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Second Green Revolution for Sustainable Growth in Indian Agriculture

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Abstract

The main aim of this paper is to analyze the causes, advantages and problems of first green revolution and need for a second green revolution in Indian agriculture sector. In 1951 the well irrigated area in India was only 17% India's current deficit was increasing. In 1950's and 1960's India was frequently visited by floods and cyclones so the crop production was fluctuating. Farmers did not receive the true value for their crop and the crop distribution was not proper. People suffered from starvation and malnutrition. Farmers were financially weak and banks did not provide credit to the farmers and money lenders were demanding high interest. The demand for food was much higher than the production which called for the first green revolution. Then the first green revolution was launched to ensure the food security as there was severe scarcity of food in the country which boost to the agriculture sector across the country. Due to first green revolution India's food output, which was 72.3 million tonnes in 1966 rose to 108.4 million tonnes by 1971 which helped to overcome food shortage & banish the spectre of starvation or living from ship to mouth. But, today it has been found out that the areas which witnessed the green revolution are suffering from problems of environmental degradation and due to excessive crop rotation land quality has decreased. Therefore, there is need for a second green revolution that is more broad-based, more inclusive and more sustainable. For this it is required to produce more without depleting natural resources any further, and for this purpose our agricultural scientists should contribute for ushering in this green revolution. Because by year 2020-21 the total demand for foodgrain is projected to touch 285 million tonnes not only for foodgrain but also for fruit, vegetables and animal products. At present, the country allocates about 0.6% of its agricultural GDP on agricultural research and development. This needs to be enhanced at least by 2-3 times by 2020. The present paper examine the consequences of first green revolution which make need for a broad based and sustainable second green revolution for meeting rising demands of food and ensuring the nutritional security. The present paper enforce on the requirement of second science- based green revolution which will be more inclusive and more sustainable.

Keywords: first green revolution, consequences, second green revolution, sustainable agriculture

1. 1. Introduction

The agricultural scenario all over the world has undergone rapid and tremendous changes over the years particularly since middle of 20th Century from the status of agriculture being a subsistence occupation to meet the food and fiber demands of farmers and his family, farming has crucially transformed from an occupation to an agri business. India is no exception to this phenomenon. This new 'agricultural strategy' was put into practice for the first time in India in the kharif season of 1966 and was termed High-Yielding Varieties Programme (HYVP). This programme was introduced in the form of a package programme since it depended crucially on regular and adequate irrigation, fertilizers, and high-yielding varieties of seeds, pesticides and insecticides. Initially it was implemented in a total area of 1.89 million hectares. On the eve of the Fourth Plan, the coverage was estimated to be 9.2 million hectares. In 1998-99 the area under HYVP was 78.4 million hectares which was about 62 per cent of the total area under foodgrains. As a result of HYVP (also known as New Agricultural Strategy), foodgrains output increased substantially from 81.0 million tones in the Third Plan (annual average) to 187.0 million tones in the Eighth Plan (annual average) and further to 202.9 million tonnes in the Ninth Plan (annual average). Foodgrains production in the Tenth Plan (annual average) stood at 202.2 million tonnes-the last year of Plan 2006-07 registering a record production of 216.1 million tonnes. As far as productivity is concerned, the yield per hectare of all foodgrains rose from 710 kgs in 1960-61 to 1,707 kgs in 2006-07.

Although Green Revolution led to considerable increases in agricultural production and productivity it had some undesirable consequences as well particularly in the initial period. Since early successes were limited to wheat, the wheat growing areas (Punjab, Haryana and Western Uttar-Pradesh) marched much ahead of other regions leading to substantial increases in regional inequalities. However, during the last decade and a half, impressive gains have been recorded by rice and non-foodgrains (particularly oilseeds). As a result, the eastern and the southern regions of the country have made up the lost ground considerably. In addition to increase in regional inequalities, the initial period of Green Revolution was also marked by increases in inter-personal inequalities as large farmers benefited much more from new technology than the small and marginal farmers. This was not unexpected as the new technology called for substantial investments which were generally beyond the means of a majority of this country's small and marginal farmers. Only relatively rich farmers who were in a position to 'afford' the new strategy which is a package programme involving the use of high-yielding varieties of seeds in combination with other inputs like irrigation, fertilizers, pesticides etc. adopted it. This shifted the advantage of productivity per acre in favour of big farmers. This advantage, in turn, got reflected in the distribution of benefits from new technology in the region that adopted it. However, with the passage of time, the supply of institutional credit to small farmers increased enabling them to adopt the new technology. Thus Green Revolution started benefiting small farmers as well.

Thus, it can be said that India was successful in creating a green revolution which give a boost to the agriculture sector across the country. We need to create a similar revolution in the near future as we have already started experiencing stagnation in growth in the agricultural sector. Once again, we need to re-orient ourselves to create another green revolution. While the first green revolution was to ensure food security as there was severe scarcity of food in the country, the second green revolution should aim at creating sustainable livelihood security for the poor and eradication of poverty by generating gainful self-employment. While the first green revolution was aimed at undertaking mass production, the second green revolution should be to promote production by the masses. This is in line with the Gandhian philosophy of involving the poor in development for equitable distribution of our prosperity. Thus, keeping in view the above facts, the main aim of this paper is to analyze the causes of Ist green revolution its consequences and need for second green revolution for sustainable agriculture and hence sustainable development of India.

2. Literature Review

Jain, K.K. Singla, S.K. and Gill, G.S. analyzed the impact of improved seed technology on pulses and oilseeds crops in Punjab. They emphasized that positive changes could be brought about by increasing the per unit value productivity. Gopalappa, D.V. concluded in his study that due to diversification of the farm activities, there was significant change in the income level and standard of living of small and marginal farmers in Karimnagar district of Andhra Pradesh. Parikh, Ashok and Trivedi, Pravin found in their study that irrigation and fertilizer use was the dominant source of output growth in the Andhra Pradesh.

However, Maheshwari, Asha concluded in her study that in Karnataka the yield increase were brought about by HYV seeds were not really revolutionary. Singh, Katar examined the impact of new agricultural technology on farm income distribution in Aligarh District of Uttar Pradesh and found that the estimates of income inequality indices an overall decline in the farm income inequality in the District. Jain, Reena concluded in her study that due to introduction and adoption of HYVs most districts experienced significant increase in yields in Uttar Pradesh. Sharma Vijay Paul and Singh, Rajvir found that in Himachal Pradesh due to implementation of various development programmes the investment on productive assests, cropping intensity and productivity have increased more on adopted group of farmers as compared to non-adopted farmers.

Further, Jha, Brijesh concluded in his study that with new technology instability in agricultural income reduced with adequate irrigation facilities and consistent price policy in Kurukshetra District of Haryana, Thakur, Jawahar and Sinha, D.K. analyzed trend and technological evaluation of slow growth crops in Bihar and found that though the yield of the major oil-seeds crops of the state has increased substantially in green revolution era but this increase in yield failed to expand the area under the crops, probably because of shifting of fertile land to other

cereals and cash crops to avoid risk involved in oil-seeds production. Chakarwanti, Ila and Verma, Vimlesh emphasized in their study that lack of proper and technical training facilities for the farmers and inadequate credit, non-availability of inputs, social stigma, etc. are the factors that hinder the further progress of new technology in two villages of Chittorgarh, Rajasthan. Rangaswamy, P. found in his comparative study a positive association between adoption rates and profitability of the new technology in dry land areas i.e. Hissar in Haryana and Kovilpatti in Tamilnadu, Bogahawatte, F. found in his study that adoption of new technology has contributed to the Paddy production in Sri Lanka. Similarly, Sharma, Ushaben found in her study that the contribution of HYVs to output, yield and area growth for wheat was remarkable.

However, Patil, R.C. and Jha, Dayanath analyzed output growth and technological change in Maharashtra agriculture and found that it would be enough to bring about rapid output growth. On the other side Sharma, V.K. and Haque, T. concluded in their study that the adoption of HYVs technology has reached its limit in most of the developed states and for all the major cereal crops in India. Joshi, P.K. concluded in his study that the two industrial inputs namely, tractor and fertilizer have significant bearing on agriculture sector.

Former Union Finance Minister Pranab Mukherjee” thoughts about Second Green Revolution. Pranab Mukherjee said he would explore the possibility of setting up a committee of CMS of the eastern states for a second green revolution in the region and praised Assam, Bihar, Jharkhand and West Bengal for substantial increase in rice production during current fiscal.

Bill Gates has been among the proponents of a Second Green Revolution, saying three guarders of the world’s poorest people get their food and income by farming small plots of land if we can make smallholder farming more productive and more profitable, we can have a massive impact on hunger and nutrition and poverty. We have to develop crops that can resist pests and disease. We need higher yields on the same land in harsher weather.

Stressing the need “A Second Green Revolution” as called for the current economic survey, Union. Agriculture Minister sharad Pawar said this would be one of India’s major achievements in the coming years. “We feel, with our efforts, our nation’s major achievement in the next five years will be a second green revolution, not just in crops, but also in fisheries, meats, eggs, fruits and vegetables. The Farmer takes care of the needs of one billion people, his condition must be improved”.

3. First Green Revolution in India

Green revolution has three basic elements which were as:

3.1 Continued expansion of farming areas

The area of land under cultivation was being increased right from 1947. But this was not enough in meeting with rising demand. Other methods were required. Yet, the expansion of cultivable land also had to continue. So, the Green Revolution continued with this quantitative expansion of farmlands. However, this is NOT the most striking feature of the Revolution.

3.2 Double-cropping existing farmland

Double-cropping was a primary feature of the Green Revolution. Instead of one crop season per year, the decision was made to have two crop seasons per year. The one-season-per-year practice was based on the fact that there is only one natural monsoon per year. This was correct. So, there had to be two “monsoons” per year. One would be the natural monsoon and the other an artificial “monsoon”. The artificial monsoon came in the form of huge irrigation facilities. Dams were built to arrest large volumes of natural monsoon water which were earlier being wasted. Simple irrigation techniques were also adopted.

3.3 Using seeds with superior genetics

This was the scientific aspect of the Green Revolution. The Indian Council for Agricultural Research (which was established by the British in 1929 but was not known to have done any significant research) was re-organized in 1965 and then again in 1973. It developed new strains of high yield value (HYV) seeds, mainly wheat and rice but also millet and corn. The most noteworthy HYV seed was the K68 variety for wheat. The credit for developing this strain goes to Dr. M P. Singh who is also regarded as the hero of India’s Green Revolution.

Food Grain Production (Million Tones)

| Table No.1 | | | | | | |
|---|----------------|----------------|----------------|----------------|-----------------|------------------|
| Crop/Year | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05* | 2005-06\$ |
| Rice | 85.0 | 93.3 | 71.8 | 88.3 | 85.3 | 73.8 |
| Wheat | 69.7 | 72.8 | 65.8 | 72.1 | 72.0 | - |
| Coarse Cereals | 31.1 | 33.4 | 26.1 | 38.1 | 33.9 | 26.4 |
| Pulses | 11.1 | 13.4 | 11.1 | 14.9 | 13.4 | 5.0 |
| Foodgrains | | | | | | |
| (i) Kharif | 102.1 | 112.1 | 87.2 | 116.9 | 103.3 | 105.3 |
| (ii) Rabi | 94.7 | 100.8 | 87.6 | 96.6 | 101.3 | - |
| Total | 196.8 | 212.9 | 174.8 | 213.5 | 204.6 | - |
| (i)+(ii) | | | | | | |
| *-4 th advance estimates. \$-1 st advance estimates (Kharif only) | | | | | | |
| Source:- Ministry of Agriculture | | | | | | |

Crop production in 2004-05 and prospects for 2005-06 The first advance estimates of food grains production for 2005-06 released by the Ministry of Agriculture on September 19, 2005 put kharif production at 105.3 MT, up by 2 MT from the previous year's level (Table No. 1). Production of rabi food grains would be around last year's level of 101.3 MT provided the weather remains favorable.

3.4 Capital Formation in Indian Agriculture

The decline in the share of the agricultural sector's capital formation in GDP from 2.2 percent in the late 1990s to 1.7 percent in 2004-05 is a matter of concern. This declining share was mainly due to the stagnation or fall in public investment in irrigation, particularly since the mid-1990s. However, there is indication of a reversal of this trend with public sector investment in agriculture reaching its highest level of Rs.12, 591/- crore in 2004- 05 since the early nineties. The share of public investment in gross investment increased by over 11 percentage points to reach 29.2 percent in 2004-05 relative to 1999-2000.

4. First Green Revolution in Indian Agriculture- An Overview

Some micro level socio-economic studies of green revolution areas have revealed certain undesirable social consequences of the green revolution. Many large farmers have evicted tenants as they now find it more profitable to cultivate land themselves. Thus a large number of tenants and share-croppers have lost their lands and have been forced to join the ranks of agricultural laborers. Wet lands have also attracted outsider (non-agriculturists from nearby towns) to invest capital in buying farms. Because of these tendencies "the polarization process that accentuates the rural class differences has been further intensified by the green revolution."

The health hazards of the new technology can also not be lost sight of increased mechanization that has accompanied the modernization of farm technology in green revolution areas carries with it the risk of incapacitation due to accidents. Many farm workers in green revolution areas have lost their limbs while working on wheat threshers and some have even lost their lives. What is an additional cause for concern is the fact that the attitude of the government towards the problems of treatment and rehabilitation of victims of accidents on farm machines is that of total ambivalence. Very meager compensation is provided to the victims. The government neither takes effective steps to prevent farmers from using substandard threshers nor does it prevail upon them to give rightful and adequate compensation to victims or to protect potential victims from such hazards.

The health hazards for the rural agricultural workers are not confined to incapacitation resulting from machine accidents. The agricultural work in green revolution areas has been rendered even more injurious by the increasing use of poisonous chemical sprays for plant protection on a large scale. The high yielding varieties of seeds (which are an indispensable part of the green

revolution strategy) are highly susceptible to diseases, and in India (and other third world countries adopting this strategy) poisonous pesticides are used both extensively and intensively for plant protection without realizing the health hazards that follow for agricultural labour. Surveys show that victims of such acute poisoning are invariably agricultural workers, and only rarely rich farmers themselves. It is surprising that no legal protection is available to the victims of poisoning accidents on agricultural farms as the Workmen Compensation Act is applicable only to industrial workers in this respect.

Unfortunately, for many farmers the cost of machinery was too much and they simply couldn't afford it, as well as the high initial outlay, money was also required for fuel and repair. Many very poor farmers, were tenant farmers, with little money to buy even the new seeds or fertilizer that was required. New irrigation schemes were required to provide the reliable source of water required by the HYVS (High Yielding Varieties of Rice). As well as being expensive, in some cases. Where inappropriate schemes were used Stalinization became a problem. Dam construction in some areas also resulted in the flooding of some good farming land. The large amounts of fertilizers and pesticides required by the HYVS also led to serious environmental problems as they entered water supplies. In areas where there was an increase in mechanization, there was an increase in unemployment with fewer people needed to do the jobs that were now done using tractors etc. The consequent increase in unemployment in rural areas led to an increase in rural-urban migration with more people moving to the cities, causing urban problems. Green revolution created wide regional and interstate disparities. The plan was implemented only in areas with assured supplies of water and the means to control it, large inputs of fertilizers and adequate farm credit. These inputs were easily available in at least parts of the states of Punjab, Haryana and western. Uttar Pradesh thus yields increased most in these states. In other states where these input were not assured, the results were limited or negligible leading to considerable variation in crop yields within these states.

However, there were some positive impacts of first green revolution like crop areas under high-yield varieties needed more water, more fertilizer, more pesticides, fungicides and certain other chemicals. This spurred the growth of the local manufacturing sector. Such industrial growth created new jobs and contributed to the country's GDP. The increase in irrigation created need for new dams to harness monsoon water. The water stored was used to create hydro-electric power. This in turn boosted industrial growth, created jobs and improved the quality of life of the people in villages. India paid back all loans it had taken from the World Bank and its affiliates for the purpose of the Green Revolution. This improved India's creditworthiness in the eyes of the lending agencies. Some developed countries, especially Canada, which were facing a shortage in agricultural labour, were so impressed by the results of India's Green Revolution that they asked the Indian government to supply them with farmers experienced in the methods of the Green Revolution. Many farmers from Punjab and Haryana states in Northern India were thus sent to Canada where they settled (That's why Canada today has many Punjabi- speaking citizens

of Indian origin). These people remitted part of their incomes to their relatives in India. This not only helped the relatives but also added to India's foreign exchange earnings.

5. Need for Second Green Revolution

Now after 47 years passed after first green revolution Indian Agricultural scientists are stressing the need for the second one. For younger generation this may not resonate, but for those who have seen the older India, India visited with floods and cyclones frequently, where people are suffering from malnutrition, this has a great importance and urgency.

Food Requirement-Indian Scenario



Oilseed 31 Million Tonnes

will India import food grains in 2023

6. Discussion and Conclusion

It can be concluded from the discussion that food availability in India has gone back to 1970's between 2007-10 the population of India was increased by 1.9% where as the food production was increased by 1.2% and there is a fear that this gap will increase rapidly in the near future. Now after 47 years passed after first green revolution Indian Agricultural scientists are stressing the need for the second one. For younger generation this may not resonate, but for those who have seen the older India, India visited with floods and cyclones frequently, where people are suffering from malnutrition, this has a great importance and urgency. The reasons for this are. First green Revolution in India was focused mainly on fewer crops and only in fewer state in Eastern states mainly U.P and Bihar there is still a probability of producing 2 to 3 times of which is producing now. India is now suffering from highly fluctuating food prices than it has never before. The reason for this goes back to fiscal deficit (debt) and current deficit.

Suggestions

Thus keeping in view the above mentioned facts the following policy measures should be adopted for sustainable growth in Indian agriculture:

1. It appears that adoption of existing HYV technology has reached its limit. Therefore, future pace of agricultural growth will be slow, unless there is further technological break through by way of HYVs, hybridization, tissue culture, genetic engineering, etc.

2. There may be still some scope for improving the food grains production through balanced use of chemical fertilizers and manure and better management practices but the past policies have not been really favorable for this purpose. Therefore, in case of use of pesticides a scientific approach is needed because this approach is lacking in most of our farmers. They are not aware of the actual quantity of toxicant needed to destroy a pest and tend to use more quantity than is necessary. The surplus used appears as a residue that may persist and accumulate with in the eco web.
3. There is still a vast acreage of land under local varieties for most of the cereal crops due to various agro-climatic constraints, demands an evolution of location specific suitable varieties for such lands.
4. Adequate infrastructural support in terms of irrigation, credit, market, road, delivery services, etc. would be essential. Therefore at all India level there is a need to take a bold stand and make policies to strength the Agriculture sector which will determine the economic and political future of India. India has to shape the future in a desirable direction through increasing its production efficiency which depends on research in Bio-Technology, genetic engineering, promotion of better utilization of irrigation capacities, better conservation of rain water, minimization of salinity and water logging problems and improvement in rural infrastructure facilities like power, roads etc. At this juncture the state intervention, through public investment deserves serious attention.
5. The Second generation reforms should address such issues so that generation of productive employment opportunities are created for rural poor and the contribution of Agriculture sector would be significant coupled with falling ICOR's overtime.
6. Delay free and corruption-free transactions of the govt. facilitate a smooth and effective delivery of economic progress to the people.
7. In order to foster Total Factor Productivity growth, there is a need for sustained improvements in farmer's performance, which will require a more active role for the public sector and international agencies in research and extension activities in collaboration with farmers to raise human accumulation. A promising possibility may be to train farmers in production programmes for them to learn more on crops.
8. Effective implementation of the Food Security Act along with India's desire to achieve double digit economic growth and keep food prices in check will require food output to be doubled in the next decade. In order to boost agriculture output, major policy changes are required at every level of government. Agriculture needs board representation proportionate to its strength in the economy in important public institutions to triumph the multidimensional problems afflicting the sector.
9. The second green revolution should focus on generation of employment for the small and marginal farmers and the landless, while enhancing agricultural production. As these families mostly own degraded and low fertile lands, deprived of irrigation, the focus should be on efficient use of such lands. As such lands are not suitable for intensive

cropping of high yielding food and cash crops, priority should be given to dry land, horticulture and agri-silvi pastures.

10. In order to have sustainable agriculture and hence sustainable development of India organic farming along with scientific inputs is the only answer. Organic farming in different forms and different degrees have been once again picking up as movement. But at present only two groups of the people are engaged with it. a) ecologists, environmentalists and dedicated farmers and b) businessmen and rich farmers. The motive of the first group is humble and dedicated to the mother earth (prakriti); however, the other groups are very active in money making race in order to fetch maximum benefits through exporting the organic produces and food products in the world market under the globalization and privatization of world market. Thus, we are at a juncture where we need to take cautious approach and adopt judicious strategy in order to safeguard the larger interests of small and marginal farmers, so that we can save them from existing trend of committing suicides in such a large number. It is our moral and social duties to save the life of these million food growers (anndatas).

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