

# **Soybean Productivity in India Issues and Solutions**

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# INTRODUCTION

- The Soybean Processors Association of India (SOPA) is the National Apex Organization of Soybean Processors, Refiners, Exporters, Farmers and other stake holders including, Inspection and Certification Agencies, Laboratories Shippers, Cargo Handling Agencies, Brokers and other Trade intermediaries.
- Trade bodies normally confine themselves to lobbying with the Government and looking after trade issues. Realizing that raw material is the backbone of this industry, SOPA took up the Soybean Development Programme in the eighties and became the only Association in India which works directly with the farmers for increasing soybean productivity, with the objective to increase farmers' income by higher productivity. Our farm activities include Seed Production, Front Line Demonstrations, Farmers Service Center and Farmers Training, SMS Advisory Service etc.
- As a service to farmers, we have established a seed testing laboratory as well as a soil testing laboratory at Indore.

## WHERE INDIA STANDS IN SOYBEAN

India is a marginal player in the world soybean sector, with a production of just over 11.5 million tons in 2016, as against the world's estimated soybean production of 346 million tons this oil year. As a USP, India is the only country in the world that does not grow any genetically modified soybean.

Our average productivity of around 1000 kilos per hectare is the lowest in the world, being less than one third of the world average. It is worth mentioning here that India has short duration crops with maturity period from 90 to 105 days while Argentina, Brazil and USA have soybean varieties having maturity period ranging from 150 to 160 days.

90% of soybean is grown in three states, namely Madhya Pradesh, Maharashtra and Rajasthan.

Food use of soybean in India is very low at less than 10% and more than 90% of soybean is used for oil extraction and feed.

# SOYBEAN SECTOR – INDIA AND THE WORLD

The table below shows India's place in global production and supply of soybean, soybean meal and soybean oil.

**In Million Tons**

Description	Soybean			Soybean Meal			Soybean Oil		
	World	India	% Over World	World	India	% Over World	World	India	% Over World
Production	345.965	11.500	3.324	228.786	7.200	3.147	54.555	1.620	2.969
Imports	140.049	NA		63.637	NA		11.027	3.800	34.461
Exports	143.304	NA		67.446	NA		11.611	NA	
Crushing/ Dom. Con.	291.948	9.000	3.083	224.662	5.400	2.404	53.839	5.500	10.216

Source : Oilseed: World Market and Trade, April 2017 issue, Published by USDA.

# AREA UNDER SOYBEAN CULTIVATION

In Million Hectare

YEAR	US	BRAZIL	ARGENTINA	CHINA	INDIA	OTHERS
2006-07	30.190	20.700	16.300	9.304	8.120	9.950
2007-08	25.959	21.300	16.371	8.754	8.800	9.664
2008-09	30.222	21.700	16.000	9.127	9.510	9.880
2009-10	30.907	23.500	18.600	9.190	9.730	10.630
2010-11	31.003	24.200	18.300	8.516	9.600	11.745
2011-12	29.856	25.000	17.577	7.889	10.270	12.538
2012-13	30.814	27.700	19.750	7.172	10.700	13.642
2013-14	30.858	30.100	19.250	6.791	11.716	13.683
2014-15	33.423	32.100	19.340	6.800	10.911	15.688
2015-16	33.076	33.300	19.530	6.506	11.600	16.031
2016-17	33.482	34.000	19.200	7.200	11.400	16.617

# WORLD SOYBEAN PRODUCTION

In Million Tons

Year	US	Brazil	Argentina	China	India	Others
2006-07	87.001	59.000	48.800	15.080	7.690	18.670
2007-08	72.859	61.000	46.200	12.725	9.470	16.709
2008-09	80.749	57.800	32.000	15.540	9.300	16.637
2009-10	91.470	69.000	54.500	14.980	9.700	20.836
2010-11	90.663	75.300	49.000	15.080	10.100	24.113
2011-12	84.291	66.500	40.100	14.485	11.700	23.243
2012-13	82.791	82.000	49.300	13.011	12.186	29.186
2013-14	91.389	86.700	53.400	11.951	9.477	21.593
2014-15	106.878	97.200	61.400	12.154	8.711	33.252
2015-16	106.857	96.500	56.800	11.785	7.125	33.957
2016-17	117.208	111.000	56.000	12.900	11.500	37.357

# INDIAN PRODUCTIVITY GAP

In Kg/Hectare

Year	US	Brazil	Argentina	China	Others	India	Gap over Brazil %
2006-07	2882	2850	2994	1621	1876	947	- 66.77
2007-08	2807	2864	2822	1454	1729	1076	- 62.43
2008-09	2672	2664	2000	1703	1684	978	- 63.29
2009-10	2960	2936	2930	1630	1960	997	- 66.04
2010-11	2924	3112	2678	1771	2053	1052	- 66.20
2011-12	2823	2660	2281	1836	1854	1139	- 57.18
2012-13	2687	2960	2496	1814	2139	1139	- 61.52
2013-14	2962	2880	2774	1760	1578	809	- 71.91
2014-15	3198	3028	3175	1787	2120	798	- 73.65
2015-16	3231	2898	2908	1811	2118	614	- 78.81
2016-17	3501	3265	2917	1792	2248	1009	- 69.10

## PRODUCTION OF OILSEEDS, AVAILABILITY OF EDIBLE OIL AND IMPORT OF OIL

Oil Year	Production of Oilseeds (Lakh Tons)	Net Availability of edible oils from all domestic sources (Lakh Tons)	Import of Edible Oils (Lakh Tons)	Dependability on Imports (In%)
2005-06	279.78	83.16	40.91	32.97
2006-07	242.89	73.70	46.05	38.46
2007-08	297.55	86.54	54.34	38.57
2008-09	277.19	84.56	74.98	47.00
2009-10	248.82	79.46	74.64	48.44
2010-11	324.79	97.82	72.42	42.54
2011-12	297.99	89.57	99.43	52.61
2012-13	309.43	92.19	106.05	53.50
2013-14	327.49	100.80	109.76	52.13
2014-15	275.11	92.57	127.31	57.90
2015-16	252.51	84.83	154.39	64.53
2016-17	335.96*	113.05		

\* 2<sup>nd</sup> Advance Estimates of Ministry of Agriculture

Source : Production of Oilseeds as per Ministry of Agriculture as on 15.02.2017, Net availability of edible oils from all domestic sources as per Directorate of Vanaspati, Vegetable Oils and Fats, Import of Edible oils as per DGCIS.

## REASONS FOR LOW PRODUCTIVITY

Libraries of various central and state government departments, ICAR Institutes and Agriculture Universities are full of reports on causes of low oilseed productivity and possible remedies. No doubt, a lot of work has been done over the years to increase yields but the sad fact remains that there is little noticeable growth in average yields. This shows complete lack of coordination between various agencies.

Major reasons for low productivity of soybean, other than weather and low farm size, are:

- Poor adoption of technology and casual approach of farmers towards soybean.
- Non availability of quality inputs, particularly seeds, at the right time and right price.
- Improper soil and nutrient management.
- Poor agriculture extension.

## SOYBEAN PRODUCTIVITY CAN BE DOUBLED

- It is possible to double India's current average soybean productivity of around 1000 Kgs. per hectare to at least 2000 Kgs. in the next 7 to 10 years.
- Concerted efforts are needed by all the stake holders, with one single body responsible for monitoring the progress. The lack of coordination among various agencies has to go.
- The current approach of a subsidy based policy for productivity enhancement is not really working, because it lacks focus and the promotional actions of the state extension machinery are driven more by subsidy than by real achievements.

# PANACEA FOR BETTER YIELD

RIGHT DOSE

AT RIGHT TIME

USING RIGHT METHOD

## EIGHT-POINT PROGRAMME FOR YIELD IMPROVEMENT

- Educate farmers to adopt appropriate production technology including use of high quality seed of improved varieties and other inputs.
- Replace seed every three years and also change the variety, if possible. For this, availability of good certified seed has to be ensured.
- Ensure and disease management.
- Effective transfer of latest crop production technologies through extensive farmer training programmes and Front Line Demonstrations.
- Farm Mechanization.
- Efficient Water management through micro irrigation.

## SEED SUPPLY – THE BIGGEST CHALLENGE

- Poor availability of good quality seed is the biggest challenge of Indian Agriculture, particularly in crops like soybean where the seed requirement is high.
- The general recommendation is that seed should be replaced once every 3 years. However, this is not happening, either because enough certified seed is not available or because the farmer thinks it is economical to use his own seed.
- There are different figures and claims of what the current seed replacement rate is. The best way to calculate this is to work backwards to production of breeder seed and see how much certified seed would have been theoretically available in a given year.

# SOYBEAN BREEDER SEED INDENT V/s PRODUCTION

In Quintals.

Year	Indent	Production	Shortfall
Kharif 2013	18,417	8,019	-10,398
Kharif 2014	15,326	9,009	-6,317
Kharif 2015	16,941	8,956	-7,985
Kharif 2016	18,079	15,311	-2,768

Source : Department of Agriculture and Cooperation, Ministry of Agriculture, GOI.

Breeder Seed production in some years was less than half the demand. However, if another stage i.e. F-II is introduced, the breeder seed requirement will drastically reduce. Also it is reported that a lot of breeder seed does not go into the seed chain and this puts tremendous pressure on agriculture universities and research institutes to produce more breeder seed.

## SOYBEAN CERTIFIED SEED AVAILABILITY V/s DEMAND

Year	Certified Seed available Qtls.	Area In Ha.	Certified Seed Required @ 33% SRR Qtls.	Shortfall Qtls.	Shortfall over SRR %
Kharif 2011	1,251,700	10,333,800	2,238,990	987,290	44.10
Kharif 2012	1,938,600	10,694,800	2,317,207	378,607	16.34
Kharif 2013	1,837,100	12,032,600	2,607,063	769,963	29.53
Kharif 2014	2,071,800	10,883,500	2,358,092	286,292	12.14
Kharif 2015	801,900	11,065,700	2,397,568	1,595,668	66.55
Kharif 2016	900,900	10,971,600	2,377,180	1,476,280	62.10
Kharif 2017	895,600	12,000,000	2,600,000	1,704,400	65.55

Seed Rate @ 65 Kg/Hectare. Availability has been calculated at 100 times the breeder seed produced in year before last. Production of F-II has not been considered.

## SEED PRODUCTION AND SUPPLY

Seed production in India is regulated by the Seed Act, implemented through the States. The entire seed production in soybean sector is in the hands of either the public sector agencies or hundreds of small one-room one-man seed companies who work through agents in the field, without any regard to the process or quality. Even a few big private sector companies fall prey to this dubious method because of the way the rules are implemented.

The subsidy which is available only to the public sector causes serious distortion in the market and acts as a deterrent to the private seed companies.

## DEVELOPMENT & PROMOTION OF NEW VARIETIES

Out of 126 soybean varieties released till date, only 30 varieties are currently in the seed chain. Of these, 3 are less than 10 years old and 7 are less than 5 years old.

As per data available, 80% of breeder seed production in Kharif 2016 was only for 7 varieties (JS 335, JS 93-05, JS 95-60, RVS 201-04, MAUS 71, MAUS 158 and JS 20-29). Which means that 80% of Soybean production comes from these varieties. JS 335, which is more than 20 years old, still contributes to about 23% of Soybean production.

A number of new varieties have been released in the last 5 years. However, availability of Breeder Seed of some varieties is still low. For example, JS 335 should have been replaced long back because a better substitute variety with better yields is already available. However, this has not happened for want of seed in the system.

# SOYBEAN BREEDER SEED PRODUCTION VARIETY-WISE (KHARIF 2016)

Soybean Variety	Year of release	Production in Qtls.	Share of total production %
JS-335	1994	3631.78	23.72
MAUS-71	2002	1872.00	12.23
JS-93-05	2002	1845.80	12.06
JS 20-29	2014	1634.85	10.68
MAUS 158	2010	1405.00	9.18
JS 95-60	2007	1319.85	8.62
RVS 2001-4	2014	780.00	5.09
Others		2821.45	18.42

Source : Department of Agriculture and Cooperation, Ministry of Agriculture, GOI.

## MANAGEMENT PRACTICES IN USE OF SEED

- The seed rate adopted by farmers is higher than recommended, resulting in higher plant population, lower yields and higher input cost. Farmers should be educated to use optimum seed rate.
- Most of the time, seed treatment is not done by farmers. This results in poor germination and is perhaps the reason for higher seed rate. It should be made mandatory to treat seed with fungicide and bio-culture before sowing.
- The farmer should be encouraged to change the seed every three years, to maintain genetic purity and vigour.
- Farmers who use their own seed must first grade the seed to remove bad grains and also get a germination test done.
- If the farmer uses his own seed, it must be properly stored and handled, to ensure good germination.

## SEED - POLICY RELATED ISSUES

- Seed Act, Rules and regulations and State Rules followed by Seed Certification Agencies need a review and necessary changes, to plug loopholes, remove anomalies and make seed business profitable for private sector.
- Increase availability of breeder seed of new varieties, to put enough seed in the system and phase out old varieties. Private sector should be allowed to produce breeder seed.
- Treat private sector at par with public sector seed companies and remove distortion in the system caused by subsidies. This will encourage private sector to invest in developing new varieties and also augmentation of seed supply.

## ADOPTION OF IMPROVED TECHNOLOGY

Even more than the inputs, the biggest reason for low productivity is poor adoption of improved technology. Results of Front line demonstrations, over a period of 15 years, have consistently shown that when proper and improved techniques are used, the productivity is more than double the national average.

Agriculture is a state subject and extension efforts need to be increased manifold to be effective for education of farmers to use proper technology. The cost of training would be small, when compared with benefits.

The policy-makers somehow think that subsidies alone will result in increased yields. Our policies have become subsidy driven and the extension efforts are focused more on areas where subsidy is available rather than where it should be.

## Impact of Improved Production Technology on productivity of soybean under Real Farm Condition (SOPA FLD RESULTS)

Year	Improved Technology (IT) (Q/Ha.)	Farmer Practice (FP) (Q/Ha.)	% increase over FP
2005-06	20.04	13.10	52.98
2006-07	19.08	13.72	39.07
2007-08	21.49	15.54	38.29
2008-09	21.45	14.63	46.62
2009-10	25.73	15.45	66.54
2010-11	20.53	15.04	36.50
2011-12	15.20	11.69	30.03
2012-13	15.31	12.11	26.42
2013-14	12.92	10.20	26.67
2014-15	16.32	11.98	36.23
2015-16	11.84	8.38	41.29
2016-17	16.46	12.37	33.06
<b>Average</b>	<b>18.03</b>	<b>12.85</b>	<b>39.48</b>

## LAND AND WATER MANAGEMENT

- Majority of farmers do not bother about proper land preparation and water management which directly or indirectly affects the productivity of any crop.
- Deep ploughing in summer every third year would help in rapid ingress of rain water and retention of top fertile soil, but this is not done.
- Adoption of broad-bed and furrow / ridge and furrow system for sowing will help in drainage of excess water and also in situ water conservation.
- Crop should be saved from moisture stress during three critical stages viz. flowering, pod formation and grain filling, even if irrigation has to be applied. Soybean is a rain fed crop and any kind of irrigation is non-existent. However, in the years of low rainfall or intermittent drought spells, it is necessary to give light irrigation. Micro irrigation system can be installed for this purpose.

## INTEGRATED NUTRIENT MANAGEMENT

- Nutrition use is highly imbalanced. Potassium, Sulphur, zinc and boron are not used in required quantities. No soil health report is available in most cases.
- Method of placement of nutrients is not proper.
- Fertilizer should be applied below the seed using a fertiseed drill. Farmers generally either broadcast or mix the seed and fertilizer. Many times, fertilizer is applied by top dressing. These practices lead to poor nutrient use efficiency.
- Bio fertilizers are not available in sufficient quantity and also a lot of spurious bio material is supplied to farmers.
- Farmers are lured by unscrupulous elements to use all kinds of unnecessary products in the name of nutrients and growth promoters.

## WEED MANAGEMENT

- The crop should be weed free during the first 40 days when the weeds cause maximum crop loss.
- Weeds may cause upto 40% reduction in yield if not properly managed. Encouraging proper weed management practices will help in weed control.
- Currently, due to non availability of farm labour, most of the time, chemical method of weed control is used.
- Here again, the dealer plays a major role in selection and doses of herbicide, irrespective of correct recommendations.
- Method, quantity and time of application is also not proper most of the time.

## PEST AND DISEASE MANAGEMENT

- Diseases and infestation of various insects and pests can cause severe loss in yield. Therefore, corrective measures for managing these are essential.
- Farmers do not use judicious doses and proper technology for pest and disease management.
- In general farmers do not use recommended doses of the insecticide/pesticide. They are mostly guided by the dealer. These chemicals, if used either in lower or higher than recommended dose or at the wrong time, will cause more harm than benefit.

## SUMMARY AND RECOMMENDATIONS

- Poor adoption of technology and problems with Input supply, particularly seed, are the two major reasons for low productivity. Proven technology is available. But if it does not reach the farmer, it is of no use.
- The existing efforts for transfer of technology to farmers are not well coordinated. The technology simply does not reach the farmers.
- To overcome this, agriculture extension, which is in a pathetic state, needs to be thoroughly overhauled.
- The Extension Cell in state agriculture department should be given a target of training a fixed number of farmers every year. The success of extension efforts should be measured by a well-designed test to be given by farmers for each crop and the result of the test should be one of the criteria for measuring performance of the concerned officers.

## SUMMARY AND RECOMMENDATIONS

- Design innovative schemes to convince the farmers to adopt improved technology. For example, if the farmer is given an incentive for getting better yield, rather than a subsidy, he is more apt to adopt improved technology.
- Micro irrigation for rain-fed crops can do wonders. NMOOP should have provision for financial support for installation of such systems on a wide scale.
- Timely input supply must be ensured. Current system is lax and many times, farmers get fertilizers, seeds etc. after the time for their use is over.
- We should identify low productivity districts with large area under the crop and give special attention to adopt location specific technology and inputs. This will improve the average productivity of the country.

## SUMMARY AND RECOMMENDATIONS

- Overhaul of seed supply system is required with necessary changes in the policy.
- A ten-year plan for variety replacement for soybean may be prepared so that old varieties can be replaced with new ones within a reasonable period. JS-335 is a good example, the variety needs to be replaced, alternative better variety has been developed and notified but is still not available in sufficient quantity.
- A Master Data of soil health, broken district wise should be prepared. The current Soil Health Card Scheme should be suitably modified.
- Weather conditions play a major role in affecting the productivity of any crop. Accurate and intensified weather forecasting coupled with correct and timely advisory system at grass root level will definitely help in improving the productivity.

## SUMMARY AND RECOMMENDATIONS

- Industry, even though dependent on agriculture produce, pays only lip service to farmers problems or for productivity improvement. Efforts and investments in agriculture extension are missing. Industry must make serious and sincere efforts for improving productivity for obvious reasons.
- Many research reports with recommendations remain on paper and serve no purpose other than academic. Every report prepared by expert groups or scientists should be taken to its logical conclusion.
- Make soybean cultivation remunerative to farmers. Cheap import of edible oil has already killed our soymeal export market. Customs duty on import of soy oil over a quantity of 1 million tons should be at WTO bound rate of duty.

**THANK YOU**