

The Performance of India's Food Grains Production: A Pre and Post Reform Assessment

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Abstract- Climate change has emerged as an important determinant, particularly in the recent past. In India before economic reforms government was providing a lot of subsidies over the inputs that made the purchase of inputs affordable for the farmer which helps in fighting against the climate change. But after the economic reforms high rise in the prices of inputs of agricultural production has made it difficult for the farmers to purchase the inputs in right amount and vulnerability of agriculture to climate change has increased and it is expected that agriculture sector in India will be negatively affected.

The growth rate in the food grains production and productivity has decelerated when India entered in the era of globalization. The growth rate production of food grains is 2.80 per cent per annum in pre reform period which declined to 1.98 per cent in post reform period. The situation is more worsen in case of growth rate of rice and wheat. The growth rate in productivity of food grains is slightly improved in post reform period over the pre reform period but in case of rice and wheat productivity, the result is quite opposite. In this paper we made a modest attempt to analysis this result by considering the change in growth rate of fertilizer consumption, change in cultivated area, change in irrigated area and change in climate conditions.

Index Terms- Food grains, Production, Productivity, Fertilizer Consumption, Irrigated Area, Climate Chang

I. INTRODUCTION

The era of 1990s can be marked as a decade of complete departure from the restriction and controlled economic system when the government of India introduced a number of new economic policies in the form of structural adjustment and macro stabilization programme to integrate the national economy. Though, the Indian economy had got its way of rapid economic growth right from the beginning of the eighties, however, acceleration in the growth rate of GDP and per capita income have been realized only after 1991. This continuous and accelerated high growth of the Indian economy provides a large base for being the 4th largest economy of the world in terms of PPP (G.S. Bhulla, 2005). But the main problem with this high rate of growth of GDP and per capita income is that it has been as explicit growth of the economy. The growth performance of the Indian agriculture has decelerated significantly after the opening up of the economy. "Since agriculture continues to be the largest sector of the economy in terms of employment, the deceleration of growth of this sector has serious implications for

the living standard of agricultural workers both farmers and agricultural laborers" [Ibid]

The growth rate of agriculture production is generally judged by the performance of food grains and non-food grains production. From these both items of agriculture production of food grain is more significant due to two reasons. Firstly, it provides the base for subsistence by supplying basic food items and secondly, it is the only group of agricultural produce where "Green Revolution" was introduced firstly and more successfully. Its importance has also increased due to the inception of World Trade Organization (WTO) in 1995 and therefore in the present study we shall concentrate our self over the production. At the time of independence agriculture occupied the most dominant place in the Indian economy by providing livelihood to about 70 percent of population and contributing about 48.6 percent of GDP (Sharma, P.N., 2005). After the introduction of Green Revolution, the scene has completely changed about the Indian agriculture has transformed from food shortage to self reliance. This has become possible because of technological changes as well as the Government initiatives in form of various programme. The new method of agricultural practice brought a drastic change in the productivity and production. More and more agricultural land are brought under cultivation with the help of improved irrigation facilities (with the help of assured means of irrigation) cheaply available chemical fertilizers and supply of high yield varieties of seeds in the market. Farm mechanization has also shortened the period of ploughing, sowing and harvesting process of agriculture. The implementation of land reform has further added a new dimension in Indian agriculture. Therefore the successful implementation of Green Revolution and Land Reform not only increases the productivity but also increases the area under cultivation that paved the way for a higher growth of the agricultural sector.

With the passage of time as the fruits of green Revolution and land reform reaped, the Indian agriculture moved from food shortage to self sufficiency and from self sufficiency to surplus agricultural produce. The period of 1980s has witnessed a higher increment in food grain population in comparison to increase in the population that increases the supply of food grains in the economy over the demand (Yadav Krishna Nand, 2005). Consequently the items of food grains failed in attracting the appropriate prices in the market and therefore India was in a great need of new market for the food grains. The opening up of the economy in 1991 and the establishment of WTO in 1995 once again changed the life of Indian farmers. On the other hand

the new economic policies has increased the cost of agricultural inputs due to rise in the prices of high yielding of varieties of seeds (HYVS) fertilizers, insecticides, pesticides and water and electricity while on the other hand, WTO regime has opened the world agricultural market for Indian food grains. Where Indian farmers may get a respectable price for their produce.

The post independent era of Indian agriculture especially production of food grains may be divided into two phases. In the first phase (that starts from 1947 and last to 1990) the farmers were protected and supported by the Government of India. Government had supplied nearly all agricultural inputs at highly subsidized rate that resulted in form of a revolution in the Indian agriculture. The cheaper availability of factors of production supposed to increase the consumption of fertilizers and land under irrigation facilities so as to increase the total food grains production by increasing the yield and area under cultivation. In the next phase (that starts from 1991 and is continue) it has been assumed by the government that now the Indian agriculture is maintained enough to survive on her own feet. The opening up of the market no doubt increase the cost of agricultural inputs but the improved prices in the world market may cover the gap and the Indian agriculture will sustain herself.

Further climate change has emerged as an important determinant, particularly in the recent past. In India before economic reforms government was providing a lot of subsidies over the inputs that made the purchase of inputs affordable for the farmer which helps in fighting against the climate change. But after the economic reforms high rise in the prices of inputs of agricultural production has made it difficult for the farmers to purchase the inputs in right amount and vulnerability of agriculture to climate change has increased and it is expected that agriculture sector in India will be negatively affected.(Narain,Ghosh,Sexena,Parikh,Soni,2009)

To know the fact, therefore, it is important and necessary to access the performance of Indian agriculture under WTO regime. The comparative study of the Indian agriculture with respect to the pre and post WTO regime may be fruitful to access the viability of WTO with respect to Indian agriculture.

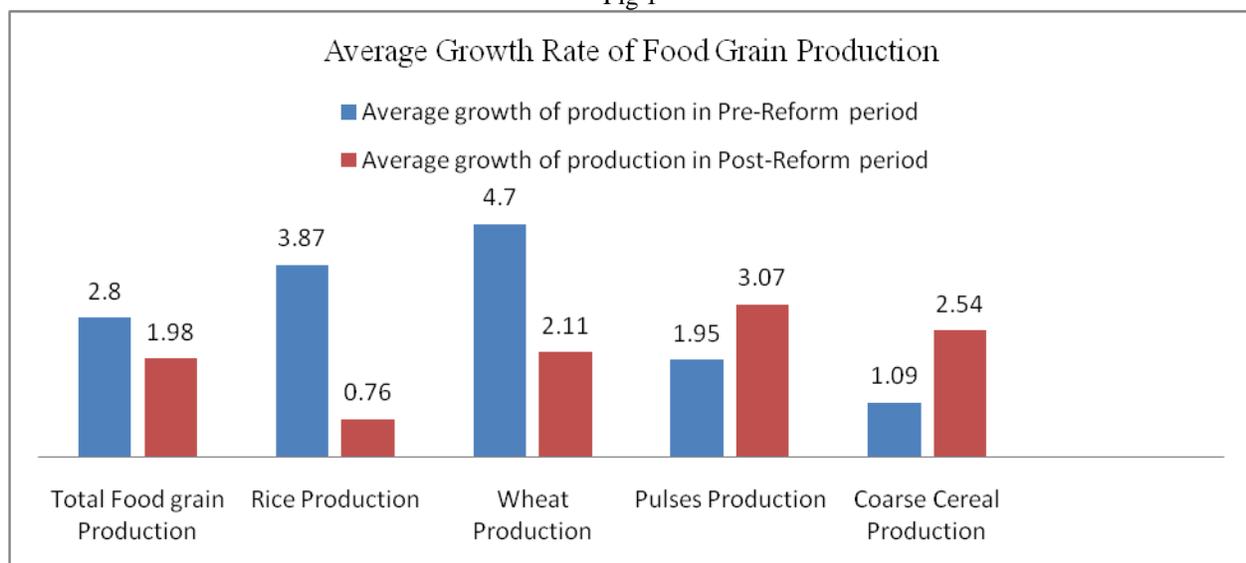
II. METHODOLOGY

The present study is divided into two period, first from 1970-71 to 1990-91 and second from 1991-92 to 2008-09. Six parameters are taken into consideration for the analysis. These parameters are total food grains productions, area under cultivation, yield per hectare, consumption of fertilizers, area under irrigation and rain fall. Firstly, we shall access the performance of food grains in aggregate and after that separate analysis may be carried out for rice, wheat, pulses and coarse cereals. With the help of available information an attempt is made to examine the movement in the consumption of fertilizers, area under irrigation, area under cultivation (in aggregate as well as for individual crops) and more importantly production and productivity under the first phase (phase of green Revolution from 1970-71 to 1990-91) and second phase of liberalized economic system. For this purpose simple statistical tools like average, percentage change etc. will be utilized.

Changes in food grains production:

As it was expected, the growth in the food grains production has decorated when India entered in the era of globalization. The free market play has adversely affected the production of food grains and the rate of growth of food grains production declined after the introduction of New Economic Policy (NEP) in India. From 1970-71 to the end of the 1990s, the production of food grain has grown by 2.80 per cent annually where as the growth rate of food grains for the period of 1991-92 to 2008-09 has been 1.98 per cent comparatively lesser than the previous period. This might has happened because before the introduction of new economic policy agricultural inputs were highly subsidized and available at lower prices than it may be in free market. But after 1991, the cost of fertilizers, seeds irrigation facilities etc. has increased and it becomes difficult for the small farmers to purchase it and consequently total food grains production declined.

Fig 1



Source- computed from Table 1

From the available statistics it can be easily observe that there has been always an irregularity in the performance of food grains production in both the periods, pre-reform as well as post reform. No prediction is possible in case of the growth rate of food grains production. However it rarely happened that there is consecutive negative growth of food grains productions for two years except for 1971-73 and 1986-88. The other aspect of the growth of food grains production is very interesting that is, there has always been a positive growth of food grains production after a negative growth and the positive growth is greater than the negative one.

The differential growth in the food grains production in the pre and post reform period might have caused by the differences in the prices of agro-products in national and international market during the pre and post reform period. In the pre-reform period the prices of most of the food grains items was higher in the international market in comparison to the domestic market that lured the Indian to produce more and more food grains before economic reform to take the advantage of the higher prices, but when the world agriculture market liberalized under WTO commitments the supply of food grains increased in the international market however demand did not due to the inelastic demand of food grains and consequently international prices declined and become less than the domestic market and farmers lost their zest for more and more production of food grains (Dr. Krishna Nand Yadav,). The opening up of the economy has also adversely affected the production of food grains by increasing the prices of all the agricultural inputs particularly in case of small farmers who are unable to purchase the desired and appropriate amount of fertilizers and other inputs at higher prices.

As far as the implicit growth of the food grains production is concerned, the picture is different from different items in both the periods. In case of pre-reform period what is dominating over all the items viz. rice, pulses and coarse cereals the production of wheat has grown by 4.70 percent annually during the pre-reform period followed by rice, pulses and coarse cereals which are grown by 3.87 percent, 1.95 percent and 1.09 percent respectively.

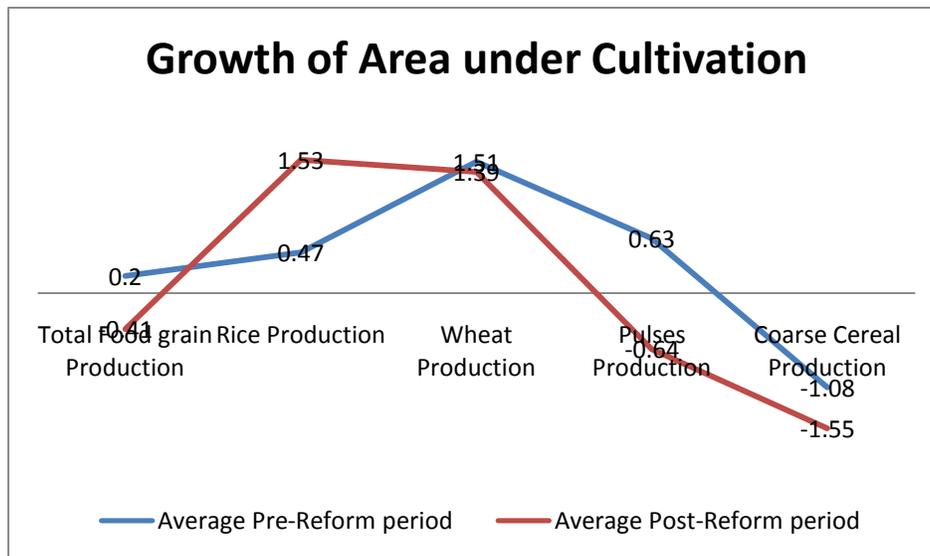
The situation is quite different in the post reform period when the highest growth is registered in the production of pulses. The production of pulses grew by 3.07 percent annually which is not only more than the growth rate of all the item of food grains but also greater than the average growth rate of the food grains production in the post reform period. The growth rate of coarse cereals production is the reform period it has grown by 2.54 per cent annually. The other two items namely rice and wheat grown by 0.76 and 2.11 percent respectively in the reform period. The production of coarse cereals and pulses has therefore grown more in the post reform period in comparison to the pre-reform period while wheat and rice grew more in the pre-reform period in comparison to post-reform period.

On the basis of growth performance we may have two groups in food grains production. The first group is consisting of wheat and rice and in case of second group we are having pulses and coarse cereals. The items of first group has grown more in the pre-reform period against the tendency of the second group that has grown more in the post-reform period. This might has happened so because of the very nature of the produce. For the production of wheat and rice, there is a comparatively higher requirement of fertilizers, high yield varieties of seeds, proper irrigation facilities etc. in comparison to the production of pulses and coarse cereals. Since the cost of all the items has increased after the reform period it comes unaffordable for farmers to purchase the appropriate doses of all the inputs and as a result the growth of production of wheat and rice decelerated in the reform period. The unusual behaviour of monsoon in post reform period has also adversely affected the production of wheat and rice as both the items require a good amount of irrigation facilities. Reverse to it the nature of pulses and coarse cereals is completely different from rice and wheat which require not only a comparatively lower amount of fertilizer but also a lesser irrigation facilities and therefore it has not been much affected by rising prices of fertilizers and unusual behavior of monsoon in the reform period.

Change in Area under Cultivation:

With the help of institutional changes in form of land reform in 1951 and technological changes in 1960s along with various irrigation projects and establishment of land development bank, Government of India was expecting to increase the area under cultivation. The information about percentage change in area under cultivation is given in table 2 for the production of food grains in India in general and for the production of rice, wheat, pulses and coarse cereals in particular. It is clear from the available information that the growth rate of area under cultivation for the production of food grains has grown very slowly in pre reform period or even negative growth registered in post reform period. The rate of growth in the area under cultivation for the production of food grains in both the periods that it may be regarded as stagnant condition. But a nearly stagnant situation in case of area under cultivation of food grains does not mean that all the policies of the government to increase the area under cultivation have failed. This might has happened because as the process of industrialization and urbanization accelerated more and more agricultural land brought under non-agriculture uses. The problem of soil erosion also negatively affected the growth of the cultivable land. We should say thanks to the Indian government who stresses more on bringing uncultivable land under cultivation with the help of different land development programmes like water programme.

Fig 2



Source- computed from Table 2

From the four items of food grains production only the wheat production registered same convincing growth in area under cultivation before the economic reform. The area under cultivation for the production of wheat grown by 1.51 percent annually during 1970-71 to 1990-91 which is the highest rate of growth among the other items of food grains production. A comparatively higher growth rate in area under cultivation for wheat production might be supported by 'Green Revolution'. Since Green Revolution recorded a great success in wheat production due to favourable climate condition and types of soils.

After the introduction of Green Revolution method of production of wheat completely changed. Now for the production of wheat there is requirement of high yield varieties of seeds, high doses of fertilizers and finely irrigation facilities that cannot be done without the help of assured irrigation facilities. All these activities are costly affairs and therefore as the New Economic Policy implemented, there is a many fold wise in the prices of these product and consequently deceleration in the growth of the area under cultivation is observed. The growth in area under cultivation for the production of wheat decelerated to 1.39 percent annually during the period of economic reform and in this way the area under cultivation of wheat production has been higher before the economic reform as compared to the post reform period.

The growth rate in area under cultivation for rice has set up a completely reverse trends in comparison to the growth rate in area under cultivation for wheat production. For the production of rice, more and more area has been brought under cultivation in the post reform period against the pre-reform period. In the pre-reform period area under cultivation for rice production grown by only 0.47 per cent annually whereas in the post reform period it has grown by 1.53 per cent annually. This shows that farmers feel comfortable to grow rice than wheat in the post reform period. There may be a number of reasons for such type of trends in the growth of area under cultivation for rice production.

Firstly, whatever there has been growth in the area under cultivation all is utilized towards the production of rice in the post-reform period or since lesser choice is available for the production of the crops in that area. Secondly, the introduction of New Economic Policy increases the prices of fertilizers and therefore it seems suitable to produce rice in place of wheat or other crops where comparatively better huge doses of fertilizers are required. Thirdly, comparatively better prices for rice is in comparison to wheat in the international market may be a reason behind growing rice thrice in a year in the states like Punjab and West Bengal.

The growth pattern of area under cultivation for pulses almost same the trend of area under cultivation for food grains. The area under cultivation for production of pulses grew more in the pre-reform period in comparison to the post reform period. However the gap between the growth rate in pre-reform and post-reform period is not only but in absolute term also there is a very slow growth in the area under cultivation for the production of pulses grew by 0.63 per cent annually in the pre-reform period. In the post reform period the area under cultivation for the production of pulses grew negatively i.e. -0.64 per cent annually. Therefore it can be said that farmers have shown lesser interest towards the production of pulses in the post-reform period in comparison to the pre reform period.

The growth in area under cultivation for coarse cereal production sets its own trend, independent from the other items of the food grains production. The area under cultivation of coarse cereal registered a negative growth in both the periods, the area under cultivation for the coarse cereals declined by 1.08 per cent annually. This decline trends further increased in post reform period. In the post reform period it declined by 1.55 per cent annually. Hence we can say that the economic policies hardly matters for the cultivation of coarse cereals. It declines trends in area under cultivation for coarse cereals either may be caused by the very nature of the produce i.e. inferior type of

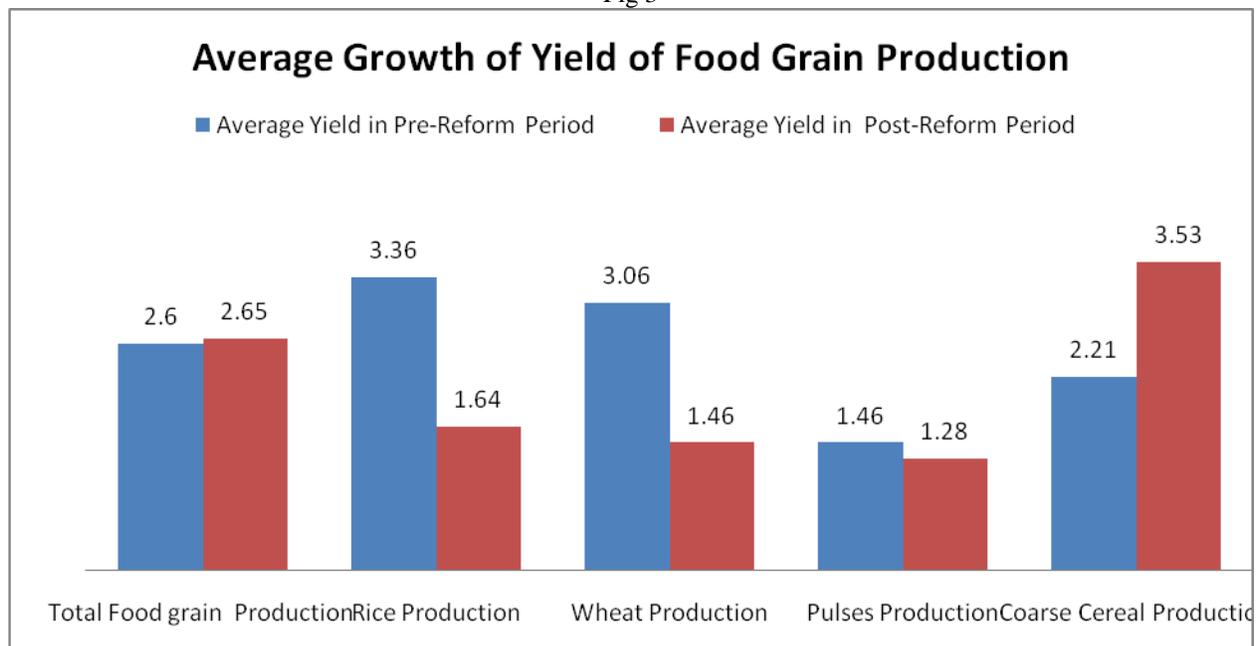
agricultural product or the growing success of Green Revolution in the production of wheat which is also grown at the time when coarse cereals are grown.

Productivity of food grains

The information about the average annual growth in the yield of food grains production in general and yield of rice, wheat, pulses and coarse cereals in particular is given in the following table 3. The data reveals that in the pre-reform period average annual growth rate of yield of food grains production is greater than the growth rate in the post-reform period. The yield of food grains production grew by 2.60 per cent annually from 1970-71 to 1990-91. During the pre-reform period, there is differential growth rate in yield of food grains production. In comparison to 1970s, 1980s observed higher growth in yield of food grains

production. During the post reform period there is mixed or wide fluctuation in growth rate in yield of food grains production is observed. The growth rate in yield of total food grains production in pre-reform period is 2.60 percent per annum. While in post reform period which is marginally increased to 2.65 per cent per annum. But in the case of rice and wheat production is concerned, the picture is quite different in pre and post reform period. In the pre-reform period, the average percentage change in yield of rice and wheat are 3.36 and 3.06 per cent per annum respectively while in the post reform period which declined to 1.64 and 1.46 per cent per annum respectively. That might be possible in the post reform period, there is declined in the use of fertilizer in the production of wheat and rice due to hike in the price of fertilizer and other inputs.

Fig 3



Source- computed from Table 3

In case of pulse, in the pre-reform period, the average change in yield of food grains production is 1.46 percent per annum which slightly declined to 1.28 per cent per annum in the post reform period. This figure shows that how much Government policy is success to increase productivity of pulse and minimized the dependence on import of pulses. It is the time; Government must redesign their policy to increase production and productivity of pulses.

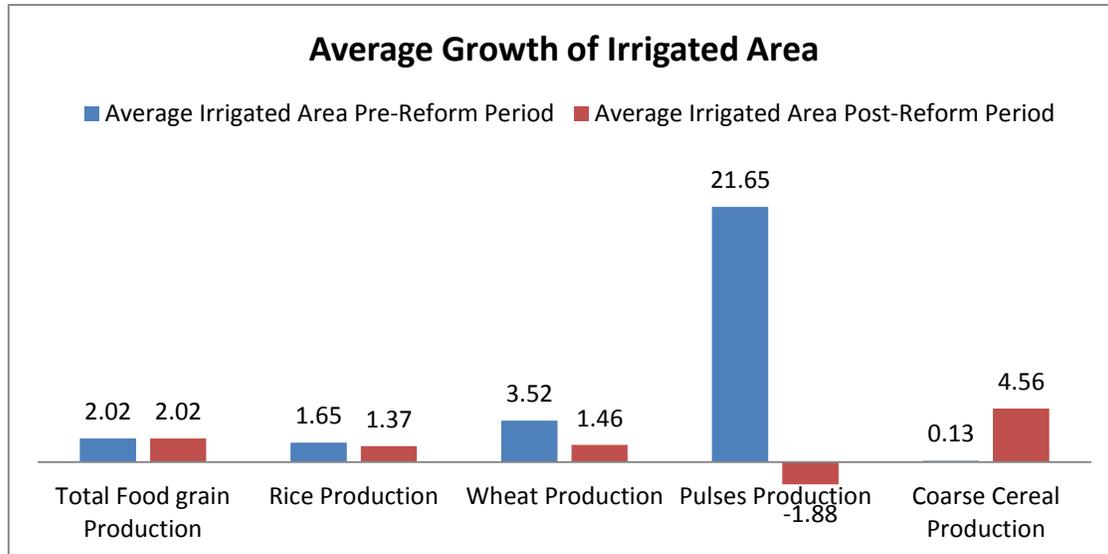
Coarse cereal is the only item in above mention food grains items whose growth in productivity has relatively increased in post reform period in comparison to pre reform period. In pre

reform period, the growth in productivity is registered 2.11 per cent per annum which increased significantly to 3.53 per cent per annum in the post reform period.

Area under irrigation

Indian agriculture is considered as gamble of monsoon because of more than 50 per cent agriculture depends upon rainfall. Government of India initiated numbers of project of irrigation over the year. But still, major Indian agriculture depends upon Monsoon.

Fig4



Source- computed from Table 4

The growth of irrigated area under total food grain is concerned. There is no difference in the growth of irrigated area for the production of food grain in pre and post reform period. In the both period, there are 2.02 per cent per annum, growth is registered. In case of rice production, the average annual growth of irrigated area is 1.65 per cent recorded in pre-reform period which slightly declined to 1.37 per cent in the post reform period.

An important item of food grain is wheat, the growth of irrigated area for the production of wheat is significant i.e. 3.52 per cent per annum in the pre reform period but this convincing growth could not be mentioned in post reform period which dropped to only 1.46 per cent for annum what is more than half growth is recorded in the post reform period as compared to pre-reform period.

In case of pulses, the situation is completely reverse in pre reform period and post reform period. In reform period, very convincing growth rate of irrigated area for production of pulses is registered i.e. 21.65 per cent per annum momentum of growth rate of irrigated area for the production of pulses actually started since 1977-78, that would be mentioned up to 1990-91 except two years i.e. 1981-82 and 1986-87. The picture is quite opposite in post reform period. Pulses is only item in above mention food grain tem which irrigated area is declined by the rate of 1.88 per cent per annum. The figure is reflected that how much government serious about to increase production and productivity of pulses.

The differentiated growth rate is irrigated area under coarse cereal production is observed in pre and post reform period. In pre reform period, the average annual growth rate irrigated area under coarse cereal production is only 0.13 per cent recorded which drastically increased to 4.56 per cent in post reform period. The high annual growth rate in post reform period is mainly due to nearly 100 per cent growth rate recorded in 2005-06 over the last year.

Consumption of fertilizer

A mismatch between the national food grain production and requirement has already crept into the system, which is further widening. The human population of India has increased to 1210.2 million at a growth rate of 1.76 per cent in 2011 over 2001 (1028.77 million) and is estimated to increase further to 1530 million by 2030 (census of India, 2011). On the other hand our national food grain production for past 3-4 years is hovering around 234 million tones. This means that per capita food grain production is only about 193 kg per year. There are projections that depend for food grains would increase from 234 million tones in 2009-10 to 345 million tones in 2030 (GOI, 2009). Hence in the next 20 years, production of food grain needs to be increased at the rate of 5.5 million tones annually. With ground water tables declining, there are growing pressure to increase the yield. The key factor behind high yield growth could be the developments of new technology that will produce higher yield per hectare, and fertilizer remains a key player in the most important ask as it has been in the past. However, fertilizer application should be optimum in quantity to meet the crop's nutrient requirement fully so as to achieve the set yield target. Table (5) shows the annual percentage change in consumption of fertilizer as well as annual growth in usage of fertilizer per hectare in pre and post reform period. The table illustrates significant difference in the consumption of fertilizer in pre and post reform period. In pre reform period, the average annual growth rate of total consumption of fertilizer is registered 8.59 per cent while in the post reform period it declined to only 4.04 per cent.

III. THE IMPACT OF RAIN FALL ON AGRICULTURE PRODUCTION

The impact of climate change as witnessed in recent times has immense potential to adversely affect agriculture in this country in a variety of ways. As a large part of the arable land in India are rains fed the productivity of agriculture depend on the rainfall and its pattern. Agriculture will be adversely affected not only by

an increase or decrease in the overall amounts of rain fall but also by shifts in the timing of the rain fall. Any change in rain fall patterns poses a serious threat to agriculture and therefore to the economy and food security. Summer rainfall accounts for almost 70 per cent of the total annual rain fall over India and is crucial to India agriculture. (<http://www.greenpeace.org/india/campaigns/choose-positive-energy/what-is-climate-change>)

Table (6) represents actual and normal rain fall along with actual rain fall percentage deviation from normal in the month June to September during the period of 1998-99 to 2008-09. From the table we observed that except few years i.e. 1998-99, 2003-04 and 2007-08. There were negative actual rain fall percentage deviations from normal. The highest negative deviation is recorded in 2002-03 i.e. -20.58 per cent. During the period, 1998-99 to 2008-09, the average actual rain fall a percentage deviation from normal is -3.80 percent. However, on the one hand during the study period, rainfall is declined at rate of 3.80 per cent and on the other hand rising temperature would increase fertilizer requirement per the same production target and result in higher GHG emissions, ammonia vitalization and cost of production increased frequencies of droughts floods storms and cyclones are likely to increase agricultural production variability.

subsidized rate that resulted in form of a revolution in the Indian agriculture. The cheaper availability of factors of production supposed to increase the consumption of fertilizers and land under irrigation facilities so as to increase the total food grains production by increasing the yield and area under cultivation. But after the adoption of new economic policy, it has been assumed by the government that now the Indian agriculture is maintained enough to survive on her own feet. Further the reduction in subsidiary causes to increase the prices of agricultural inputs. This ultimately adversely effected the food grains production and productivity.

From the above analysis data also reveals that, there is significant declined in growth of production and productivity of total food grain production in post reform period. However the growth of coarse cereal and pulses in post reform period has increased. But most heated items of food grain are rice and wheat whose growth of production and productivity adversely affected in post reform period. This is great challenge to Government of India to improve in production and productivity of rice and wheat under new economic regime. . The adverse effect on production and productivity of rice and wheat is not only reduction on subsidiary on agricultural inputs but also the overall declined in amounts of rain fall and shifts in the timing of the rain fall. Any change in rain fall patterns poses a serious threat to agriculture and therefore to the economy and food security

IV. CONCLUSION

Before the inception of new economic reform, the farmers were protected and supported by the Government of India. Government had supplied nearly all agricultural inputs at highly

APPENDIX

Table-1: Percentage Change in Food Grain Production –Pre Reform Period

Year	Total Food grain Production	Rice Production	Wheat Production	Pulses Production	Coarse Cereal Production
1971-72	-3.01	2.01	10.83	-6.17	-19.48
1972-73	-7.73	-8.89	-6.32	-10.64	-5.93
1973-74	7.87	12.26	-11.96	1.01	24.59
1974-75	-4.62	-10.15	10.65	0.09	-9.36
1975-76	21.25	23.14	19.67	30.14	16.38
1976-77	-8.15	-13.99	0.59	-12.88	-5.03
1977-78	13.71	25.64	9.44	5.37	3.95
1978-79	4.34	2.09	11.84	1.75	1.40
1979-80	-16.83	-2.09	-10.36	-29.64	-11.40

1980-81	18.13	26.69	14.07	24.04	7.60
1981-82	2.86	-0.71	3.14	8.28	7.13
1982-83	-2.83	-11.51	14.26	3.04	-10.74
1983-84	17.64	27.55	6.29	8.68	22.16
1984-85	-4.48	-2.93	-3.10	-7.21	-8.05
1985-86	3.37	9.41	6.76	11.70	-15.94
1986-87	-4.67	-5.12	-5.80	-12.35	2.40
1987-88	-2.14	-6.11	4.71	-6.40	-1.75
1988-89	21.07	23.97	17.20	26.37	19.38
1989-90	0.66	4.37	-7.87	-7.15	10.45
1990-91	-0.38	0.98	10.61	10.89	-5.93
Average	2.80	3.87	4.70	1.95	1.09

Continue

Percentage Change in Food grains Production- Post Reform Period

Year	Total Food grain Production	Rice Production	Wheat Production	Pulses Production	Coarse Cereal Production
1991-92	-1.18	0.52	1.00	15.71	-20.52
1992-93	6.59	-2.44	2.73	6.65	40.78
1993-94	2.66	10.21	4.60	3.74	-15.77
1994-95	3.93	1.88	9.91	5.56	-3.05
1975-76	-5.78	-5.90	-5.58	-12.32	-2.84
1996-97	10.54	6.18	11.67	15.84	17.86
1997-98	-3.60	0.97	-4.32	-8.98	-10.85
1998-99	5.90	4.30	7.44	14.87	3.09
1999-00	2.94	4.18	7.12	10.13	-3.22
2000-01	-6.10	-5.24	-8.76	-32.85	2.47
2001-02	8.15	9.84	4.43	20.78	7.36
2002-03	-17.89	-23.05	-13.75	-16.75	-21.87
2003-04	21.98	0.23	9.73	33.96	43.72
2004-05	-6.95	-6.09	-4.87	-11.93	-10.67
2005-06	5.16	10.41	1.03	1.98	1.79
2006-07	4.16	1.71	9.31	6.04	-0.44

2007-08	6.21	3.56	3.64	3.94	20.13
2008-09	-0.99	2.57	2.68	-1.28	-1.74
Average	1.98	0.76	2.11	3.07	2.54

Source- Computed from Various reports of Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Government of India

Table 2: Percentage change in area under cultivation for the production of food Grains- pre reform period

Year	Total Food grain Production	Rice Production	Wheat Production	Pulses Production	Coarse Cereal Production
1971-72	-1.37	0.45	4.93	-1.73	-5.18
1972-73	-2.07	-2.83	1.67	-5.55	-3.12
1973-74	6.09	4.36	-4.52	12.00	9.55
1974-75	-4.31	-1.04	-3.07	-5.97	-6.68
1975-76	5.86	4.20	13.55	10.98	1.50
1976-77	-2.98	-2.46	2.30	-6.01	-4.25
1977-78	2.54	4.60	2.58	2.26	0.81
1978-79	1.17	0.50	5.50	0.68	-0.12
1979-80	-2.94	-2.62	-2.07	-5.92	-2.06
1980-81	1.16	1.85	0.50	0.90	1.01
1981-82	1.95	1.39	-0.63	6.14	1.60
1982-83	-3.13	-6.01	6.46	-4.24	-4.76
1983-84	4.84	7.79	4.67	3.11	3.16
1984-85	-3.42	-0.19	-4.50	-3.40	-5.99
1985-86	1.06	-0.15	-2.38	7.39	0.66
1986-87	-0.64	0.07	0.56	-5.16	0.68
1987-88	-5.90	-5.73	-0.30	-8.16	-8.03
1988-89	6.67	7.52	4.55	8.84	5.83
1989-90	-0.70	1.05	-2.53	1.12	-2.56
1990-91	0.84	1.23	2.85	5.34	-6.63
Average	0.20	0.47	1.51	0.63	-1.08

Continue

Percentage change in area under cultivation for the production of food grains- post reform period

Year	Total Food grain Production	Rice Production	Wheat Production	Pulses Production	Coarse Cereal Production
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1991-92	-4.67	-0.09	-3.76	-8.60	-7.98
1992-93	1.05	-2.04	5.72	-0.80	2.94
1993-94	-0.32	1.82	2.07	-0.49	-4.65
1994-95	0.90	0.63	2.19	3.50	-1.98
1975-76	-2.30	0.07	-2.68	-3.26	-4.01
1996-97	2.12	1.38	3.52	0.76	3.0
1997-98	0.22	0.05	3.13	1.87	-3.08
1998-99	1.06	3.11	3.07	2.75	-4.83
1999-00	-1.65	0.80	-0.11	-10.13	0.00
2000-01	-1.66	1.00	-6.40	-3.64	3.13
2001-02	1.43	0.42	2.37	8.16	-2.44
2002-03	-9.89	10.29	-5.62	-8.90	-10.87
2003-04	8.42	3.42	9.33	14.43	14.11
2004-05	-2.79	-1.59	-4.87	-2.98	-5.74
2005-06	1.33	4.17	1.03	-1.62	-0.03
2006-07	1.73	0.34	9.31	1.89	-1.13
2007-08	0.29	0.22	3.64	2.02	-0.80
2008-09	-0.99	3.71	2.68	-6.51	-3.61
Average	-0.41	1.53	1.39	-0.64	-1.55

Source- Computed from Various reports of Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Government of India

Table 3: Percentage Change in Yield of Food grain Production Pre Reform Period

Year	Total Food grain Production	Rice Production	Wheat Production	Pulses Production	Coarse Cereal Production
1971-72	-1.60	1.60	5.58	-4.39	-15.19
1972-73	-5.24	-6.22	-7.90	-5.39	-2.84
1973-74	1.72	7.57	-7.79	-9.91	13.69
1974-75	-0.36	-9.20	14.16	6.56	-2.73
1975-76	14.56	18.18	5.38	17.14	14.52
1976-77	-5.30	-11.82	-1.63	-7.32	-0.72
1977-78	10.85	20.11	6.70	3.24	3.05
1978-79	3.13	1.53	5.94	0.98	1.55
1979-80	-14.28	-19.13	-8.42	-25.24	-9.57
1980-81	16.78	24.39	13.51	22.86	6.59
1981-82	0.88	-2.74	3.70	2.11	5.47

1982-83	0.29	-5.89	7.39	7.45	-6.55
1983-84	12.27	18.36	1.49	5.59	18.64
1984-85	-1.12	-2.74	1.46	4.01	-2.21
1985-86	2.26	9.53	9.41	3.99	-16.48
1986-87	-4.00	5.22	-6.35	-7.49	1.66
1987-88	3.99	-0.41	4.49	1.78	6.81
1988-89	13.47	15.29	12.09	16.12	12.90
1989-90	1.35	3.31	-5.48	-8.19	13.27
1990-91	2.30	-0.29	7.54	5.28	2.39
Average	2.60	3.36	3.06	1.46	2.21

Continue

Percentage change in yield of food grain Production --Post Reform Period

Year	Total Food grain Production	Rice Production	Wheat Production	Pulses Production	Coarse Cereal Production
1991-92	0.14	0.63	4.95	-7.78	-13.55
1992-93	5.43	-0.40	-2.80	7.50	36.63
1993-94	3.02	8.26	2.28	4.36	-11.66
1994-95	3.00	1.22	7.52	2.00	-1.06
1975-76	-3.56	-5.96	-2.97	-9.51	1.18
1996-97	8.25	4.73	7.89	15.04	14.04
1997-98	-3.84	0.96	-7.24	-10.71	-8.02
1998-99	4.83	1.10	4.22	11.82	8.32
1999-00	4.73	3.38	7.26	0.16	-3.18
2000-01	-4.58	-4.28	-2.52	-14.33	-0.68
2001-02	6.64	9.36	1.94	11.58	10.13
2002-03	-9.92	-13.23	-5.18	-8.40	-14.94
2003-04	12.50	17.20	3.94	1.94	26.39
2004-05	-4.34	-2.93	-4.09	-9.13	-5.56
2005-06	3.81	6.04	0.65	3.63	1.64
2006-07	16.55	1.28	3.39	2.34	.85
2007-08	2.55	3.33	3.47	2.12	21.06
2008-09	2.63	-1.08	3.74	5.44	1.95
Average	2.65	1.64	1.46	1.28	3.53

Source- Computed from Various reports of Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Government of India

Table 4: Percentage Change in Irrigated Area under Food grains Production—
 Pre Reform Period

Year	Total Food grain Production	Rice Production	Wheat Production	Pulses Production	Coarse Cereal Production
1971-72	-0.06	-1.52	4.84	00.00	-4.79
1972-73	2.26	2.38	3.48	28.57	-0.32
1973-74	1.34	1.74	-0.09	11.11	3.03
1974-75	3.63	0.03	3.03	20.00	13.94
1975-76	5.53	3.73	13.36	00.00	-3.65
1976-77	0.38	-2.94	8.18	00.00	-7.14
1977-78	3.46	9.65	1.15	8.33	-6.84
1978-79	5.11	4.14	8.16	61.54	0.16
1979-80	2.43	0.40	1.55	147.62	10.51
1980-81	-0.83	-3.16	3.01	42.31	-4.31
1981-82	1.54	3.27	-0.06	-16.22	1.14
1982-83	0.87	-4.80	9.77	11.29	-6.49
1983-84	5.01	9.87	5.02	37.68	-9.8
1984-85	-0.37	1.60	-2.38	30.53	-0.71
1985-86	-0.24	-1.84	-1.12	11.29	8.53
1986-87	3.39	2.71	2.39	-2.17	9.01
1987-88	-3.12	-6.60	0.73	21.48	-4.55
1988-89	7.83	12.80	6.91	1.22	0.65
1989-90	0.81	1.67	-1.25	9.64	4.64
1990-91	1.43	-0.19	3.60	8.79	-0.43
Average	2.02	1.65	3.52	21.65	0.13

Continue

Percentage Change in Irrigated Area under Food grains Production—Post Reform Period

Year	Total Food grain Production	Rice Production	Wheat Production	Pulses Production	Coarse Cereal Production
1991-92	1.98	4.01	0.26	-5.05	1.23
1992-93	2.32	-0.40	6.12	-5.85	-0.70
1993-94	3.00	3.23	2.91	-1.69	2.66
1994-95	3.38	3.10	3.14	4.02	5.20
1975-76	-0.79	0.36	-2.25	0.55	0.38
1996-97	2.63	3.37	3.87	3.85	-4.18
1997-98	0.79	-0.41	2.45	-2.64	-0.88
1998-99	7.62	5.88	3.37	-20.11	31.25
1999-00	1.63	4.70	3.00	4.08	-8.63
2000-01	-5.53	-2.45	-6.16	5.23	-14.19
2001-02	2.27	2.51	1.69	-27.33	4.23
2002-03	2.39	-11.84	-3.88	-5.13	-3.09
2003-04	-1.40	4.78	0.45	-5.55	-4.0
2004-05	4.73	3.99	1.13	2.20	00
2005-06	2.94	2.37	0.65	7.91	96.96
2006-07	1.75	1.25	3.39	2.66	3.07
2007-08	1.07	0.35	3.47	5.19	5.97
2008-09	.64	0.52	3.87	3.70	2.81
Average	2.02	1.37	1.46	-1.88	4.56

Source- Computed from Various reports of Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Government of India

Table 5: Percentage Growth in Fertilizer consumption

Pre Reform Period	Percentage change of fertilizer consumption	Pre Reform Period	Percentage change of fertilizer consumption
1971-72	3.47	1991-92	1.45
1972-73	4.12	1992-93	-4.50
1973-74	2.56	1993-94	1.73
1974-75	-9.36	1994-95	9.67
1975-76	12.47	1975-76	2.30

1976-77	17.86	1996-97	3.11
1977-78	25.65	1997-98	13.18
1978-79	19.38	1998-99	3.56
1979-80	02.69	1999-00	7.73
1980-81	04.96	2000-01	-7.96
1981-82	09.89	2001-02	4.38
1982-83	05.50	2002-03	-7.29
1983-84	20.44	2003-04	4.37
1984-85	06.49	2004-05	9.52
1985-86	03.20	2005-06	10.55
1986-87	02.01	2006-07	6.44
1987-88	01.60	2007-08	4.24
1988-89	25.68	2008-09	10.36
1989-90	04.78	Average	4.04
1990-91	08.45		
Average	8.59		

Source- Computed from Various reports of Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Government of India

Table 6: Annual Rainfall in India

Year	Actual Rain Fall(June-Sep.)in MM	Normal Rain Fall(June-Sep.)in MM	Actual Percentage Deviation from Normal
1998-99	926	863	7.23
1999-00	826	862	-4.12
2000-01	786	852	-7.77
2001-02	792	852	-7.04
2002-03	683	860	-20.58
2003-04	923	903	2.19
2004-05	781	893	-12.55
2005-06	879	893	-1.48
2006-07	887	892	-0.63
2007-08	937	892	5.01

2008-09	873	892	-2.13
Average	844.81	877.63	-3.80

Source: Indian Metrological Department

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