4265.59	4774.80
2. Irrigation Potential (000 ha)	2300	3276.67	2095.80
3. Afforestation and pasture ('000 ha)	2700	3879.86	3741.66

Source : Five Year Plans of the Government of India.

From Table 2 we see that percentage of total expenditure to total allocation increased from 73.4 in the 5th Plan to 88.57 in the 6th Plan and 99.8 in the Seventh Plan.

The DPAP aimed at creating durable assets which help in mitigating the effects of drought in the DP areas. In the fulfilment of this objective, it is seen that an irrigation potential for about 2300 thousand hectares in the Fifth Plan, 3276.67 thousand hectares in the Sixth Plan and 2095.8 thousand hectares in the Seventh Plan were created through minor irrigation works. Soil conservation acreage has also increased during the plan period from 1076 thousand hectares in the Fifth Plan to 4774.8 thousand hectares in the Seventh Plan. The forestry and pasture development included 2700 thousand hectares in the Fifth Plan, 3879.86 thousand hectares in the Sixth Plan and 3741.66 hectares in the Seventh Plan. The last two projects have been designed to restore ecological balances in the area.

Table 3 and Table 4 show the proportion of DP areas, outlay sanctioned and their utilisation by states.

Table 3 STATE-WISE DP AREAS & FUND UTILISATION.

State	Area under DPAP (sq. km.)	Total area of the drought affected dist.	DP areas as % of total DP areas of India	Proportionof Expenditure to Total expenditure (%)	
				Fifth plan	Seventh plan
1. Andhra Pradesh	83.5	127.2	14.20	11.7	11.99
2. Bihar	23.6	46.1	4.03	4.7	9.05
3. Gujarat	56.5	154.7	9.66	12.9	7.52
4. Haryana	9.1	29.6	1.55	2.1	1.42
5. Jammu and Kashmir	11.7	16.2	2.00	1.7	2.06
6. Karnataka	48.9	152.8	8.36	11.7	9.05
7. Madhya Pradesh	38.7	94.8	6.62	9.5	11.64
8. Orissa	16.9	22.8	2.89	8.3	12.32
9. Maharashtra	44.0	13.9	7.58	3.6	5.51
10. Rajasthan	191.0	214.9	32.67	14.6	4.95
11. Tamil Nadu	22.2	84.6	3.79	5.3	5.94
12. Uttar Pradesh	27.2	43.0	4.62	10.5	13.86
13. West Bengal	11.4	26.9	1.95	3.9	4.63
All India	584.7	1027.5	100.00	100.0	100.00

Source : Five Year Plans of Government of India.

Table 4 STATE-WISE UTILISATION OF OUTLAYS DURING THE FIFTH AND THE SEVENTH PLAN

State	Fifth Plan		Seventh Plan	
	Outlay sanctioned (in Rs lakh)	Percentage of expenditure to outlay sanctioned	Outlay sanctioned (in Rs lakh)	Percentage of expanditure to outlay sanctioned.
1. Andhra Pradesh	3418.25	64	5304	108
2. Bihar	1268.64	70	3924	110
3. Gujarat	3059.59	80	3298	109
4. Haryana	670.09	59	648	105
5. J. & K.	535.43	59	978	101
6. Karnataka	2794.92	79	5480	79
7. Madhya Pradesh	1975.62	91	3676	151
8. Orissa	2284.15	68	5758	102
9. Maharashtra	1025.04	66	2880	92
10. Rajasthan	3874.41	72	2288	104
11. Tamil Nadu	1222.50	83	3120	91
12. Uttar Pradesh	2609.86	73	6426	103
13. West Bengal	1098.92	67	2464	90
All India	25837.42	73	46244	103

Source : Five Year Plans

The States with larger area unde DPAP (e.g., Rajasthan, Madhya Pradesh) made lower proportion of expenditure during both the plans.

PHYSICAL AND FINANCIAL ACHIEVEMENTS IN WEST BENGAL

In West Bengal DPAP came into operation from 1976-77. The DPAP area of West Bengal has a humid sub-tropical climate, varying temperature over a wide range from 3.8^0C to 15.60^0C in summer. Soil erosion is a common feature of the area coupled with wind erosion at an enormous rate. The dispersal of rainfall varies considerably. The socio-economic condition of the people of this area is very poor and they are living in perpetuating poverty conditions. Majority of the population of this area are marginal farmers, scheduled castes and scheduled tribes.

In the initial stage of the programme, the area development work under it was rather sporadic and the desired integration of sectoral activities could not be achieved. Further, there was no yardstick regarding the weightages to be given to different sectoral activities. The sectors having good infrastructure including staff potential were utilising more funds and no thought was given to the desired weightages to different sectors for making an all-round and integrated development of the area. Of late, this problem has been solved through the formulation of the plan as per the guidelines issued by the central sanctioning committee on DPAP[16].

Before the set-up of the agency (DRDA) in Midnapore district some funds were allotted to Forest Department, Irrigation and Waterways Department and some other concerned departments for the developement of the area. After the District Rural Development Agency (DRDA), the implementing apex agency, starts operation, out of total grants of Rs 1711.86 lakh upto 1992-93, Rs 1426.62 lakh has been utilised till date in the district. The details of the financial performances are shown in Table 5. Since the inception of the DPDA till 1992-93 eighty three percent of financial resources was spent.

Tables 5 FINANCIAL ACHIEVEMENTS OF DPAP MIDNAPORE DISTRICT

Period	Target	Financial resources	Expenditure incurred
5th plan (1976-77)	196.62	162.55	104.40
		(100)	(64.2)
1979-80	42.27	127.00	65.08
		(100)	(54.24)
6th plan (1980-85)	758.48	552.33	481.64
		(100)	(87.20)
7th plan (1985-90)	659.66	546.98	572.34
		(100)	(93.60)
1990-91	138.00	131.23	100.88
		(100)	(76.87)
1991-92	113.44	106.17	84.24
		(100)	(79.34)
1992-93	109.50	85.60	78.08
		(100)	(91.16)
Total	2017.97	1711.86	1426.62
		(100)	(83.34)

Source : Annual plans of DPAP (DRDA), Midnapore

The physical and financial achievements of different programmes of 3 districts are given in Table 6. It is revealed from this table that more emphasis in terms of financial allocation is given in these districts on two programmes, namely water resources development and forestry. Soil conservation programme is neglected to some extent.

Table 6 PHYSICAL AND FINANCIAL ACHIEVEMENTS IN RESPECT OF DIFFERENT PROJECTS OF DPAP IN 3 DISTRICTS OF WEST BENGAL

Types	Midnapore (upto 1995–96)		Bankura (1990–91)		Purulia upto 1992–93)	
	Physical (in ha)	Financial (lakh)	Physical (in ha.)	Financial (Rs. lakh)	Physical (in ha)	Financial Rs. lakh)
1. Dryland Farming	17444	168.976 (10.73)	—	151 (9.02)	34,227.16	191.77 (5.79)
2. Sol Conservation	9087	197.568 (12.54)	6072	140.6(8.37)	7,567.36	322.48 (9.74)
3. Water Resoarce Development	8469	509.234 (32.34)	—	445.14(26.59)	21,951.00	1220.00 (36.85)
4. Forestry and Pasture Dev.	25447	567.503 (36.03)	23621	643.35 (38.44)	38,238.50	1331.66 (40.23)
5. Other activities including project management		131.40 (8.34)	—	293.45 (17.53)	1,802.00	244.23 (7.38)
Total		1574.68 (100)	—	1673.54 (100)	—	3310.13 (100)

Source : Annual Plans, DPAP (for 3 districts).

Through the implementation of various schemes under DPAP in Midnapore 77, 98, 800 nos. of mandays were generated and 4,41,495 nos of persons were benefitted, out of which 10,505 nos and 1,32,528 nos. belong to SC and ST categories respectively. In Bankura, upto 1991-92, 1934900 mandays were generated. In Purulia there is a systematic increase in additional mandays creation to the tune of 30 lakhs per year.[16]

In Purulia, the degree of soil erosion has been minimised to some extent and has brought about agro-climatic improvement to the felt degree resulting in minimising the severity of the drought. Increase in gross cropped area to the tune of 5% per annum has been possible after the implementation of schemes like land development and extension of irrigation facilities.[17]

In the light of the above discussion, we accept our first hypothesis that the growth performances of DPAP districts in India as well as of three districts of W. B. are less than satisfactory.

We may now examine the role of DPAP in changing acreage, production and productivity in Purulia district (which is totally a DPAP district) vis-a vis those for Bankura & Midnapore (which are partially DPAP districts).

Using the index number of area, production and productivity of three districts of West Bengal, we see from Table 7 that production and productivity performances of Midnapore and Bankura in recent years are encourging, while the preformances for Purulia are not impressive. So, our fifth hypothesis that yield rate of agricultural crops has increased in the DPAP period is accepted along with a note that the increase in yield rate and total production has not been so impressive for Purulia district as in other two districts.

Table-7 INDEX NUMBER OF AREA, PRODUCTION AND PRODUCTIVITY OF 3 DISTRICTS OF WEST BENGAL (BASE YEAR - TRIENNIUM ENDING CROP YEAR 1971-72 = 100)

	Area			Production			Productivity		
District	1977-78	85-86	95-96	77-78	85-86	95-96	77-78	85-86	95-96
Purilia	102.38	93.66	109.79	123.78	157.47	161.46	120.90	162.79	147.07
	(100)	(91.48)	(107.24)	(100)	(123.18)	(138.44)	(100)	(134.65)	(121.65)
Bankura	111.60	105.71	120.18	120.09	136.06	174.73	107.61	128.71	183.42
	(100)	(94.72)	(107.69)	(100)	(113.30)	(145.49)	(100)	(119.61)	(176.44)
Midnapore	113.11	114.87	123.27	138.58	153.15	255.99	122.52	133.32	207.66
	(100)	(101.56)	(108.98)	(100)	(110.51)	(184.72)	(100)	(108.81)	(169.49)

*Source : Govt. of West Bengal : **Statistical Abstract***

Significant changes in cropping pattern have occurred during the DPAP period in the districts, particularly Bankura in favour of dry land crops like paize, pulses, vegetables and other cash crops and also in favour of some superior cereals like aus and boro rice (see Table 8).

Table 8 PERCENTAGE OF AREA UNDER DIFFERENT CROPS IN PURULIA AND MIDNAPORE DISTRICTS

Crops	Purulia		Midnapore	
	1985-86	1993-94	1984-85	1994-95
Aus	2.08	6.84	11.68	14.16
Aman	78.22	67.26	72.95	59.85
Boro	.34	1.28	4.44	6.30
Wheat	2.22	1.95	1.56	1.66
Maize	2.60	3.29	—	.83
Total pulses	4.48	5.40	2.70	3.50
Total oilseeds	1.90	3.20	1.75	2.01
Mesta	.19	.28	—	—
Potato	.72	1.13	.40	.85
Sugarcane	.42	.33	—	—
Other crops	6.83	9.04	4.52	10.83

Source : Annual Action Plan on Agriculture, Purulia and Midnapore districts

Using a croping pattern index (CPI) for three districts, we observe that the CPI values have declined for Purulia, though there is some increasing trend for Bankura and Midnapore (West) (Table 10).

Table 10 CHANGING CROPPING PATTERN IN THE DISTRICTS OF BANKURA, MIDNAPORE AND PURULIA (DIVERSIFICATION INDEX)

Year	Purulia	Bankura	Midnapore (West)
1977-78	1.037	.9898	.9923
1983-84	1.051	.982	1.101
1988-89	.982	1.036	1.026

***Source** : Govt. of West Bengal*

On account of non-impressive changes on the agricultural front, the socio-economic conditions of the people in the DPAP districts remain underdeveloped as evidenced by massive dependence on agriculture, low literacy rate and the concentration of SC/ST population in the DPAP districts in some states (Table 11).

Table 11 SOME SOCIO-ECONOMIC INDICES FOR THE DPAP DISTRICTS VIS-A-VIS THE TOTAL AREA IN SOME STATES

Socio-Economic Indices		Andhra Pradesh		Karnataka		Madhya Pradesh		West Bengal	
	Year	Total	DPAP districts	Total	DPAP districts	Total	DPAP districts	Total	DPAP districts
1. Percentage of	1971	70.0	74.7	66.7	73.6	79.4	88.1	58.4	78.6
agricultural	1981	69.5	74.9	65.0	73.7	76.2	87.7	55.00	75.2
workers	1991	64.8	74.5	63.1	73.7	75.2	85.5	53.0	75.0
2. Literacy rate									
(%)	1971	24.6	21.7	31.3	28.0	22.1	12.2	33.2	21.5
	1981	29.9	26.8	38.5	26.9	27.9	15.9	40.9	29.7
	1991	42.8	33.0	46.7	41.2	35.5	21.9	43.3	35.2
3. % of SC/ST									
Population	1971	17.1	15.0	13.9	17.2	32.2	62.3	25.6	34.6
	1981	20.1	19.9	20.0	21.8	37.1	—	22.0	37.54
	1991	24.6	20.6	20.6	37.8	61.9	24.61	38.6	

***Source** : Census of India*

Hence, our second and third hypotheses are accepted.

Macro-economic studies could not always bring out the complexity and diversity of a rural economy. To find the exact impact of DPAP on agricultural income of households in the DP regions, we conducted two sample studies—one on impact of water resource development and another on

impact of dryland farming. For the former a stratified sample study of 48 households over 4 villages in Jhargram subdivision of Midnapore district was done. Out of these 4 villages, two of them have irrigation facilities but others have none.

We observe that per acre agricultural income of the households in irrigated areas is more than in the non-irrigated areas.

To find the impact of the aforesaid programme a multiple regression model has been built of the following form.

$$y = a + b_1 + x_1 + b_2 + x_2 + b_3 + x_3 + b_4 + x_4$$

where, y = Net income from agriculture (Gross Agricultural Income-Material cost of production)

x_1 = Total land area in acre.

x_2 = Working members of the family

x_3 = Cropping intensity, X_4 = Dummy variable

(= 1 for River life irrigation

= 0 for otherwise)

The results obtained from the multiple regression are given below :—

$$Y = 185.288 \quad X_1 + 21.2725\ X_2 + 18.0865\ X_3 + 791.21\ X_4, \qquad R^2 = 0.405, \quad R^2 = 0.363.$$

(0.223) (8.578) (2.836)

Note : figs. in parentheses indicate T Ratios.

The results indicate that the independent variables can explain the dependent variable to the extent of 36 percent. Among the independent variables the most significant are cropping intensity, followed by the dummy variable (whether there is irrigation facility or not).

Inpact of dry land farming on household agricultural income is studied with reference to expansion of area under Babui and other dry land crops like maize cultivation and pulses and thus the expansion of gross cropped area. We conducted a survey of 20 households in village Tasgram under Bunduan Block of Purulia district. It is observed that household agricultural income is significantly correlated will gross cropped area and positively correlated with income from Sabai cultivation. The relevant regression equation with household agricultural income as the dependent variable is as follows : Agri

income = 1871.3 GCA + 0.0235 income/Sabai + 3609 HYV + 8638.74

(3.79) (0.014) (3.89)

$R^2 = 0.867$ $R^2 = 0.84$ $F(3/16) = 34.86$

where, GCA = Gross Cropped area

HYV = High yielding varieties of rice,

Agri income = Agricultural income of households.

It is revealed from the regression equation that variation in agricultural income across the sample

households is significantly explained by variation in gross cropped area and area under HYV, the co-efficients of these independent variables being significant at 1% level. Income from Sabai is not a statistically significant independent variable but its effect on household agricultural income is found to be positive. The entire model is statistically significant, the value of F being more than 34. A micro level study on sample households in Purulia district also shows that dryland farming has positive and significant impact on household agricultural income.

From the discussion so far the following measures and policy conclusions emerge.

First, emphasis should be made on improvement of quantitative performances in respect of DPAP so that the programme could have higher impact on ecology and economy of the drought (prone) area.

Second, the implementation of the programme should be made more target-oriented so that the relatively backward area and people derive the benefits of the programme.

Third, highest priority should be given on water reasource development programme. Whatever water resources are available should be tapped and utilised in the best interest of crop diversification and the target group of people.

Finally, target group-oriented dryland farming and farm forestry should be encourged so that waste lands are converted into green belt yielding benefits to the poverty-stricken rural families.

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THE ROLE OF RURAL POPULATION GROWTH IN WEST BENGAL AGRICULTURE : AN AGGREGATIVE DYNAMIC ANALYSIS.

ARUP CHATTOPADHYAY *

I

A comparision of agricultural growth in West Bengal during 1980-95[1] with that during 1949-80[2] shows that the situation of backwardness and low productivity of West Bengal agriculture has changed towards continuing rapid growth in both production and productivity since the early 1980s. For instance, the overall growth rate in agricultural production in the State increased from 1.74 per cent during 1949-80[3] to 3.65[4] per cent during 1978-95. This significant increase in agricultural growth rate is the result of unique state policies, such as, the policy of land reforms including 'operation barga', steady supply of modern agricultural inputs through well-developed 'Panchayati raj'system, etc. But in regard to population control no such unique state policy is observed in West Bengal, barring the general pursuance of the national policy. Probably duc to this reason rural population growth remains unchecked and it has grown at the rate of around 2 per cent per annum[5] in the State all through the plan period. Now if we correlate these two phenomena (viz., agricultural growth and rural population growth) in the fundamental sense, it may be established that in West Bengal before 1980s rural population acted as a growth retarding factor in agriculture and after 1980s its role has reversed. But their actual relationship should be studied on the basis of appropriate model-testing based on proper theoretical prespective.

The effect of rural population growth on agriculture may be examined on the basis of two well-known contrasting theories of population : Neo-Malthusian theory and Induced Innovation theory. In a pioneering work Malthus argued that the increase of population against a fixed supply of land would inevitably lead to an 'impoverished subsistence equilibrium', with starvation holding population in check. Historically, this Malthusian thesis, however, lost its importance specially in the wake of technological changes in the developed countries. But for the densely populated Third World Countries, like India, Malthusianism is still alive while many scholars, popularly known as Neo-Malthusians[6], give arguments in favour of growth retarding effect of the population explosion in these countries. According to the Neo-Malthusian theory, economic development in general and agricultural growth in particular, would be thwarted by the growth of population (rural population in particular) owing to (a) diversion of public and private resources from productive investment to consumption and non-productive 'social welfare investments', (b) degradation of the environment through deforestation, overgrazing, use of manures and crop residues as fuel rather than as fertilizer etc. and (c) deterioration of agrarian structure in the form of uneconomic farm size (caused by the fragmentation of land), chronic underemployment, indebtedness, sub-infeudation etc.

According to the Induced Innovation theory[7], on the other hand, population growth boosts up the agricultural growth in the long-run by favourably inducing the technological and institutional changes. The growth of population leads to extensive clearing of uncultivated land, drainage of swamps,

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introduction of improved crops and manures, diffusion of intensive cultivation techniques, compulsions to work harder and longer for the subsistence of large families etc., which in turn lead to agricultural growth. There is also another theory, known as Labour Surplus theory[8] which states that the growth of population does not have any impact upon the growth of agricultural output.

While these theories try to establish relation between population growth and agricultural growth with the former as the determining variable, development theorists have also established reverse causal relationship between agricultural growth and population growth with the former as the determining variable. In this paper we, however, make an attempt to empirically test the Neo-Malthusian, Induced Innovation and Labour Surplus theories in the case of West Bengal agriculture. This study considers all the districts in the State, except Howrah and 24-Parganas[9]. The plan of work is like this. In Section II methodology[10] and data base of the study have been explained. Section III has been devoted to analysis and interpretations. Lastly, conclusions have been enlisted in Section IV.

II

From inter-district variations in rural population growth and agricultural output growth, the demographic effect on the performance of West Bengal agriculture has been assessed with the help of Boyce's model :

$$GO_{Ti} = a + b\ GP_{(T-K)i} + U_i \quad \text{.....(1)}$$

Here GO_{Ti} denotes agricultural output growth rate of ith district during period T (T = 1957/8-1994/5 or 1957/8-1976/7 or 1977/8-1994/5)[1], $GP_{(T-K)i}$ is the rural population growth rate in ith district for the period T-K (K, being a positive integer, determines the lag structure which has been found out by trial and error method as there is no a *priori* information on it) and U_i is the disturbance term.

In this model output growth in one period is regressed on the population growth in an earlier period to exclude the possibility of reverse causal relationship (i.e., agricultural production induced population growth), as mentioned earlier. This model, of course, does not imply that past population growth is the sole determinant of subsequent agricultural growth ; rather it merely tests how, *ceteris paribus,* population growth affects agricultural growth in a later period. More specifically, significantly positive (negative) b implies the existence of Induced Innovation (Neo-Malthusian) theory and for Labour Surplus theory b would be insignificant. Actually, the estimated coefficient b of equation (1) here provides the direct estimate of the elasticity of output (in period T) with respect to rural population [in period (T-K)]. It should be noted in this connection that one may get biased estimate of b in this model if one period's (say second sub-period) output growth is highly collinear with the output growth of the earlier period (say first sub-period), because in this case the population growth getting inducement from first sub-period's output growth will always positively affect the output growth of the second sub-period. But such possibility does not arise here as the correlation between two sub-periods' output growth is observed to be very weak (the estimated correlation coefficient is 0.2646 which is statistically insignificant).

The relationship between rural population growth and agricultural performance may by restated in terms of output growth per capita, GOPC (i.e., output growth minus rural population growth) as dependent variable :

$$GOPC_{Ti} = GO_{Ti} - GP_{Ti}$$

$= [a + b\ GP_{(T-K)i} + U_i] - [a'' + b''\ GP_{(T-K)i} + U_i]$

(assuming population growth as a function of prior population growth)

$= (a-a')' + (b-b')\ GP_{(T-K)i} + (U_i - U_i)$

i.e., $GOPC_{Ti} = a' + b'\ GP_{(T-K)i} + U_i$ .....(2)

where a' = a–a" and b' =b–b"

To determine the demographic effect on agricultural performance in West Bengal we have estimated equations (1) and (2) separately and from these an indirect estimate of b'' has been made (to know whether the districts experiencing high population growth in the past are also experiencing high population growth in the present or not).

In relation to the objective and the adopted methodology of the study we have collected district-wise data on inter-census rates of growth of rural population from the study of Boyce [Table 5.1, P.139 (1987)] and census reports, 1980-81 & 1990-91, Govt. of India. The rural population growth rates are presented in Table 1.

Table 1 INTER- CENSUS RATES OF GROWTH OF RURAL POPULATION, WEST BENGAL BY DISTRICTS , 1921-91

(per cent per annum)

District (1)	1921-31 (2)	1931-41 (3)	1941-51 (4)	1951-61 (5)	1961-71 (6)	1971-81 (7)	1981-91 (8)
Burdwan	0.94	1.46	1.13	3.00	1.81	1.12	1.50
Birbhum	1.07	0.91	0.10	2.98	2.05	1.51	2.10
Bankura	0.86	1.38	0.22	2.30	1.98	1.55	1.73
Midnapore	0.48	1.21	0.34	2.55	2.39	1.89	2.17
Hooghly	0.32	1.84	0.99	3.12	2.46	1.69	1.96
Nadia	0.13	1.30	2.58	4.00	2.59	2.55	2.82
Murshidabad	1.13	1.73	0.39	2.81	2.51	2.21	2.67
West Dinajpur	0.70	1.02	1.19	2.52	3.19	2.36	2.69
Malda	0.48	1.53	0.99	2.61	2.77	2.27	2.67
Jalpaiguri	0.63	1.28	0.36	3.76	2.48	1.81	2.30
Darjeeling	1.23	1.42	0.99	3.13	2.27	1.87	2.18
Coochbehar	-0.02	0.69	0.11	4.23	3.30	2.24	2.13
Purulia	1.57	0.97	0.61	1.50	1.48	1.38	1.94

Sources : Boyce (1987), Table 5.1, Page 139, for columns 2 to 7 and for column 8 Census reports, 1980-81 & 1990-91, Govt. of India.

We have also collected officially published yearly data on agricultural production (all crops combined) of the districts in the form of index numbers during the period 1957/8 to 1994/5. These indices have been expressed in terms of triennium ending crop year 1971/2 as base year. The sources for these data are (i) Economic Review, Statistical Appendix (various annual publications), Directorate of Agriculture, Government of West Bengal and (ii) Statistical Abstract (various issues), Bureau of Applied Economics and Statistics, West Bengal. From these basic data, agricultural growth rates of the districts have been measured for the whole period as well as for two sub-periods by fitting appropriate trend lines. These estimated growth rates may be considered unbiased, consistent and

efficient as, unlike in the earlier studies, (see notes 1 & 2) here due attention has been paid on the selection of appropriate trend equation and also on the necessary adjustments in the data set. Consequently, in growth estimation the econometric and other problems (like the presence of autocorrelation, heteroscedasticity and non-randomness in the disturbance term and the volatile fluctuations in the data set) are duly taken care of. For a detailed discussion on this technique of growth measurement one may go through the study of Chattopadhyay and Das (1997). The estimated growth rates in the agricultural production of the districts are presented in Table 2.

Table 2 ESTIMATED GROWTH RATES IN AGRICULTURAL PRODUCTION, WEST BENGAL BY DISTRICTS, 1957/8 TO 1994/5

(Per cent per annum)

	Estimated Growth Rates		
District	Whole Period (1957/8-1994/5)	First Sub-Period (1957/8-1976/7)	Second Sub-Period (1977/8-1994/5)
Burdwan[L]	3.286*	2.786*	3.837*
Birbhum[E]	2.205*	2.086*	2.435*
Bankura[L]	2.636*	1.269*	4.807*
Midnapore[L]	3.166*	1.537*	5.074*
Hooghly[E]	4.476*	4.261*	4.727*
Nadia[E]	4.163*	3.911*	4.461*
Murshidabad[E]	3.237*	3.068*	3.583*
West Dinajpur[P]	2.267*	1.948*	3.144*
Malda[P]	3.144*	2.742*	3.740*
Jalpaiguri[P]	1.797*	2.050*	1.484*
Darjeeling[E]	2.870*	2.513*	3.325*
Coochbehar[E]	2.032*	1.792*	2.314*
Purulia[P]	2.007*	0.687	3.325*

*Notes : * implies significance at 1% level ; E, L and P denote respectively the fitting of Exponential, Log-quadratic and Parabolic trend equation to estimate whole periods' growth rate. In the cases of E and L, sub-period's growth rates have been estimated by fitting 'Kinked Exponential' trend equation and in case of p these have been estimated by fitting 'Kinked Linear' trend equation.*

The rural population growth rate for a particular period has been estimated from inter-census rates of growth of rural population (presented in Table 1) with the help of geometric mean, and per capita output growth rate for a particular period has been defined as output growth rate (presented in Table 2) minus rural population growth rate for that period. In Table 3 per capita agricultural output growth rates of the districts for the whole period and for two sub-periods are presented.

Table 3 ESTIMATED GROWTH RATES IN AGRICULTURAL OUTPUT PER CAPITA, WEST BENGAL BY DISTRICTS, 1957/8 TO 1994/5

(per cent per annum)

	Growth Rates		
District	Whole Period (1957/8-1994/5)	First Sub-Period (1957/8-1976/7)	Second Sub-Period (1977/8-1994/5)
Burdwan	1.72	1.06	2.43
Birbhum	0.22	0.07	0.49
Bankura	0.85	-0.63	3.12
Midnapore	0.99	-0.72	2.97
Hooghly	2.38	1.96	2.83
Nadia	1.38	1.10	1.70
Murshidabad	0.73	0.60	1.02
West Dinajpur	-0.43	-0.83	0.53
Malda	0.56	0.16	1.16
Jalpaiguri	-0.52	-0.40	-0.70
Darjeeling	0.67	0.23	1.22
Coochbehar	-0.57	-1.30	0.16
Purulia	0.40	-0.76	1.53

Note : Population growth rates for the years 1991/2, 1992/3, 1993/4 and 1994/5 have been estimated from 1991 Census.

At the outset we can explain the results of Table 2 and Table 3. It is observed that agricultural output growth rate in West Bengal increased remarkably during the second sub-period compared with that of the first sub-period[12]. This increase is much more evident in the per capita output growth rates. Nearly fifty per cent of the districts registered negative growth in per capita output during the first sub-period while during the second sub-period all the districts (except Jalpaiguri) experienced positive and higher growth rates. In general, agricultural performance of the northern districts is lower than that of the central districts.

III

To examine the lagged effect of rural population growth on agricultural performance in West Bengal the total output growth rate and also per capita output growth rate of the districts have been regressed upon the past growth of rural population. As the exact lag structure in the relationship between rural population growth and agricultural growth is unknown, different lagged values of rural population growth (as independent variable) have been considered in the regression equations and the statistical significance of the estimated coefficients is examined. In Table 4 the most reliable estimates have been presented.

Table 4 REGRESSION COEFFICIENTS SHOWING THE IMPACT OF LAGGED RURAL POPULATION GROWTH ON AGRICULTURAL OUTPUT GROWTH AND PER CAPITA OUTPUT GROWTH IN WEST BENGAL ACROSS DISTRICTS$^{\alpha}$.

Dependent variables	Independent variables	Estimated Regression Coefficients		Indirect Estimates
		$\hat{b}$	$\hat{b}'$	$\hat{b}''$
GO_T, $GOPC_T$	$GP_{31\text{-}71}$	1.3277*	0.9299**	0.3978
		(3.449)	(1.810)	
GO_1, $GOPC_1$	$GP_{31\text{-}51}$	1.5897*	1.4531*	0.1366
		(3.366)	(3.241)	
GO_2, $GOPC_2$	$GP_{51\text{-}71}$	-0.6137 ++	-1.0040***	0.3903
		(-1.088)	(-1.736)	

Key : GO = output growth rate, GOPC = output growth rate per capita, GP = rural population growth rate.
Subscripts T, 1 and 2 refer to 1957/8-1994/5, 1957/8-1976/7 and 1977/8-1994/5 respectively.
Subscripts 31-71, 31-51 and 51-71 refer to 1931-71, 1931-51 and 1951-71 respectively.

Notes : α Excluding Howrah and 24-Parganas, * significant at 1% level, **significant at 5% level, ***significant at 10% level, ++ significant at 20% level. Levels of significance have been calculated by applying one-tailed test. t values are in the parentheses. b and b are the estimated coefficients of equations (1) and (2) respectively ; $\hat{b}'' = \hat{b} - \hat{b}'$.
1951-91 : 1951-71 & 1971-91.

From Table 4 it is observed that the impact of rural population growth on agricultural performance of West Bengal for all periods is felt most strongly after a lag of approximately 25 years (more or less similar to Boyce's observation which is based on the lag structure of 30 years). Further, for all the periods the districts which experienced earlier high rural population growth are also presently experiencing high rural population growth (as b>O), though with varying magnitues. When the whole period's agricultural output growth is regressed upon 1931-71 rural population growth, the elasticity is estimated to be 1.3277 (t = 3.449). In other words, a 1 per cent increase in rural population for the period 1931-71 is associated with more than 1 per cent (1.33%) increase in agricultural output for the period 1957/8-1994/5. During the same period the elasticity of per capita output growth with respect to rural population growth is also high and positive, but less than the elasticity of total output growth with respect to rural population growth.

So far as the two sub-periods are concerned, the estimates of elasticity of agricultural output / per capita output with respect to rural population are strikingly different. During the first sub-period these elasticities of agricultural output and per capita output were positive and high with strong statistical significance. But for the second sub-period these elasticities were negative and statistically significant at 20% and 10% probability levels. The weak statistical significance (i.e., substantial dispersion around trend line) may be accepted as natural because past population growth could not completely explain subsequent substantially improved agricultural performance. However, due to high level of population growth in 1951-71 compared to 1931-51 the magnitude as well as the statistical significance of the elasticity of per capita output growth with respect to population growth is higher than that of total output growth rate during the second sub-period.

IV

Conclusions

Some comments need be made before concluding this empirical exercise. First, this study establishes that the district-wise growth performance of West Bengal agriculture has improved significantly during the Left Front Government (LFG) regime compared with that in the pre-LFG regime. This improvement becomes more evident if one considers the growth in agricultural output per capita. This agricultural development may be considered one of the economic causes behind the rule by the LFG, led by C. P. I. (M), in West Bengal over the past 20 years or so and its strong hold in rural West Bengal in particular, specially in the era of world-wide fading out of communism and the advent of globalisation and market economy. Secondly, the fear of losing electoral base may be the cause of reluctance on the part of the political parties to control population growth. Left parties are not different from other national political parties in this respect. Consequently, it is observed, rural population growth in West Bengal began to increase remarkably after independence and there was no substantial break in it during the LFG regime.

Thirdly, from an aggregative dynamic analysis we see that the population growth during 1931-51 had strong induced effect upon the total output/per capita output growth in agriculture during the first sub-period (pre-LFG period), thereby testifying the operation of Induced Innovation theory in West Bengal. But the population growth during 1951-71 had detrimental effect on agricultural performance during the LFG regime (indicating the operation of the Neo-Malthusian theory). This detrimental effect, however, was too weak to outweigh the induced effect of population growth during the whole period, 1957/8 to 1994/5. Nonetheless, this detrimental effect signals that if population growth is not checked, the present level of satisfactory growth in agriculture may not be sustained in future in West Bengal. Moreover, to preserve its strong hold in rural West Bengal in the long-run, the LFG, after successful implementation of land reforms, should now give emphasis on the control of rural population growth.

Notes

1. During this period agricultural growth rates in West Bengal were estimated by CMIE (1993), Saha and Swaminathan (1994), Sawant and Achuthan (1995), Rogaly et al (1995), Bhalla and Singh (1997), Chattopadhyay and Das (1997), etc.
2. Das (1978), Boyce (1987), Vaidyanathan (1987), Bhalla and Tyagi (1989) etc. were the notable scholars who estimated agricultural growth rates in the State during this period.
3. Boyce, 1987.
4. This growth rate (3.65%) significantly differs from the growth rate (6.4%) estimated by Saha and Swaminathan. Apart from the coverage of different time periods (e.g., 1980-91), there were some weaknesses in the estimation procedure adopted by Saha and Swaminathan ; for detailed discussion see the study of Chattopadhyay and Das (1997).
5. More specifically, the inter-census rates of growth (per annum) of rural population in West Bengal were 2.76%, 2.34%, 1.83% and 2.30% during 1951-61, 1961-71, 1971-81 and 1981-91 respectively.
6. Davis (1951), Coale and Hoover (1958), Cassen (1973), Kelley (1976), Van de Walle (1983), etc.
7. The proponents of this theory were Schumpeter (1947), Hirschman (1958), Boserup (1965), Clark (1967), North and Thomas (1973), etc.
8. Labour Surplus theory was developed by Schultz (1964), Mehra (1966), Uppal (1969), Desai and Mazumdar (1970), Rudra (1973) etc.
9. Howrah and 24-Parganas (North and South) have been excluded from the analyses of the study because of their proximity to the big metropolies, which may lead to the inclusion of semi-urban population. Further, West Dinajpur (North and South) has been considered here as a single district to facilitate comparisons over time.

10. In regard to the reasoning and adopted methodology of the analysis, the author is highly indebted to J. K. Boyce (1987, Pp. 149-151).
11. The whole period, 1957/8-1994/5, has been divided into two sub-periods—Pre-Left Front Government regime, 1957/8-1976/7 and Left Front Government regime, 1977/8-1994/5—to assess the demographic effect on the period-wise performance of agriculture in West Bengal.
12. The estimated growth rates (over districts) of this study, however, differ from those of the earlier studies where estimation, as mentioned earlier, suffers from upward bias due to some methodological weaknesses and also due to non-consideration of data adjustments.

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TREND AND POTENTIALITY OF FLOWER EXPORTS FROM INDIA

SACHINANDAN SAU*

1. Introduction

Flower production is as old as human civilisation. Man's love for flowers is eternal. In European countries, flower cultivation has become a commercial occupation providing livelihood to a good number of producers. India is also slowly but steadily moving in that direction.[1]

Flower is still considered a minor crop in terms of area, production, monpower involvement, contribution to GDP as well as trade and commerce. Though a popular and profitable occupation now to a cross section of people of India flower cultivation is still seasonal. The development and promotion of hybrid flower and orchards are in the hands of established and recognised private interests.

Among the problems that plague floriculture in India the most important are absence of modern technology, inavailabiltiy of finance and inadequate infrastructural including marketing facilities. It is important to make a detailed and careful appraisal of the characteristics and contours of the national and international markets. Though floriculture has become much commercialised in the recent years following sweeping changes in the global markets with its investment totalling above Rs 70,000 crores and the yearly trade in flowers in international markets reaching a staggering figure of Rs 20,000 crores, India has not been able to take advantage of this thriving trade. It has made a poor performance on the global markets briniging in meagre foreign exchange[2] . The world import of flower and allied articles recorded a staggering US $ 2,500 million in 1985. With an estimated annual growth rate of 3.5 per cent, the predicted figure in 1995 was over $ 5,000 million. Cut-flower accounted for nearly 52 per cent of this value and its value amounted to about $2,600 million. It is a pity that India's share in this world figure has been hardly $ one million .[3]

Against this backdrop the present note makes an attempt at analysing the trend, direction, problems and potentiality of flower exports from India.

The plan of the rest of the paper is as follows. Section 2 discusses the importance of floriculture in India. Section 3 examines the trend and direction of flower exports from India and Section 4 analyses the problems and prospects for the same. Section 5 summarises the earlier discussion and makes concluding observations.

2. Importance of floriculture in India

The importance of floriculture may be studied from three perspectives - economic, medicinal and cultural. Besides floriculture being labour-intensive, thousands of labourers are engaged in processing, selling and transportation of flowers. An acre under flower cultivation can help support a family consisting of five to six members. It can fetch an annual income of Rs 30,000, if much-valued flowers like orchids, carnation and gladiali are grown over the said area.[4]

In recent years it is recognised that like jute, wheat, tea, potato, flower is also an important commercial crop in the agro-based economy of India. The area under flower cultivation is estimated

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to be 34,000 hectares. West Bengal ranks third with 3150 hectares of land coming under flower cultivation after Tamil Nadu (8384 hec.) and Karnataka (7879 hec.). Of the total area under the crop about 90 per cent is cultivated by small and marginal farmers. A large number of landless labourers are involved in this cultivation. The value of flower exports from India is also substantial. During 1995-96 above Rs 464 million worth cut flower and other cut flowers was exported from India. All floriculture products which have a demand both in internal market and abroad can be produced in some or the other part of India because of agro-climate varieties prevailing in different zones. Karnataka has taken lead in production of rose, carnation, chrysantheum, gladiolus, ornamental foliage plants etc. Kerala has started production of orchid, anthurian and foliage plants on commercial basis. In West Bengal also, roses, winter season flowers, "Rajanigandha" and foliage plants are grown on commercial basis.[5]

Flowers are of great importance from aesthetic and social point of view also. Flowers have been regarded as the best offerings in religious and social functions from time immemorial. It is an indispensible item for interior decoration. Fragrant flowers are used for the extraction of essential oil for making perfumes.[6]

Flowers have also enormous medicinal properties. They relieve bad headache, diarrhoea, indigestion, constipation etc.

3. Trends and Directions of Flower Exports from India

Though world trade in floriculture products is fast increasing, India's share in global floriculture trade remains meagre and insignificant. World trade in flowers during 1981 was 13 billion US dollars. Developed countries accounted for 90 per cent of this trade. India's exports of cut flowers and foliage valued only about Rs 1 crore. Our flower exports include roses, gladiolus, carnation, jasmine and few orchids. Main foreign markets for India are the USA, Gulf countries, Germany, France and England.

In 1991, the global import of fresh cut flowers and foliage plants totalled $ 6,64 billion, which was $ 6.14 billion in 1990 and $ 4.34 billion in 1987. Cut flower imports accounted for $ 3.37 billion in 1991. Cut flower accounted for 50 per cent of the global trade in non-edible horticultural items. Germany was the largest importer (37%) followed by the USA, France, the UK, Netherland, Japan, Switzerland and Italy.

Most of the floral products sold in the European market moves through auctions in Netherland and then sold to some 166 countries in 1991 which constituted 64 per cent of the world imports. This was followed by Columbia ($ 389m), Israel ($ 146m), Italy ($ 113m) and Thailand ($ 77m).[7]

Export of floriculture produce from India in 1990-91 was Rs 7.86 crore which rose to Rs 13.0 crore in 1991-92.[8] The export of cut flowers and flower buds from India registered at Rs 10.31 crores during 1993-94.[9]

During the early years of the eighties (1980-81 to 1982-83) exports of cut flowers and foliage valued less than Rs one million, which increased to Rs 9.25 million in 1988-89, Rs 26.69 million in 1990-91, Rs 84.43 million 1992-93, Rs 133.61 million in 1993-94 and Rs 464.89 million in 1995-96 (Table 1).

The annual expontial rate of growth of value of the cut flowers export during 1971-72 to 1979-80 is estimated to be 6.92 per cent, which soared to 15.56 per cent during 1980-81 to 1995-96 (Table 2).

Table 1 VALUE OF FLOWER EXPORTS FROM INDIA, 1980-81 TO 1995-96

Year	Value of Exports (Rs Million)	Index
1980-81	0.84	100
1984-85	3.33	397
1988-89	9.25	1101
1992-93	84.43	10051
1994-95	225.76	26876
1995-96	464.89	55344

Source : Directorate General of Commercial Intelligence and Statistics, Government of India.

Table 2 EXPONENTIAL EQUATIONS AND ANNUAL EXPONENTIAL GROWTH RATE CONCERNING FLOWER EXPORTS

	Period	Exponential Equation	Annual Exponential growth Rate%	F-value
I	1978-79 to 1979-80	$Y'_1 = 1.32+0.69t$ (2.57)	6.92	6.63
II	1980-81 to 1995-96	$Y'_2 = 3.20+0.45t$ (3.70)	15.56	13.71

Notes : Y' = log Y,
Y = Value of cut and other flowers exports
t = time period = year,
( ) = Figures in parentheses indicate t-ratio.

Table 2 reveals that exports of flowers have a significant growth during the 1970s, accelerated during the 1980s and the early 1990s, the growth rate in the later period being higher than that in the former period. The coefficient of time, the independent variable, is significant in both the equations.

4. Change in the Direction of Flower Exports

Though the rate of growth of flower exports was significant during the early 80's, exports were limited to a few countries and there was good concentration of exports. During the late 80's and early 90's there has been significant countrywise diversification of exports. In 1995-96, the U.S.A. was the leading flower importing country followed by the U.K., Germany, Saudi Arabia and Netherland, in contrast to Saudi Arabia being the leading flower importing country from India (Table 3).

Table 3 EXPORTS OF CUT FLOWERS AND FOLIAGE AND OTHER CUT FLOWERS FROM INDIA BY MAJOR COUNTRIES

Countries	1982-83	1986-87	1990-91	1992-93	1994-95	1995-96
1. Australia	—	3	217	1021	1851	3658
		(.04)	(.85)	(1.21)	(.82)	(.78)
2. German FREP	37	119	4953	13959	36983	65257
	(5)	(1.83)	(19.39)	(16.53)	(16.38)	(14.03)
3. Kuwait	99	340	73	118	5	456
	(13)	(15.25)	(.28)	(.14)		(.10)
4. Japan	—	92	56	1402	12038	53053
		(1.42)	(.22)	(1.66)	(5.33)	(11.41)
5. Netherland	19	—	445	2946	29043	76050
	(2.5)		(1.74)	(3.48)	(12.86)	(16.36)
6. Oman	—	19	242	613	65	139
		(.29)	(.94)	(.72)	(.03)	(.03)
7. Saudi Arabia	340	1107	1183	5007	2783	4810
	(46)	(17.10)	(4.63)	(5.93)	(1.23)	(1.03)
8. Singapore	78	—	—	246	843	1525
	(10)			(.29)	(.37)	(.33)
9. Sri Lanka	—	—	—	1651	4087	8152
				(1.95)	(1.81)	(1.75)
10. Arab EMTE	77	285	7	1233	4216	11460
	(10)	(4.40)	(.03)	(1.46)	(1.86)	(2.46)
11. U. K.	—	1	6895	24829	22821	39557
		(.01)	(26.99)	(29.40)	(10.10)	(8.51)
12. U. S. A.	—	4329	6114	2767	10269	157811
		(66.88)	(23.98)	(3.27)	(4.55)	(33.94)
13. Other countries	95	177	5354	28645	100759	42958
	(12)	(2.73)	(20.96)	(33.92)	(44.63)	(9.24)
Total :	745	6472	25539	84439	225763	464886
	(100)	(100)	(100)	(100)	(100)	(100)

Source : Government of India.

It is revealed from this table that Saudi Arabia accounted for 46% of total exports, Kuwait 13% and U.Arab EMTE 10% of the total exports in 1982-83. But their shares declined drastically in 1995-96. On the other hand, the share of German FREP, Japan, Netherland, U.K. significantly increased during this period. Japan and the USA are the world leading cut flower consumers. But most of the former's requirements are met from domestic production, although it is the largest consumer of floral products. Per capita consumption of cut flowers is highest in Switzerland. In 1995-96, the USA accounted for about 34% of total exports from India, while Netherland 16%, German FREP 14% and the U. K. 9%. India exported cut flowers and foliage to only 9 countries of the world during 1982-83. The number of importing cuntries increased significantly to 47 during 1995-96. This shows the significant countrywise diversification of India's flower exports.

5. Prospects and Problems of Flower Exports

Flowers have, as we already seen, a good market in the USA, Germany, Netherland, the U. K., and also in the Persian Gulf countries and Hong Kong. Cut flowers and flower buds are of a good

demand in foreign countries where flower is used in bouquets or for ornamental purposes. The demand for Indian orchids is increasing steadily.[10] There is a tremendous potentiality of development of flower exports from India.

But floriculture sector in India is most unorganised. No scientific estimate for the production of flowers is available. Floriculture in India is plagued by a host of problems that need to be addressed immediately to remedy the anomalous situation. Technology transfer holds the key with increasing accent on areas such as research and development (R & D). There are problems relating to the availability of finance and the creation of adequate infrastructural facilities. Our farmers need to be aware of the state-of-the-art as regards the biotechnological application and information net-work to keep them updated on recent developments in commercial floriculture. India has to strike a balance between meeting the domestic demand for relatively cheap flowers and producing high quality flowers for the much-needed foreign exchange. It is also imperative to ensure Drip Irrigation, Tissue-Culture production, Glass-house breeding, Improved air transport, good roads, power supply, refrigeration of flowers and marketing outlets.

Since flower markets are disorganised, the commission brokerage is exorbitant. Sellers are not also getting prompt payments. Bringing cut flower markets under ambit of Regulation would solve many inherent problems in the system.

Post harvest damage to flower crops is colossal. The price fluctuates treamendously 5 to 8 times in the off-season. There is no cold store for storing flowers. Consequently the flower growers suffer seriously due to the unstable price in the market. The price fluctuates from hour to hour.

As per West Bengal Agricultural Marketing (Regulation) Act 1972, flower is not still a notified commodity. Planning for its growth is thus neglected.

6. Summary and Conculsions

Flower is an important cash crop in India. It has become a highly modern important industry in the world. Following both the internal and external demand, development of floriculture has assumed a considerable importance in India today. It has occupied a significant position in the agricultural economy of the country as an important source of employment and income for the farming families, particularly the small and marginal ones in the perspective of low and declining land-man ratio and the consequent proliferation of marginal farmers. This cultivation is highly labour-intensive and particularly suited to small holdings. All floriculture products which have a demand both in the internal market and abroad can be produced in some or the other part of India because of agro-climatic varieties prevalling in different zones.

Though there were ups and downs over the years the export of cut flowers and flower buds from India has been registering significant increase in recent years. There has also been the considerable countrywise diversification in the context of fast increasing world trade in floriculture products. The direction of flower exports from India has changed in recent years from the Gulf countries to the developed countries like the U.S.A., the U.K., Netherland, Japan and German FREP.

India's share in global floriculture trade has, however, remained very meagre and insignificant. In spite of having almost all the inputs for being a leader in the world market, India has not been able to make any significant dent on it. Floriculture in India is plagued by host of problems like technological backwardness, inadequacy of finance and infrastructural facilities, unorganised market, presence of intermediaries with the exorbitant commission brokerage, tremendous price fluctuations, colossal post harvest damage and lack of proper planning.

There is tremendous potentiality of development of flower exports from India where land and labour are cheep relative to the European countries. In order to realise this fully the following policy prescriptions may be made.

First, emphasis should be made on expanding research on floriculture and popularising the results of research. Transfer of developed technology from the developed countries also holds the key.

Second, since the industry has now been capital-intensive, provision may be made for the supply of adequate institutional credit at reasonable rates. Growers may be highly benefitted through horticulture development schemes.

Third, infrastructural facilities like air-conditioned road and air transport, supply of power, marketing outlets, refrigeration of flowers, drip irrigation should be improved and organised. Glass-house breeding may also be developed. Farmers should be given an adequate training so that they can produce quality flowers for export markets.

Fourth, to eliminate the exploitation of the growers of flowers by the intermediaries, co-operative societies should be organised with flower growers and the co-operatives would despatch the produce to the wholesalers or for export. NAFED may participate in the export business of flowers.

Fifth, there should be a proper market intelligence system covering the growing and the foreign consuming areas.

Lastly, a crop insurance scheme should be introduced in the case of flower cultivation.

Notes :

1. Dev, 1995 : 5
2. ***Hate Bazare,*** Editorial, 1995 : 3
3. Maiti, 1995 : 39
4. ***Hate Bazare,*** Editorial, 1995 : 3
5. Bhattacharya, 1995 : 12
6. Samaddar, 1995 : 16
7. ibid
8. ibid
9. Laskar, A.K., 1995 : 14
10. Laskar, L., 1995 : 21.

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Equation (2) contains two parameters α and β. According to Friedman α is to be determined from outside the model. On the other hand, β is to be determined from within the model so that the correlation between C_t and Y^p_t reaches the maximum. In estimating the Y^p_t series Friedman uses that value of α or that exoponential rate of growth at which C_t (and not Y_t) is observed to grow. The reason for this is not clearly stated in Friedman's book. It is generally observed that Y_t grows at a faster rate than C_t. He probably considers that consumers do not think the growth rate of income as fully permanent; rather they think that, that part of growth of income as permanent at which they raise their consumption.

By using consumption and income data for the US economy for the period 1905 through 1951, except the war years, i.e., 1917, 1918 and 1942 through 1945, Friedman calculates permanent income taking $\alpha = 0.02$ on the basis of the secular rate of growth of C_t. The value of β is estimated at 0.4 so that the value of R^2 in the regression of C_t on Y^p_t becomes maximum. The weights for 17 years significant to 3 decimal are 0.330, 0.221, 0.148, 0.099, 0.067, 0.045, 0.030, 0.020, 0.013, 0.009, 0.006, 0.004, 0.003, 0.002, 0.001, 0.001, 0.001. These weights sum up to one. Based on these weights Friedman calculates the ratio of permanent consumption to permanent income at 0.88 and observes that the constant in such a regression is close to zero.

After the publication of his book several theoretical and empirical studies have been made on this hypothesis. Michael Darby (1974) argues that 'the actual data on consumption, available are in the form of consumers' expenditure on goods and services. While some of this total corresponds directly to service flow concept, much of the expenditure are for goods that are related to component of C_t only to the extent that inventories are unchanged.' But inventories do infact change in response to transitory income and so the appropriate equation for consumption expenditure under the permanent income hypothesis should include Y^T_t together with Y^p_t. Under such circumstances estimation of β through maximisation of R^2 in the regression of C_t on Y^p_t alone leads to a positive bias. So one has to be very careful in the choice of consumption data.

It is also argued that one should not rely too heavily on maximising R^2 to determine the appropriate planning horizon within which consumers determine their permanent income. Koerts and Abrahamese (1970) argue that it is not possible to compare the R^2 from any two competing specifications. Therefore, conclusion with respect to the validity of the permanent income hypothesis is acceptable only if the results are one sided within a farely wide range of values of β.

Colin Wright (1969) explains that the discrete period analogue of equation (1) can be simply written as

$$Y^p_t = B \sum_{i=0}^{\infty} (1-B+A)^i Y_{t-i} \quad \ldots \quad (3)$$

Here A is the analogue of α and B is the analogue of β. He takes $A = 0.02$ and uses the same data as used by Friedman to arrive at a different estimate of B in the range of 0.7 to 0.8. He, however, uses an alternative method for estimating the value of B. Given that

$$C_t = a_0 + a_1 Y^p_t \quad \ldots \quad (4)$$

he transforms equation (4) with the help of equation (3) to have

$$C_t = a_0' + a_1 B Y_t + (1 - B + A) C_{t-1} \quad \ldots \quad (5)$$

From the estimate of the coefficient of C_{t-1}, he estimates the value of B given a pre-estimated value of A. For the US data his estimates of B for this method also ranges between 0.7 and 0.8.

A series of empirical studies have also been made to test the validity of the permanent income hypothesis in different countries. Both time series and cross section data have been used in this connection. For India, Friend(1966) and Ramanathan(1968) use cross section data to measure the propensity to consume with respect to permanent income in India. Friend and Taubman(1966) and Williamson(1968) use time series data of several countries including India to arrive at estimates of long-run consumption function for those countries. Roy Chowdhury(1968), Gupta(1970), Laumas and Laumas(1976) and Ghatak (1985) deal specially with Indian data. Roy chowdhury and Gupta calculate permanent income as a moving average of two or three years of current and past incomes. But both of them observe that in majority of cases marginal propensity to consume with respect to transitory income is not significantlly lower than the marginal propensity to consume with respect to permanent income and in some cases the former is greater than the latter. Laumas and Laumas observe that calculating permanent income as a moving average of incomes of two or three years attaches equal weights to all these incomes. From Friedman's own formulation one can observe that weights should not be equal. Laumas and Laumas use Indian data on per capita national income and per capita private consumption expenditure at 1938 prices for the period 1919-1960 as given in Vakil(1973). They further observe that for India the difference between national income and disposabale income is negligible and so per capita national income is used as a proxy for per capita disposable income.They find that consumption and also income in India during this period are nearly constant and so $\alpha=0$. The optimum value of β is found to be equal to one with weights of income as 0.6321, 0.2325, 0.0855, 0.0315, 0.0116, 0.0043, 0.0016, 0.0006, 0.0002 and 0.0001. However, they also observe that MPC out of transitory income is not significantly lower than that out of permanent income. Thus, they suspect the validity of the permanent income hypothesis in an underdeveloped country like India.

Ghatak uses a different set of data from 1950-51 to 1972-73 and estimates permanent income by followlwing three methods, viz, the method of moving average of two and three years, the method of quadratic trend and the method of weighted average with exponentially declining weights. For all three methods she finds that MPC out of transitory income is greater than the MPC out of permanent income. In the third method she does not allow for any growth (i.e. α is taken to be equal to zero) and she mistakenlly uses the rate of interest as a proxy for β. She considers two alternative values of β at 0.08 and 0.15 both of which are far below from the optimum value of β in India. Probably this leads to inconsistent result.

3. The Database and the Methodology :

The present paper tries to look afresh into the Indian data for the period 1950-51 to 1994-95 and examines the applicability of the permanent income hypothesis in India. Like Laumas and Laumas this paper also uses per capita national income and per capita private final consumption expenditure for the period 1950-51 to 1994-95 at constant price obtained from National Accounts Statistics.

For the choice of a proper methodology for empirical verification of the permanent income hypothesis this paper uses the following considerations:

(1) If income grows at a higher exponential rate than consumption in the short-run then the growth rate of income is to be treated as the estimate of α because in the long-run this growth will be considered permanent and permanent consumpion will also grow at the same rate. Therefore, if one wishes to estimate permanent consumption from observed consumption then it will be wise to consider this value of α in cosumption series also.

(2) The alternative method of estimating β (or B) used by Wright and others has a number of weaknesses. The method presupposes the relation (4). But accoding to Darby this is an improper specification. However, if one starts with the relation

$$C_t = a_0 + a_1 Y^p_t + a_2 Y^T_t \quad \ldots \quad (6)$$

then one can have a fair estimate β or B. Alternatively, if one starts with the relation

$$C^p_t = b\, Y^p_t \quad \ldots \quad (7)$$

then also one can have an estimate of B through an iterative method (if the processes converge).

In this method as one regresses C_t on Y_t and C_{t-1} he may face the problem of multicollinearity and then the coefficients and the estimate of β become unreliable.

Therefore, this paper follows the same method used by Friedman to estimate permanent income and long-run marginal propensity to consume. But it tries with two alternative values of α, viz., the average rate of growth of consumption and the average rate of growth of income, and several alternative values of β that maximises R^2 in the following three alternative specifications :

$$C_t = a_1 Y^p_t \quad \ldots \quad (8)$$

$$C_t = a_0 + a_1 Y^p_t \quad \ldots \quad (9)$$

$$C_t = a_0 + a_1 Y^p_t + a_2 Y^T_t \quad \ldots \quad (10)$$

For empirical verification of the permanent income hypothesis this paper performs the following regressions

$$C^p_t = b_0 + b_1 Y^p_t \quad \ldots \quad (11)$$

$$C^T_t = d_0 + d_1 Y^T_t \quad \ldots \quad (12)$$

$$C_t = a_0 + a_1 Y^p_t + a_2 Y^T_t \quad \ldots \quad (13)$$

and examines whether marginal propensity to consume out of transitory income is significantly less than marginal propensity to consume out of permanent income or not (i.e., whether $d_1 < b_1$ and $a_2 < a_1$). It also examines whether $b_0 = 0$ or not.

4. Empirical Estimates

By regressing log Y_t and log C_t on time the average rates of growth in Y_t and C_t are estimated at 0.0154 and 0.0135 respectively. With $\alpha = 0.0135$, the value of R^2 in the regression of C_t on Y^p_t without constant becomes maximum for $\beta = 0.6$. The weights for present and past income in the permanent income are 0.454, 0.253, 0.141, 0.078, 0.044, 0.024, 0.013, 0.007, 0.004, 0.002, 0.001 and 0.001 respectively. The above regression gives the coefficient of Y^p_t as 0.872889 with the standard error at 0.003475 and R^2 at 0.979869.

After estimating permanent and transitory components of income and consumption with $\alpha = 0.0135$ and $\beta = 0.6$, the following regression results are obtained to examine the validity of the permanent income hypothesis in India.

$$C^p_t = 16.41 + 0.78\, Y^p_t \quad \ldots \quad (14)$$

std. err. (1.49) (0.01) $R^2 = 0.994$, d.f. = 43, std. Err. = 2.024

$$C^T_t = -0.43 + 0.51\ Y^T_t \quad \ldots \quad (15)$$

std. err. (0.17) (0.06) $R^2 = 0.638$, d.f. = 43, std. Err. = 1.142

$$C_t = 16.14 + 0.78\ Y^P_t + 0.53\ Y^T_t \quad \ldots \quad (16)$$

std. err. (2.15) (0.01) (0.15) $R^2 = 0.990$, d.f. = 42, std. err = 2.72

These results show that the marginal propensity to consume out of permanent income is 0.78 and the marginal propensity to consume out of transitory income is 0.51 or 0.53 both of which are significantly lower than that for permanent income. The relevant t-statistic for the null hypothesis that $a_1 = a_2$ against the alternative $a_1 > a_2$ takes the value of 1.6485 with degrees of freedom = 42 and so the null is rejected at 5% level of significance. Thus, in the light of India's income and consumption figures for the period 1950-51 to 1994-95 one has to conclude that the permanent income hypothesis is valid for a country like India also. However, the proportionality hypothesis can not be proved to be valid.

While trying for alternative values of β (viz., 0.5, 0.6, 0.7, 0.8, 0.9 and 1.0) to obtain differnt estimates of Y^P_t and R^2 between C_t and Y^P_t, it is observed that the value of R^2, though becomes maximum for $\beta = 0.6$, is not reducing much for other values of β.

On the other hand, if C_t is regressed on Y^P_t with a constant, the value of R^2 becomes maximum for $\beta = 1$. In this case, out the MPC out of permanent income is found to be 0.79 and that out of transitory income is found to be 0.33 (the relevant t-value is 1.8265). Proportionality between permanent consumption and permanent income is, however, not observed in this case.

Finally, if C_t is regressed on Y^P_t and Y^T_t with a constant, the value of R^2 gets maximised for β = 0.9. In this case also MPC out of permanent income is 0.79 which is markedly greater than the MPC out of transitory income which is 0.37 (t-value = 1.8363). The intercept is, however, not insignificant.

With $\alpha = 0.0154$ also the value of R^2 in the regression of C_t on Y^P_t without constant, is maximum for $\beta = 0.6$. In this case, the MPC out of permanent income is 0.80 and that out of transitory income is 0.42 (t-value = 1.9728). However, the proportionality assumption is found to be not valid.

Given the definition of permanent income as given by equation (2) and given the relation (4), an expression similar to equation (5) can be obtained as

$$C_t = a'_0 + a_1 \frac{\beta}{\beta - \alpha}[1 - e^{-(\beta-\alpha)}]Y_t + e^{-(\beta-\alpha)} C_{t-1} \quad \ldots \quad (17)$$

The estimate of this equation is

$$C_t = 9.10 + 0.464\ Y_t + 0.415\ C_{t-1} \quad \ldots \quad (18)$$

With $\alpha = 0.0135$ the value of β calculated from the coefficient of C_{t-1} is slightly lower than 0.9.

But if the proportionality relation (8) is used then also a relation similar to equation (17) can be obtained as

$$C^P_t = a_1 \frac{\beta}{\beta - \alpha}[1 - e^{-(\beta-\alpha)}]Y_t + e^{-(\beta-\alpha)} C^P_{t-1} \quad \ldots \quad (19)$$

To estimate equation (19) the initial value of β is taken at 0.6 to estimate the C^P_t series. On the basis of this C^P_t series the estimate of equation (19) looks like.

$$C^P_t = 0.15\ Y_t + 0.84\ C^P_{t-1} \quad \ldots \quad (20)$$

The coefficient of C^P_{t-1} re-estimates β in the neighbourhood of 0.2 which is quite different from the earlier estimates. In the light of Indian data it seems unwise to follow the method of Wright and others in estimating the value of β.

5. Concluding Remarks :

The principle of estimating permanent income as a weighted sum of present and past incomes with exponentially or geometrically declining weights is well accepted in the literature of economic theory. But the principle of estimating the parameters α and β used in the above process is criticised by several economists. In the light of Indian data on per capita income and per capita consumption for the period 1950-51 to 1994-95 such criticisms still hold. But for alternative possible values of α and β, though the strong version of the permanent income hypothesis (that the relation between C^P_t and Y^P_t is proportional one) is not accepted, a weak version of the hypothesis (that the MPC out of permanent income is greater than that out of transitory income) is found tenable in India. This conclusion differs from the conclusions of a number of earlier works which either because of application of improper methodology or because of inadequacy of proper data come to the conclusion that even the weak version of the permanent income hypothesis is not acceptable for an under-developed country like India.

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