No. 3
Oct, 2016

POLICY BRIEF

Productivity and Economic Efficiency of Soybean Crop in Telangana State

E. Revathi, B. Suresh Reddy, P. Padmaja

Context

Soybean crop in recent times is identified by the Government of Telangana as a substitute for cotton in the wake of policy shift (withdrawal of export subsidy to cotton) from 2017 onwards. It is in this context the economics and technology of the crop assumes even more importance.

I. Soybean crop in Telangana

Soybean crop became an important crop to farmers in dry land regions in the country as 98 percent of its cultivation is rain-fed due to its suitability for cultivation in fallow lands having an advantage of yield and price over coarse cereals and pulses, and import substitution (edible oil) and export earnings (oil cake) (Chand, 2007). India contributes about 4 percent of total world soybean production while it ranks fourth in terms of production. Soybean crop is mainly cultivated in the states of Madhya Pradesh (MP), Rajasthan, and Maharashtra (Fig 1). Soybean cultivation started in Telangana from the early 1990s along with Maharashtra and these two states can be termed as emerging states vis-à-vis the established states of MP and Rajasthan. Telangana contributes 2 percent to area and 3 percent to total production in India.

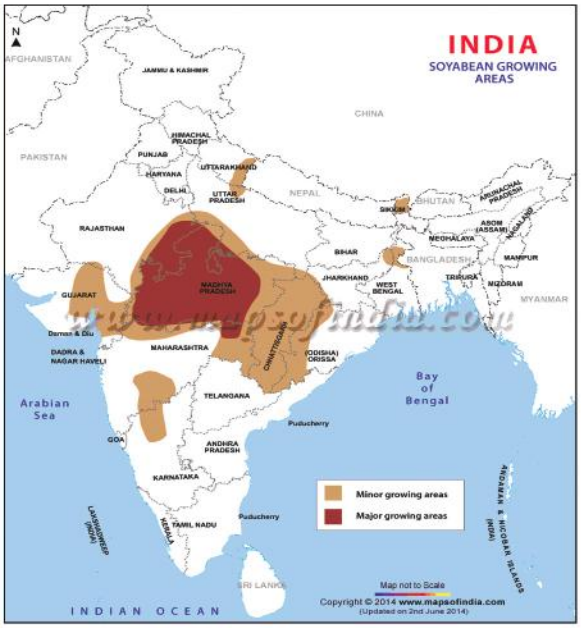


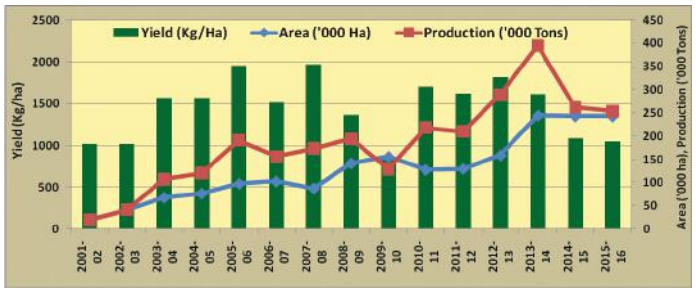
Fig 1. Soyabean Growing Areas in India

In Telangana the area under soybean cultivation picked up to 1.9 lakh hectares (ha) in 2008-09 and further increased to 2.43 lakh ha in 2015-16. Its share in cropped area is 6.3 percent; however its share in area under oilseed crops is 78 percent. Soybean production increased from 1.93 lakh tonnes in 2008-09 to 2.5 lakh tonnes in the year 2015-16 but productivity has decreased from 1380 to 1047 kgs per hectare (Figure 2). The crop is mostly cultivated in chalka soils, red and block soils in the state.

Time series data on area, production and yield per hectare for Telangana for the period 1991-2 to 2013-14 (22 years) has been analysed in two sub-periods viz 1991-2 to 2000-1and 2001-2 to 2013-14. Compound annual growth rate of area was higher for the first period but yield growth rate was high for the second period. Growth of area, production and yield for the entire period was higher for Telangana compared to the three major soybean cultivating states. But since the crop is predominantly rain-fed in the state it suffers from high instability. The instability index for the state indicates it is higher in case of yield compared to area and production. Growth coupled with instability is a main feature of rain-fed soybean crop.

The changes in soybean crop production can be due to change in area under the crop or due to change in yield or due to both. Our analysis shows that the change in average production is more due to change in area under the crop (to

Figure 2: Trends in area, production and productivity of soybean crop in Telangana (2001-02 to 2015-16)



the extent of 61%) but the interaction effect between area and yield also accounts for considerable increase in average production (to the extent of 34%) in case of Telangana compared to other states. Interaction effects arise mainly from variability in yield but also inducing the interacting variables like the behavior of farmers which affects area of crops sown. Farmers in Telangana are responding to yield changes in soybean crop by making suitable changes in area under the crop. As the instability index for yield is high the response to it in terms of area is also high thus making the interaction effects effective in determining the increase/decrease in soybean crop production (Table 1). If yield is stabilized then area under the crop also can be stabilized.

Table 1. Components of Change in Average Production of Soybean for All India and Selected States (percentage)

Components of Change	India	Rajasthan	Madhya Pradesh	Maharashtra	Telangana
Change in mean Yield	0.37	11.61	15.42	1.35	2.99
Change in mean Area	80.64	78.57	77.55	97.32	60.73
Interaction between mean area and mean yield	6.58	7.2	4.42	2.92	33.6
Change in Area Yield covariance	2.41	2.63	2.6	-1.59	2.68

Source: Primary data

II. Challenges of Soybean crop in Telangana

Adilabad and Nizamabad districts account for major area under soybean crop in Telangana. Area under soybean crop increased from 95,897 hectares (ha) in 2008-09 to 111,367 ha in 2014-15 in Adilabad, while in Nizamabad, it increased from 50,970 ha to 97,431 ha. Kautala and Jainoor (predominated by adivasis) mandals in Adilabad and Velpur and Tadwai in Nizamabad cultivate most of the crop. Average acreage per household is more in Kautala and Jainoor of Adilabad compared to Velpur and Tadwai mandals of Nizamabad district. But average yields are lower in Adilabad district more so in the adivasi villages of Jainoor mandal and average yields in Tadwai mandal in Nizamabad are higher.

Unlike the states of MP and Rajasthan where soybean has been cultivated in kharif fallows, in Telangana traditional crops like maize, pulses, cotton have been replaced by soybean due to relatively low and unstable returns from these crops more so in case of cotton crop. Moreover soybean being a short duration and rain-fed crop farmers preferred it. In Adilabad after 2011-12 soybeans substituted cotton crop while in Nizamabad maize has been a competitor for soybean crop. But over a long period of time it has displaced traditional Jowar, Maize, Seasame, and green gram in both districts (Fig 3 & 4). Moreover

Fig 3: Area of Soybean, Maize & Cotton cultivated in ha in Nizamabad from 2008-09 to 2014 -15

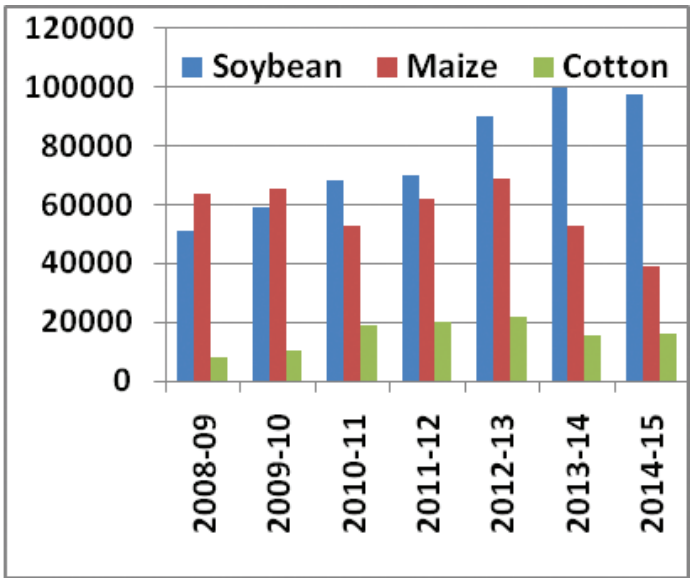
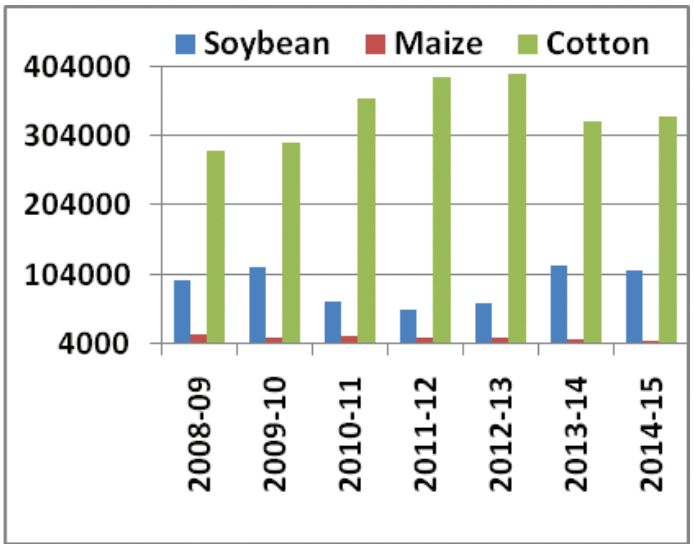


Fig 4: Area of Soybean, Maize & Cotton cultivated in ha in Adilabad from 2008-09 to 2014 -15.



in kharif 2016 area under soybean has increased displacing cotton due to policy shift by union government and the incentives (subsidized seed and implements) for soybean crop by the Telangana State government.

JS-335, a public sector and a recommended variety is popularly used by farmers in Telangana. The potential yield of this variety is 10 to 12 quintals per acre and the average farm yield at aggregate level is 4.2 quintals in 2014-15. Farm yield is low in 2014-15 which is a rain deficit year, in a normal year the yield is higher but yield gap exists. It is normal that such difference exists between potential and average yields but variation in average yields across soybean cultivating areas is a matter of concern. The average farm yields in Adilabad and Nizamabad districts in the state are 1.59 and 2.73 quintals respectively while it is as high as 8.8 quintals in Rajgarh in MP or Latur in Maharashtra. The causes for such low yield levels can be attributed to technical (not adopting the recommended practices) institutional and economic factors.

Box 1: High Yields in Kankal and Tadwai

Soybean farmers in Kankal and Tadwai villages in Tadwai mandal of Nizamabad district are obtaining high yields (6 to 8 quintals in deficit year and 8-10 quintals per acre in normal year). Farmers mostly belong to the Gudati Kapu community which has a track record of a good farming community with better resources in terms of bigger sized plots and better quality of land. Around 48 percent farmers have irrigation facility from the Nizamsagar project. Adequate water coupled with supply of subsidized seed, fertilizer, and timely availability of credit from banks, and marketing facility enabled farmers to achieve high yields. 80 percent farmers undertake crop rotation once in two years which enhances crop output. They also use tractor, ferti cum seed drill extensively to till and sow seed and spray fertilizers. The quantity of inputs used is also higher compared to villages in Adilabad.

Soybean farmers in the state face challenges on different fronts. Our field survey in the districts of Adilabad and Nizamabad has revealed that only 18 percent of farmers had their soil tested by the agricultural department while it is a basic need which is much related to adoption of package of practices recommended for the seed variety used. Farmers could not adopt the recommended practices particularly application of farm yard manure as they do not having enough livestock. They are not aware of use of correct dosage of fertilizer - NPK and sulphur, further the fertilizer price policy distorts balanced use of NPK affecting soil fertility. Farmers are also denied guidance regarding seed sowing practices where they followed broadcasting method or simply following neighboring farmers in practices. Sometimes farmers' own perceptions or experience also went against following the recommended practices. On average farmers adopted 12 recommended practices of a total of 25 practices. Younger aged farmers adopted the practices in a better way. Only 6 percent farmers received extension services, 3 percent from agriculture department and another 3 percent from private company.

Besides following the right agronomic practices gathering economic resources is a major problem to soybean farmers particularly in Adilabad and with respect to small farmers and adivasi farmers. 76 percent farmers borrowed for purchasing inputs for soybean crop and only 37 percent could access formal sources of credit. 31 percent farmers borrowed from money lender and 26 percent borrowed from fertilizer and pesticide dealers. The interest burden is high due to borrowing from informal sources which adds to cost of cultivation.

Farmers also faced problems on marketing front. 85 percent of farmers in Adilabad sell their produce to traders and only 15 percent sell in market yard while in Nizamabad 33 percent sell in market yard. Markets are interlinked more so in remote tribal areas where farmers purchase inputs at high cost and receive lower prices for output. Farmers' knowledge about support price is also low.

Farmers also faced different prices for inputs for example they faced different hiring charges for use of machinery, human labour and for seed and fertilizer due to inter linkage or imperfections of markets. Farmers in Nizamabad were able to connect well with state agencies but in Adilabad this connection is weak.

How efficiently can the inputs be used to produce output from a given bundle of inputs and technology? The efficiency of a farm or production unit can be measured either with respect to its normatively desired performance (production frontier) or with reference to performance of another farm. Given the input use the 'Technical efficiency' of farmers in Telangana is slightly lower than that of other soybean cultivating states. But in the state farmers in Nizamabad are able to produce more from the given inputs. It is a paradox to know that only six percent of the difference between potential production and actual production is due to farmer's technical inefficiency. Farmers are not able to obtain more output from given inputs because of factors not under their control. For example deficit rainfall in the year 2014-15 largely was the cause for lower production and in the current kharif season (2016) excess rainfall has caused the damage.

The ability of farmers to use inputs optimally given the input prices (allocative efficiency) is found less in Telangana state compared to other states. But within the state more farmers in Adilabad have utilized inputs in more efficient way given the prices of the inputs though they could achieve lower yields compared to farmers in Nizamabad district. This shows farmers in Nizamabad district are

using more inputs (especially use of pesticide) uneconomically thereby increasing the cost of production though they could achieve high yields. Efficiency of production is also dependent on the size of the farm. Medium and large farms emerge as technically and economically efficient farms compared to marginal farms. Variations in allocative and economic efficiency across villages and farmers may be due to differential pricing of inputs, hiring charges of machinery, and wage rates or to put in simple words due to market imperfections.

III. Way forward

Soybean crop has been cultivated in Telangana from the early 1990s. Area expansion has been high, productivity is low compared to major soybean growing states like Rajasthan and Madhya Pradesh. Moreover yield is highly unstable in the state compared to all other states. The instability in the crop is because of deviation in rainfall from normal as soybean is primarily rain fed crop. Economic efficiency levels of farms in Telangana are low compared to other states. Within the state farms in Nizamabad are technical efficient but allocative efficiency is better for farms in Adilabad. Medium, large and small farms are more efficient compared to marginal farms. Apart from technical factors the institutional factors also impacted productivity. The cost of cultivation too is high because of added costs like high cost of credit due to borrowed investment for the crop, rent for leased in land. Besides this farmers also are losing out on account of marketing as they mostly depend on private traders. This practice is relatively more in Adilabad district. Farmers also face differential pricing of inputs indicating towards imperfect markets. The farmer's suggestions point towards timely supply of inputs, providing information and extension support by agriculture department, soil sample analysis, availability of farm yard manure for better practice of recommended practices. An overall improvement in institutional support to calibrate government initiatives to overcome market failure would not only result in higher yields but also in better returns for the farmers.

Based on the evidence from the field, there is a strong need to focus on improving the productivity of rain fed soybean crop through development of non-GMO soybean varieties that can withstand both prolonged drought spells as well as excess rains. Protective irrigation may be a solution to overcome rainfall deficits. The dissemination of package of practices needs to be focused on. Timely credit should be provided through formal sources especially to unconnected areas and unconnected farmers. Exploiting market inter linkages need to be unlocked. Private information sources like the traders and pesticide dealers are not trusted much by farmers therefore knowledge needs to be disseminated through credible sources. Farmer's producer organizations may be an effective solution to making input and output markets competitive and to disseminate knowledge to farmers.

National Programme for organic production of soybean crop can also be initiated to tap the growing organic markets world over and especially in Europe. Pockets of soybean cultivation (in tribal villages) where chemical fertilizer application is low could be effectively transformed to organic method of cultivation.

References:

Bhatia, V.S., Singh Piara., Wani, S.P., Chauhan, G.S., Kesava Rao, A.V.R., Mishra, A.K and Srinivas, K.(2008), "Analysis of potential yields and yield gaps of rain fed soybean in India using CROPGRO-Soybean model", Agricultural and Forest Meteorology 148: 1252-1265, Elsevier.

Chand Ramesh (2007), "Agro-industries characterization and appraisal: Soybeans in India", Agricultural Management, Marketing and Finance Working Document, FAO, Rome.

Jayanti Kajale and Sangeeta Shroff. (2013), Report on "Problems and Prospects of Soybean Cultivation in Maharashtra", Agro-Economic Research Centre, Gokhale Institute of Politics and Economics, Pune.

Srivastava, S.K. (2014), "Improving Soybean Productivity in Different Agro-Climatic Situation" in Proceedings of Brainstorming workshop on "Soybean for Household Food and Nutrition Security", organized by TAAS, ICAR and NAAS, 21-22 March, New Delhi.

E. Revathi (revathi@cess.ac.in) is Professor and Dean of Graduate Studies at CESS, Hyderabad.

B. Suresh Reddy (srihithasuresh@yahoo.com) is Associate Professor at the Division for Sustainable Development Studies, CESS, Hyderabad.

P. Padmaja is Research Associate at CESS, Hyderabad.

This brief note is based on the study "Soybean Varieties and Package of Practices", supported by Indian Council of Agricultural Research (ICAR) through CESS, Hyderabad.

CENTRE FOR ECONOMIC AND SOCIAL STUDIES

Nizamiah Observatory Campus, Begumpet, Hyderabad-500 016

Ph : 040-23402789, 23416780, Fax : 040-23406808. Email : post@cess.ac.in, www.cess.ac.in