# NEED OF SECOND GREEN REVOLUTION FOR PULSES IN INDIA

**Mamta Dhama and Sudhir Kumar**

*Department of Botany, Janta Vedic College, Baraut, Baghpat (U.P.)*

**Abstract:** Our country India was totally dependent on food imports to feed its population. India today is not only self-sufficient in grain production but also has a substantial reserve. The progress made by agriculture in the last four decades has been one of the biggest success stories of free India. Agriculture and allied activities constitute the single largest contributor to the Gross Domestic Product, almost 33 percent of it. Agriculture is the means of livelihood of about two-thirds of the workforce in the country.

**Keywords:** Pulses, Wheat, Green revolution, Gross Cropped Area percentage, Statistical data.

## INTRODUCTION

Pulses are the important constituent of an average Indian diet as Roti with Daal and Daal chawal is an important ingredient in the average Indian diet. Pulses are the major sources of dietary protein in the vegetarian diet in our country. Besides being a rich source of protein, they maintain soil fertility through biological nitrogen fixation in soil and thus play a vital role in furthering sustainable agriculture (Kannaiyan, 1999). The poor population of India depends mainly on pulses for the protein part of their diet because these people can not afford other expensive sources of protein as protein is the building material of the body which is required for normal body growth.

Prof. M.S.Swaminathan helped India in becoming a self-sufficient nation in grain production by "Green revolution" with the help of high yielding varieties (HYV) of wheat produced by Norman Borlaug, who won the noble prize in 1970 for his work. These HYVs of wheat totally changed the scenario of our country, now we are very much self-sufficient in grain production.

The South-Asian Indo-Gangetic Plains is the birth place of 'green revolution'. Rice and wheat production dramatically increased with the introduction of improved varieties and cultivation technologies. The "begging bowls" have become "bread baskets", defying the Malthusian prediction. The 1970s saw a multi-fold increase in wheat production that heralded the Green Revolution. In the next decade rice production rose significantly; in 1995-96, rice production was 79.6 million tonnes. The total grain production crossed 211 million tones in 2001-02, a big leap from 51 million tonnes in 1950-51.

Before the Green Revolution Indians were doing organic farming, they were dependent on the organic manures made up of animal dung, plants waste, waste food materials and human excreta mainly. These bio-manures were rich in the micronutrients and microflora and fauna of soil like different types of fungi and bacteria. The microorganisms enriches the soil and the crops grown in the enriched soil were very nutritive but after the Green revolution the high yielding varieties of Wheat were introduced, which were totally dependent on chemical fertilizers.

The dependency of these so called high yielding varieties on the chemical fertilizers replaced the biofertilisers and biomanures. In the absence of biofertilisers and by the continuous use of chemical fertilizers the soils are badly degraded. The crops grown in these degraded soil became more prone to insects and pests. This led to use of more chemicals in the fields of India, in the form of insecticides and pesticides. All the chemicals in the form of fertilizers, weedicides, insecticides and pesticides are degrading the quality of our soil but we are still concentrating on the wheat and rice, not giving attention to the legumes, who can enrich the quality of the degraded soil.

Although the great "Green revolution" changed the food scenario of our country but on the other side legume crops, specially Pulses were neglected. More and more land area was occupied by wheat and rice crops and land area under pulses cultivation decreased. The cultivation and production of pulses was neglected due to the effect of 'green revolution'.The area under cultivation of wheat was

9.75 mha in 1950-51 that has increased to 27.70 mha in 2007-08 (Table 1).

**Table 1.** Production statistics of wheat in India.

| Crop Year | Area (mha) | Production (mton) | Yield (t/ha) |
|---|---|---|---|
| 1950-51 | 9.75 | 6.46 | 0.66 |
| 1960-61 | 12.93 | 11.00 | 0.85 |
| 1970-71 | 18.24 | 23.83 | 1.31 |
| 1980-81 | 22.28 | 36.31 | 1.63 |
| 1990-91 | 24.17 | 55.14 | 2.28 |
| 2000-01 | 25.73 | 69.68 | 2.71 |
| 2007-08 | 27.70 | 78.56 | 2.80 |

*Source:* Agricultural Statistics at a Glance, 2008.

However, today, due to continuous cultivation of rice and wheat, soils have deteriorated, water tables have declined, salinization has set in, insect pests and plant diseases have increased, and environmental problems have been growing in the region. The answer to the said problems is 'crop diversification' through the introduction of soil-enriching legumes that can revive the soils, decrease moisture consumption, disrupt the insect and disease cycles, and sustain the soil productivity.

The production has increased from 6.46 mton to 78.56 mton and the yield is increased from 0.66 ton $ha^{-1}$ to 2.80 ton $ha^{-1}$. These data itself reveals the success story of free India but on the other hand the intensive rice-wheat cultivation has created a stress on soil and water resources, and the very sustainability of crop production is under question. There is increasing natural resources degradation, namely the problem of water logging, salinity and over extraction of ground water particularly in high potential irrigated areas. Unbalanced fertilizer and pesticide use has led to soil nutrient imbalance in these areas. Poor soil organic carbon (SOC) content is the biggest environmental setback of green revolution technologies.

According to a survey of 8 South-East Countries, India is at bottom in SOC content ( 8.5g/kg ) as compared to Malaysia (33.6g/kg), the highest in SOC content. Poor SOC content in India is attributed to extensive mining of soil fertility, low and unbalanced fertilizer use, removal of crop residue for fodder, household fuel burning and severe soil degradation. About 130 million hectare land is under different degradation process.

All India yield of wheat was 2778 Kg $ha^{-1}$ in 1999-2000 and that has increased to 2891 Kg $ha^{-1}$ in 2008-2009. Punjab has the highest yield 4450 Kg $ha^{-1}$ in 2008-09 followed by Haryana 4268 Kg $ha^{-1}$ (Table 2.). In comparison to this all India yield of total pulses was 635 Kg $ha^{-1}$ in 1999-2000 and that has increased to 655 Kg $ha^{-1}$ in 2008-2009. ( Table 3).

**Table 2.** Statewise statistical data of production of wheat.

| **Statewise statistical data of yield of Wheat** | | | | | | | | | | **Yield Kg/ha** |
|---|---|---|---|---|---|---|---|---|---|---|
| State/ UTs | 1999-2000 | 2000-2001 | 2001-2002 | 2002-2003 | 2003-2004 | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 |
| Andhra Pradesh | 667 | 571 | 643 | 1273 | 583 | 556 | 818 | 900 | 889 | 769 |
| Arunachal Pradesh | 1308 | 1409 | 1395 | 1537 | 1500 | 2023 | 1525 | 1575 | 1442 | - |
| Assam | 1289 | 1219 | 1181 | 1130 | 1043 | 1066 | 1074 | 1117 | 1268 | 1154 |
| Bihar | 2186 | 2146 | 2065 | 1896 | 1776 | 1609 | 1617 | 1908 | 2058 | 2050 |
| Chhattisgarh | - | 1022 | 1057 | 1063 | 1024 | 853 | 886 | 1002 | 1059 | 1040 |
| Gujrat | 2116 | 2268 | 2435 | 1966 | 2681 | 2482 | 2700 | 2498 | 3013 | 2400 |
| Haryana | 4165 | 4106 | 4103 | 4053 | 3937 | 3901 | 3844 | 4232 | 4158 | 4268 |
| Himachal Pradesh | 1574 | 693 | 1738 | 1379 | 1380 | 1890 | 1894 | 1385 | 1376 | 1653 |
| Jammu & Kashmir | 1768 | 529 | 1325 | 1646 | 1804 | 1910 | 1790 | 1893 | 1782 | 1836 |
| Jharkhand | - | 1626 | 1765 | 1625 | 552 | 2381 | 1340 | 1529 | 1621 | 1500 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Karnataka | 833 | 917 | 763 | 598 | 415 | 740 | 858 | 762 | 946 | 903 |
| Madhya Pradesh | 1863 | 1471 | 1620 | 1456 | 1800 | 1735 | 1613 | 1835 | 1612 | 1723 |
| Maharashtra | 1369 | 1257 | 1388 | 1295 | 1170 | 1344 | 1393 | 1325 | 1659 | 1451 |
| Meghalaya | 1628 | 1643 | 1714 | 1741 | 1667 | 1778 | 1714 | 2000 | 1833 | - |
| Nagaland | 2500 | 2000 | 2500 | 2125 | 2000 | 1585 | 1583 | 867 | 1067 | - |
| Orissa | 1305 | 1466 | 1514 | 1261 | 1471 | 1250 | 1364 | 1487 | 1554 | 1507 |
| Punjab | 4696 | 4563 | 4532 | 4200 | 4207 | 4221 | 4179 | 4210 | 4507 | 4450 |
| Rajasthan | 2540 | 2402 | 2793 | 2709 | 2794 | 2839 | 2762 | 2751 | 2749 | 3047 |
| Sikkim | 1580 | 1403 | 1273 | 1413 | 1421 | 1456 | 1385 | 1385 | 1000 | - |
| Tripura | 1846 | 2000 | 2083 | 2000 | 4250 | 2545 | 2636 | 1800 | 1900 | - |
| Uttar Pradesh | 2764 | 2724 | 2755 | 2596 | 2794 | 2502 | 2627 | 2721 | 2817 | 3002 |
| Uttarakhand | - | 1885 | 1933 | 1825 | 1877 | 2038 | 1633 | 2049 | 2050 | 2151 |
| West Bengal | 2336 | 2485 | 2215 | 2189 | 2315 | 2103 | 2109 | 2282 | 2602 | 2600 |
| D & N Haveli | 1500 | 1600 | 2000 | 2000 | 2000 | 1833 | 1833 | 1833 | 1833 | - |
| Delhi | 919 | 3522 | 3510 | 4005 | 3515 | 3944 | 4339 | 4341 | 4354 | - |
| **All India** | **2778** | **2708** | **2762** | **2610** | **2713** | **2602** | **2619** | **2708** | **2802** | **2891** |
| *4th Advance Estimates released as on 21.07. 2009 | | | | | | | | | | |

**Table 3.** Statewise statistical data of production of total pulses.

| **Statewise statistical data of yield of Wheat** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | **Yield Kg/ha** |
| State/ UTs | 1999-2000 | 2000-2001 | 2001-2002 | 2002-2003 | 2003-2004 | 2004-2005 | 2005-2006 | 2006-2007 | 2007-2008 | 2008-2009 |
| Andhra Pradesh | 486 | 554 | 593 | 506 | 567 | 565 | 772 | 679 | 803 | 821 |
| Arunachal Pradesh | 1000 | 1115 | 1044 | 1055 | 1088 | 1046 | 1078 | 1078 | 1078 | |
| Assam | 552 | 559 | 558 | 541 | 557 | 571 | 537 | 557 | 558 | 543 |
| Bihar | 863 | 865 | 788 | 804 | 814 | 710 | 749 | 722 | 818 | 804 |
| Chhattisgarh | | 400 | 517 | 468 | 608 | 395 | 477 | 543 | 586 | 546 |
| Goa | 882 | 889 | 894 | 798 | 939 | 904 | 1045 | 1358 | 991 | - |
| Gujrat | 579 | 300 | 520 | 469 | 748 | 675 | 704 | 593 | 843 | 757 |
| Haryana | 571 | 622 | 794 | 655 | 719 | 793 | 622 | 824 | 602 | 1032 |
| Himachal Pradesh | 470 | 629 | 360 | 497 | 552 | 560 | 713 | 932 | 1062 | 1096 |
| Jammu & Kashmir | 490 | 471 | 472 | 486 | 482 | 492 | 504 | 505 | 508 | 461 |
| Jharkhand | - | 825 | 733 | 806 | 508 | 586 | 567 | 686 | 736 | 754 |
| Karnataka | 442 | 467 | 397 | 337 | 304 | 376 | 487 | 377 | 531 | 465 |
| Kerala | 796 | 797 | 792 | 773 | 833 | 853 | 775 | 857 | 857 | 979 |
| Madhya Pradesh | 766 | 640 | 773 | 574 | 761 | 759 | 754 | 780 | 609 | 810 |
| Maharashtra | 613 | 560 | 555 | 577 | 569 | 492 | 584 | 602 | 746 | 555 |
| Manipur | - | 525 | 517 | 481 | 508 | 380 | 523 | 523 | 497 | - |
| Meghalaya | 742 | 745 | 745 | 717 | 745 | 1385 | 750 | 744 | 825 | - |
| Mizoram | 1780 | 1625 | 1444 | 1087 | 865 | 1297 | 1215 | 1160 | 529 | - |
| Nagaland | 794 | 827 | 849 | 933 | 1000 | 797 | 1281 | 1200 | 1189 | - |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Orissa | 387 | 352 | 398 | 354 | 382 | 388 | 416 | 445 | 446 | 473 |
| Punjab | 688 | 740 | 670 | 783 | 823 | 801 | 804 | 850 | 804 | 829 |
| Rajasthan | 360 | 308 | 425 | 269 | 590 | 375 | 261 | 462 | 401 | 467 |
| Sikkim | 910 | 852 | 862 | 930 | 958 | 957 | 897 | 897 | 928 | - |
| Tamilnadu | 431 | 455 | 427 | 345 | 374 | 410 | 337 | 541 | 303 | 309 |
| Tripura | 587 | 584 | 647 | 625 | 619 | 618 | 629 | 654 | 691 | - |
| Uttar Pradesh | 968 | 803 | 886 | 822 | 890 | 847 | 811 | 725 | 731 | 908 |
| Uttarakhand | - | 765 | 635 | 624 | 690 | 622 | 590 | 642 | 794 | 609 |
| West Bengal | 768 | 800 | 704 | 695 | 840 | 740 | 785 | 703 | 793 | 816 |
| A & N Islands | 333 | 571 | 500 | 462 | 571 | 571 | 500 | 571 | 591 | - |
| D & N Haveli | 763 | 877 | 825 | 923 | 850 | 831 | 862 | 862 | 862 | - |
| Delhi | 250 | 571 | 667 | 750 | 800 | 1000 | 1000 | 1750 | 1750 | - |
| Daman & Diu | 1000 | 1000 | 846 | 769 | 846 | 923 | 846 | 846 | 846 | - |
| Pondicherry | 672 | 600 | 538 | 350 | 346 | 316 | 324 | 324 | 83 | - |
| **All India** | **635** | **544** | **607** | **543** | **635** | **577** | **597** | **612** | **625** | **655** |
| *4th Advance Estimates released as on 21-07- 2009 | | | | | | | | | | |

The Gross cropped area percentage of total cereals was 51.75 in 2005-06 and that is increased to 52.18 in 2006-07. In which the Gross cropped area percentage of rice alone was 22.72 in 2005-06 and 22.65 in 2006-07 (Table 4).

**Table 4.** Gross Cropped Area percentage distribution

| **Gross Cropped Area Percentage Distribution** | | |
|---|---|---|
| **Crop** | **2005-06** | **2006-07** |
| Rice | 22.72 | 22.65 |
| Wheat | 13.79 | 14.61 |
| Jowar | 4.50 | 4.35 |
| Bajra | 5.01 | 4.92 |
| Maize | 4.01 | 4.13 |
| Ragi | 0.85 | 0.68 |
| Barley | 0.33 | 0.34 |
| Other Cereals And Millets | 0.53 | 0.49 |
| Coarse Cereals | 15.23 | 14.92 |
| Total Cereals | 51.75 | 52.18 |
| Gram | 3.59 | 3.87 |
| Tur | 1.85 | 1.77 |
| Other Pulses | 6.87 | 6.65 |
| Total Pulses | 12.30 | 12.30 |
| Total Food-Grains | 64.05 | 64.48 |
| Sugarcane | 2.42 | 2.68 |
| Condiments and Spices | 1.48 | 1.53 |
| Total fruits | 2.10 | 2.10 |
| Potatoes | 0.74 | 0.78 |
| Onions | 0.34 | 1.08 |
| Total vegetables 2.97 | | 2.88 |
| Groundnut | 3.55 | 2.94 |
| Sesamum | 1.05 | 1.07 |
| Rapeseed & Mustard | 3.80 | 3.52 |
| Linseed | 0.22 | 0.22 |
| Other oil seeds | 7.31 | 7.41 |
| Total oil seeds | 15.94 | 14.87 |
| Cotton | 4.47 | 4.71 |
| Jute | 0.40 | 0.41 |
| Mesta | 0.07 | 0.08 |
| Total fibres | 4.98 | 5.23 |
| Tobbaco | 0.19 | 0.19 |
| Other crops | 5.87 | 6.03 |
| Gross cropped Area | 100.00 | 100.00 |

***Source:* Agricultural Statistics at a Glance, 2009.

In comparison to the cereals the Gross cropped area percentage of total pulses was 12.30 in 2005-06 and that remains the same in 2006-07 (Table 4).

The Gross cropped area percentage of wheat was 13.79 in 2005-06 and that is increased to 14.61 in 2006-07 (Table 4).

Now a days, we all are complaining about the high prices of pulses and we all are concern that Daal (pulse) is vanishing out from our Thali (plate) as the prices of pulses are going higher and higher. Pulses are important source of protein and all the vegetarian population of country depends mainly on pulses for the protein part of their diet. So pulse sector of India should be given national attention and special plans and strategies shoulad be introduced to boost up this pulse sector as it is neglected from decades.

The leguminous plants on symbiotic association with soil bacterium, the *Rhizobium* forms nitrogen fixing root nodules which are agronomically significant as they provide an alternative to the use of energy expensive nitrogenous chemical fertilizer. Despite the large and increasing use of nitrogenous fertilizers in agriculture, estimates suggest that biological nitrogen fixation contributes at least four times more nitrogen to the soil.

In view of sustainable agriculture, we must encourage the farmers to grow pulses as it enriches the soil so that the Indian farmers can earn without losing the most important asset, the soil. New government policies and schemes should be launched to promote the pulse sector of India.

In conclusion, a second "Green revolution" with some new techniques, approaches and strategies is needed for pulse sector which should give emphasis on the growth and further development of pulse sector so that every Indian can have pulse in his/her Thali.

## REFERENCES

Agricultural Statistics at a glance, (2008).

Agricultural Statistics at a glance, (2009).

**Bayliss, Smith, T.B. and Wanmali, S.** (1984). The Green revolution at micro scale in understanding green revolution. Cambridge University Press.

**Kang, D.S.** (1982). Environmental problems of the green revolution with a focus on Punjab, India. In Richard Barrett. (ed.), International dimensions of the environmental crisis. Westview, Boulder, Colorado.

**Kannaiyan, S.** (1999). Bioresources, Technology for sustainable agriculture, Associated Publishing company, New Delhi. p.422.

**Shiva, Vandana** (1991). The Green revolution in Punjab. *The ecologist*. **21**(2): 57-60.

**Swaminathan, M.S.** (1983). Science and the conquest of hunger. *Concept*. Delhi. p.409.