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# Instability in Indian Agriculture: An Inter-State Analysis

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**Abstract**

Instability in agricultural production has attracted renewed attention due to change in factors that affect instability positively as well as negatively. There is considerable concern about effect of climate change on production trend. Studies on instability found in the literature have not gone beyond mid 2000s after which Indian agriculture witnessed a structural change in growth. In this paper instability analysis is extended to year 2010-11 to capture recent developments. The study covers entire post-Independence period since 1950-51. The analysis is undertaken at the national and state levels. The analysis reveals that the instability in foodgrains production in India has undergone substantial decline whereas oilseeds production showed significant increase over time. The states which are well endowed with irrigation facility are showing more stability in foodgrains production. The increase in crop yield has been a major factor for accelerating production in the country. The better irrigation facilities, use of modern seed varieties, and improved fertilizer consumption helped to improve foodgrains output in the country.

***Keywords:*** Instability, area, production, yield, growth and India

Agriculture production everywhere is vulnerable to natural forces like rainfall and temperature. As a result agricultural production deviates from normal trend. This instability in agricultural production imparts considerable risk to production and farm income and directly affects livelihood of farmers. It also affects the prevailing prices in the markets, which in turn affects the economy of the country as a whole. Instability in production is a major factor in causing price volatility which in turn has serious implications for food management, food security and economic stability of a country. The interest of researchers in instability analysis stems mainly from the fact that degree of vulnerability in production can be considerably reduced through technological intervention, infrastructure like irrigation, farm investments, choice of method of production, input use and management, and right set of policies. In order to develop effective strategy to deal with instability and its effects there is a need to have a clear picture of degree of instability at various levels and how it moved over time.

Many studies are available on impact of green revolution on instability of agriculture, but results are contradicting. Some of the studies which covered 10-20 years from the initiation of this new technology revealed that this technology made the agricultural production more unstable (Mehra, 1981; Hazel, 1982; Ray 1983; Rao *et al*., 1988), whereas, MahendraDev during 1987 pointed out progressive but marginal decline in instability in food grain production at the all India level, and mixed results at state level. The study by Larson *et al.*, 2004 found out that technology led growth in foodgrains production has come at the cost of greater instability in agricultural production and yield. Chand *et al.,* 2009 concluded that increase in instability due to adoption of green revolution gets totally refuted at country level. Chand *et al.,* 2011 also observed a large variation in instability in food grain production across Indian states.

Most of the studies pointed out that the instability has increased with the adoption of green revolution but what happened to it with the wider adoption in more states in recent decade has not been examined. Also, previous studies on instability in Indian agriculture have focused on instability *per se* without linking it to patterns of growth and changes in factors affecting instability. Second, no study has gone beyond year 2006 when agriculture sector witnessed a sort of structural break in the form of reversal of deceleration in growth rate to acceleration in growth rate of output (Chand and Parappurathu, 2012). The present study fills these gaps and it extends analysis of instability to year 2010-11 to include recent period which show considerable improvement in performance of agriculture sector.[1]

This paper examines changes in instability resulting from (a) adoption of green revolution technology and (b) widespread dissemination of this technology over larger areas in the country. The paper also analyses association between growth and instability and instability and spread of irrigation.

**Data and Methodology**

Data on important variables like area, production and yield of all major food crops and groups were compiled for the period 1950-51 to 2010-11 from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi. In order to capture the impact of green revolution on stability of agriculture, we have divided the entire selected period into three phases and termed them as Pre-green revolution phase, Period of green revolution and post green revolution phase with wider dissemination of technology.

Pre-green revolution is taken from 1950-51 to 1964-65. The foodgrains production seems to be abnormal for the years 1965-66 and 1966-67, so the next period is taken from 1967-68 to 1987-88, which we referred as green revolution phase. Post green revolution period is taken from 1988-89 to 2010-11. As grouping of non-foodgrains is not as simple as foodgrains, due to heterogeneity in them. So, in order to capture the instability of non-foodgrains crops, we have used index number of area, production and yield of non-foodgrains also for the period 1950-51 to 2010-11.

The following method is used to estimate instability in agricultural production.

Where,

1 Post 2004-05, growth rate of GDP agriculture increased to 3.37% compared to 2.30% in the previous decade. (Chand and Parappurathu, 2012).

$$II = std\left[\ln\left(\frac{Y_{t+1}}{Y_t}\right)\right]$$

II = Instability Index

std = standard deviation

ln= natural logarithm

$Y_{t+1}$ = area / production / yield for the current year

$Y_t$= area / production / yield in the previous year

This index measures deviations from the underlying trend. Moreover, it is unit free and robust index. In this method, if the series of any given variable fluctuates more than ratio $Y_{t+1}/Y_t$also fluctuates more, that increases standard deviation. On the other hand, if there are no deviations from trend than ratio$Y_{t+1}/Y_t$ is constant and thus standard deviation is zero.

**Results and Discussion**

***Instability at National Level***

Estimates of instability in area, production and yield of major food groups are presented in Table 1.Inter year variation inarea under cereals as well as foodgrainsincreased in green revolution period as compared to pre green revolution period and in the post green revolution period though it declined but still remained higher than the pre-green revolution period.Instability in area under pulses and oilseeds registered acceleration over all the periods. Area under pulses showed higher instability than the area under oilseeds.

**Table 1. Instability in area, production and yield of major crop groups in different periods at All India Level**
(Percent)

| Crop group | Area | | | Production | | | Yield | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1951 to 1965 | 1968 to 1988 | 1989 to 2011 | 1951 to 1965 | 1968 to 1988 | 1989 to 2011 | 1951 to 1965 | 1968 to 1988 | 1989 to 2011 |
| Cereals | 2.30 | 3.00 | 2.77 | 9.58 | 9.43 | 7.98 | 7.75 | 7.33 | 5.44 |
| Pulses | 4.35 | 5.96 | 6.24 | 14.70 | 13.90 | 13.60 | 12.91 | 10.54 | 9.14 |
| Foodgrains | 2.59 | 3.39 | 3.09 | 10.00 | 9.65 | 8.24 | 8.06 | 7.28 | 5.52 |
| Oilseeds | 5.01 | 5.48 | 5.83 | 12.72 | 17.06 | 17.94 | 12.07 | 13.01 | 15.71 |

*Source:* Computed from various issues of Agricultural Statistics at a Glance,Directorate of Economics and Statistics, Ministry of Agriculture, GoI.

Instability in production of foodgrains shows decline in the second period as compared to the first period and in the third period it further declined as compared to the second period. In the case of oilseeds production instability increased by 34% between pre green revolution and period of green revolution, it further increased by 5% during post green period. It is noteworthy to observe that the production instability of pulses declined over time. Yield of cereals and pulses appear more stable during post green revolution period whereas opposite holds true for oilseeds productivity.

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Inter year variation in area, production and yield of individual crops is presented in Table 2. It can be inferred from the Table 2 that green revolution has impacted the instability in desired direction. The instability of wheat, which is one of the most important staple food shows decline in instability after 1968 in all three respects. Area instability reduced by 27% and almost same reduction is observed in yield instability after adoption of green revolution technology. Wider dissemination of technology and irrigation facility brought down the instability of paddy after 1988 onwards. Maize shows lowest instability in area, whereas, Bajra shows the maximum among all the selected cereals. Instability in production and yield of Bajra remained almost double as compared to pre green revolution period. Maize production variability registered sharp decline after 1988 because of reduction in yield instability. Instability in jowar yield, production and area showed decline during second phase but a big increase is registered in third period of wider dissemination of technology.

Among pulses, instability in area under gram increased over time whereas yield instability declined over time. The yield instability was reduced by 37% after 1988. Because of these counteracting factors instability in production of gram in all the three phases remained around 21%. Area under red gram also shows increase in instability over time but its yield instability show decline during green revolution period which again increased in post green revolution period. The variability in Red gram output came down from 18.8 during 1951-1966 to 14.34 during 1968-1988 which again increased to 18.42 during 1989–2011.

**Table 2. Instability in area, production, yield and irrigated area of selected crops in different periods from 1950-51 to 2010-11 at all India level**

(Percent)

| Crop | Area | | | Production | | | Yield | | | Area under Irrigation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1951-1966 | 1968-1988 | 1989-2011 | 1951-1966 | 1968-1988 | 1989-2011 | 1951-1966 | 1968-1988 | 1989-2011 | 1951-1966 | 1968-1988 | 1989-2011 |
| Paddy | 2.13 | 3.38 | 3.20 | 12.18 | 13.62 | 9.16 | 10.96 | 11.05 | 6.64 | 35.65 | 40.63 | 52.55 |
| Wheat | 6.61 | 4.59 | 3.34 | 12.93 | 8.97 | 6.67 | 10.56 | 6.58 | 4.75 | 34.29 | 65.99 | 87.12 |
| Jowar | 3.93 | 3.80 | 4.96 | 16.11 | 13.32 | 18.47 | 14.84 | 11.32 | 16.14 | 3.54 | 4.46 | 7.25 |
| Bajra | 5.89 | 10.10 | 10.61 | 18.30 | 39.54 | 38.67 | 15.32 | 32.55 | 29.88 | 2.97 | 5.02 | 7.15 |
| Maize | 3.44 | 3.06 | 2.62 | 10.81 | 18.44 | 12.99 | 9.19 | 16.74 | 11.52 | 12.49 | 18.49 | 21.83 |
| Gram | 8.05 | 10.42 | 14.29 | 20.14 | 21.68 | 20.19 | 17.95 | 16.94 | 10.66 | 13.21 | 16.62 | 27.09 |
| Red gram | 3.71 | 5.31 | 6.43 | 18.81 | 14.34 | 18.42 | 18.97 | 14.28 | 16.41 | 0.49 | 1.84 | 4.81 |
| Groundnut | 9.52 | 4.12 | 7.00 | 14.07 | 23.00 | 32.93 | 15.19 | 20.18 | 29.51 | 2.39 | 10.71 | 18.87 |
| R/Mustard | 7.97 | 9.66 | 13.69 | 20.31 | 21.26 | 21.07 | 20.98 | 18.20 | 15.33 | 10.34 | 41.68 | 66.86 |
| Coconut | 3.12 | 3.11 | 2.93 | 7.21 | 6.87 | 12.87 | 5.82 | 5.81 | 12.85 | - | - | - |
| Cotton | 5.71 | 4.76 | 7.12 | 17.25 | 16.51 | 17.92 | 15.31 | 14.52 | 15.57 | 12.21 | 24.94 | 34.75 |
| Sugarcane | 10.90 | 9.27 | 8.94 | 14.67 | 11.64 | 10.86 | 9.47 | 6.78 | 4.85 | 68.25 | 79.19 | 90.89 |
| Potato | 3.70 | 6.95 | 5.84 | 16.24 | 14.00 | 13.43 | 13.81 | 10.72 | 11.39 | - | - | - |
| Tobacco | 11.17 | 10.48 | 14.95 | 15.24 | 13.29 | 19.16 | 9.35 | 7.29 | 8.08 | 16.23 | 29.86 | 45.64 |

*Source* : Same as in Table 1

Within oilseeds group of crops, area instability in the case of groundnut declined to less than half during second phase and then increased by almost 70% after 1988. Variability in its productivity increased by 33% between first and second period which further increased by 46% between second and third phase. Almost similar trend was observed for production instability. In the case rapeseed and mustard area instability experienced substantial increase over time but yield instability registered decline in all the phases and production shows inter year variability of about 21%.

Coconut registers decline in inter year variation in area but instability in output and productivity increased in the recent period. Sugarcane is another crop which shows decline in instability in all respects over all time periods. Yet production and productivity of sugarcane appears to be more stable than area. Area under cotton witnessingdecline during green revolution period as compared to pre green revolution but after that it registered increase of 50%. Variability in cotton productivity varied around 15% and output around 18% with little change between different periods.

In case of potato, area instability is much higher in green revolution period as compared to pre green revolution period. Modern technology has some impact on the cultivation of potato and its area instability come down during post green revolution period. However, its production shows decline in instability over time and productivity register marginal increase in post green revolution period. Variability in area and production of tobacco followed a small decline in the phase of green revolution, but it increased sharply during post green revolution period.

It may be concluded here that crops which are grown under irrigated conditions register low instability in their production. Sugarcane and wheat area covered under irrigation is nearly 90% and for paddy it is around 53%. Whereas, area under irrigation is 7-16% for the coarse cereals. Among pulses, 27 per cent area is irrigated under gram and for red gram it is around 5% (Table 2).

Variability in foodgrains, non-foodgrains and all crops are computed using index numbers of area, production and yield (Table 3). Aggregation of output of non-food crops can give misleading results because of high heterogeneity in non- food grain crops. Therefore, index number approach is used here to get clear picture of their production. Instability index of both area and production of foodgrains showed increase in green revolution as compared to pre green revolution period. It is as low as 2.51% for area under food grains and as high as 10.05% for production during the pre- green revolution, which rose to 3.39 and 10.31% for area and production respectively. Inter year variation for both area and production witnessed decline during post green revolution years –the decline is sharper for output. The adoption of green revolution technology marked decline in instability in yield from 9.05 to 8.05 between periods of 1951-65 to period of 1968-88. When improved technology spread to larger areas the variability in productivity further declined and registered decline of almost 30% in post green revolution period as compared to previous period.

It is interesting to observe from the Table 3 that when area and production of food grains moved towards stability than the area and production of non foodgrains became more unstable. Area instability of non-foodgrains declined by 10% from pre green revolution to green revolution period but increased thereafter and reached to 4.26%. Similar pattern is observed by production and productivity of non-foodgrains.

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**Table 3. Instability in area, production and yield of food grains, non- food grains and all crops in different periods at all India level**

(per cent)

| Crop group | Period | Area | Production | Yield |
|---|---|---|---|---|
| Foodgrains | 1951 to 1965 | 2.51 | 10.05 | 9.05 |
| | 1968 to 1988 | 3.39 | 10.31 | 8.05 |
| | 1989 to 2011 | 3.13 | 8.51 | 5.75 |
| Non-foodgrains | 1951 to 1965 | 3.96 | 7.59 | 7.04 |
| | 1968 to 1988 | 3.54 | 6.87 | 5.01 |
| | 1989 to 2011 | 4.26 | 7.53 | 7.76 |
| All crops | 1951 to 1965 | 1.86 | 8.3 | 7.93 |
| | 1968 to 1988 | 3.19 | 8.35 | 6.43 |
| | 1989 to 2011 | 3.01 | 6.83 | 5.12 |

*Source:* Computed from various issues of Economic Survey, Ministry of Finance, Government of India

Instability in area under non- foodgrains remained higher than instability in area under food grain crops in all the three periods. However, instability in productivity of non foodgrain group was lower than foodgrains in the first and the second period but not in the third period. The combined effect of instability in area and yield on production instability clearly indicates that foodgrains production remained more unstable as compared to non-foodgrains.

Instability in total of all crops including foodgrains and non-foodgrains indicate a big increase in fluctuations in the area in the green revolution period over pre green revolution period. Though the third period of post green revolution registered slight decline in instability as compared to second period of green revolution but it remains much higher as compared to the pre green revolution period. Inter year variability of output of all crops lie between 8.30 to 8.35 during pre-green revolution period and green revolution period. Production instability of all crops declined by 18% in the post green revolution period.Instability index of productivity of all crops was 7.93 during 1951 to 1965 and it registered decline of 18% in next period and reached to 6.43 during 1968 to 1988. It further declined to 5.12 in post green revolution period.

**Instability at State Level**

Different types of agricultural conditions are prevailing in different states of India. Therefore variation in instability and growth in crop production is expected across states. State level analysis focuses on instability and growth in area, production and yield for foodgrains. The entire period 1967-68 to 2010-11 is divided into two sub period. First period of green revolution 1967-68 to 1987-88 and second 1988-89 to 2010-11 as post green revolution period with wider dissemination of technology respectively. The results are presented in Table 4.

As already discussed instability in foodgains area, production and productivity declined in second phase as compared to first phase at Country level. At state level, 10 out of 17 major states exhibit similar pattern. Gujarat registered highest instability in area under foodgrains during green revolution period. Rajasthan, Karnataka and Tamil Nadu are the next states in order according to area under foodgrains instability. During post green revolution period, Gujarat and Rajasthan exchanged their ranks and witnessed increase in instability, whereas, Karnataka and Tamil Nadu followed decline in year to year variation. Andhra Pradesh, Kerala, Madhya Pradesh, Orissa, Rajasthanand Uttar Pradesh are the other states which register increase in variation in area under food grains during 1988-89 to 2010-11. Andhra Pradesh, Kerala, Orissa and Rajasthan are the states, which witnessed increase in area instability in second period as compared to first period also witnessed increase in instability in production and productivity of food grains.

Punjab witnessed highest growth in the foodgrains production in green revolution period, whereas, Haryana registered highest growth in the foodgrains production in the post green revolution period. Haryana witnessed significant decline in the production instability over the first period. Karnataka and West Bengal are the states which showed increase in growth rates of foodgrains production and decline in instability in second period as compared to first period. Andhra Pradesh, Himachal Pradesh, Kerala, Madhya Pradesh and Orissa states are registering decline in growth and increase in instability of foodgrains production in post green revolution period over green revolution period.

**Table 4. State wise instability in food grains production during 1968-2011.**

(%)

| State | Period | Instability | | | Growth Rates | | |
|---|---|---|---|---|---|---|---|
| | | Area | Production | Yield | Area | Production | Yield |
| Andhra Pradesh | I | 5.99 | 12.94 | 8.87 | -0.86 | 2.48 | 3.37 |
| | II | 8.14 | 17.75 | 10.96 | -0.14 | 2.27 | 2.42 |
| Assam | I | 4.91 | 12.16 | 9.65 | 0.96 | 1.57 | 0.61 |
| | II | 3.68 | 8.95 | 5.84 | -0.20 | 1.13 | 1.33 |
| Bihar | I | 5.33 | 16.43 | 12.57 | -0.32 | 1.30 | 1.63 |
| | II | 3.78 | 15.77 | 13.53 | -1.17 | 0.69 | 1.88 |
| Gujarat | I | 14.29 | 40.47 | 28.53 | -0.92 | 0.73 | 1.66 |
| | II | 15.93 | 42.59 | 28.35 | -0.25 | 2.38 | 2.64 |
| Haryana | I | 9.91 | 17.54 | 12.38 | 0.22 | 4.22 | 3.99 |
| | II | 7.75 | 11.11 | 6.76 | 0.84 | 2.72 | 1.86 |
| Himachal Pradesh | I | 2.27 | 13.73 | 12.86 | 0.43 | 0.63 | 0.20 |
| | II | 1.98 | 19.29 | 18.40 | -0.43 | -0.01 | 0.43 |
| Jammu & Kashmir | I | 1.60 | 12.20 | 11.78 | 0.63 | 1.38 | 0.74 |
| | II | 1.59 | 10.29 | 10.74 | 0.19 | 0.58 | 0.39 |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Karnataka | I | 10.74 | 22.32 | 13.41 | 0.32 | 1.13 | 0.81 |
| | II | 4.82 | 18.83 | 16.11 | 0.44 | 2.33 | 1.88 |
| Kerala | I | 3.28 | 6.07 | 4.39 | -1.96 | -0.91 | 1.07 |
| | II | 3.82 | 8.15 | 5.48 | -4.98 | -3.65 | 1.40 |
| Madhya Pradesh | I | 2.49 | 19.84 | 18.55 | 0.42 | 2.21 | 1.79 |
| | II | 4.59 | 20.17 | 16.27 | -0.12 | 0.80 | 0.92 |
| Maharashtra | I | 8.18 | 27.44 | 20.08 | 0.62 | 3.28 | 2.64 |
| | II | 5.38 | 21.60 | 18.65 | -0.66 | 0.37 | 1.03 |
| Odisha | I | 4.50 | 21.92 | 18.14 | 1.11 | 1.40 | 0.29 |
| | II | 6.66 | 28.82 | 24.73 | -0.99 | 0.27 | 1.28 |
| Punjab | I | 3.58 | 5.00 | 5.11 | 2.16 | 5.59 | 3.35 |
| | II | 1.81 | 4.92 | 4.10 | 0.75 | 1.83 | 1.07 |
| Rajasthan | I | 10.92 | 27.89 | 21.34 | -0.08 | 2.00 | 2.08 |
| | II | 17.54 | 38.88 | 23.88 | 0.50 | 2.69 | 2.18 |
| Tamil Nadu | I | 10.17 | 22.76 | 15.03 | -1.17 | -0.32 | 0.86 |
| | II | 7.70 | 18.98 | 14.24 | -1.48 | -1.02 | 0.47 |
| Uttar Pradesh | I | 2.18 | 14.78 | 13.73 | 0.34 | 3.78 | 3.42 |
| | II | 2.84 | 8.34 | 6.59 | 0.08 | 1.38 | 1.30 |
| West Bengal | I | 4.69 | 15.83 | 12.94 | -0.08 | 1.49 | 1.58 |
| | II | 4.44 | 6.51 | 5.21 | -0.18 | 1.51 | 1.69 |
| India | I | 3.49 | 9.90 | 7.56 | 0.19 | 2.57 | 2.38 |
| | II | 3.30 | 8.80 | 5.83 | -0.08 | 1.42 | 1.50 |

*Source*: Agricultural Statistics at a Glance, various issues, Directorate of Economics and Statistics, Ministry of Agriculture, GoI

*Note*: Period I is 1968-88 and Period II is 1989-2011

Most of the selected states registered decline in instability of production of foodgrains over time but Andhra Pradesh, Himachal Pradesh, Kerala, Odisha and Rajasthan are the states which showed more than 30% increase in instability in production of foodgrains in second period as compared to first period. Production of Punjab seems to be most stable followed by Madhya Pradesh. Production of foodgrains in Assam, Haryana, Uttar Pradesh and West Bengal turned more stable in the second period. Instability in production remained very high - to the tune of 40% in Gujarat and Rajasthan. Karnataka, Maharashtra, Orissa, Rajasthan and Tamil Nadu are the states which exceeded scale of 20 in instability. Orissa, which is located in high rainfall eastern region, shows high instability like dry-land arid region states.

Himachal Pradesh witnessed highest increase in yield variability over the time followed by Odisha. Karnataka, Kerala and Andhra Pradesh are the other states which registered increase in instability more than 20% over pre green revolution period. West Bengal,Uttar Pradesh and Haryana were able to bring down yield instability to less than half after 1988.

## Conclusion and Policy Implications

Adoption of new agricultural technology of green revolution period and its wider dissemination after 1987-88 have affected instability in area and production differently. In the case of cereals, pulses and food grains, there is a clear evidence of decline in inter year variation in yield in the green revolution period which gained momentum in the post green revolution period. However, spread and progress in agricultural technology did not help in reducing instability in area under cereals and pulses at country level. Even irrigation expansion, which helped in reducing yield variability,did not reduce instability in area. One reason for this could be increase in cropping intensity which is more sensitive to weather aberrations than net cultivated area. In the case of oilseeds, area as well as productivity witnessed increase in inter year variation throughout. Thus, none of the factors like irrigation, technology could help in reducing risk in oil seed production in the country.

At the level of individual crops both technology as well as irrigation have played a vital role in determining the level of instability. Paddy and wheat which benefitted most from green revolution technology and state support have turned least risky. Instability in crops like jowar and bajra remained very high. Maize shows decline in inter year deviations from the underlying trend in all respects, after 1988, matching with spread of improved technology. This again demonstrate big role of technology particularly hybrids and irrigation in stabilization of production. Groundnut shows worst performance with big increase in production instability. Even in the case of cotton there was no improvement in production risk.

Among states Gujarat faced highest instability in food grain production closely followed by Rajasthan and Odisha. Andhra Pradesh, Himachal Pradesh and Odisha also show big increase in production instability after 1987-88. The state level data doesn't reveal clear pattern of association between instability and growth.

The states which were well endowed with irrigation facility adopted new technology faster and achieved higher growth in output. At the same time convincing evidence on the impact of green revolution technology in reducing instability in total agricultural production has been lacking though productivity of some crops became very stable. It is inferred that the spread of improved technology,over wider area, brings stability to agriculture production. As the fluctuations in agricultural output remain high in most of the crops, there is a need to strengthen and develop effective instruments of crop insurance to help farmers cope up with production risk. Country also needs stabilization strategy to deal with consequences of high instability in production.

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*Annexure I*

**Spread of green revolution in Indian Agriculture**

| | | |
|---|---|---|
| Irrigatedarea to Gross Cropped Area (%) | 1951-1966 | 18.08 |
| | 1968-1988 | 27.23 |
| | 1989-2011 | 40.35 |
| Fertilizer Consumption (Kg/ha) | 1951-1966 | 2.25 |
| | 1968-1988 | 32.54 |
| | 1989-2011 | 122.25 |
| Area under HYVs (%) | 1967-68 | 6.10 |
| | 1987-88 | 54.60 |
| | 1996-97 | 75.60 |
| | 2010-11 | NA |


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