Opinion

Miracle crop: the present and future of soybean production in Pakistan

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Opinion

Soybean is annual oilseed crop of family *Leguminosae* and mainly grown for edible seeds. It is the most economical source of protein (40%) for human food and animal feed. The seeds also contain 18-22% edible oil and fulfil the demand of food industry. In 2016, globally soybean crop was planted on 120.48 million hectares and 351.74 million metric tons of the seed was produced. USA is the largest producer with 117.20 million metric tons followed by Brazil 114 million metric tons and Argentina 57.80 million metric tons (MMT). According to USDA estimate, worldwide soybean production for 2017-18 is expected to reach 347.4 million metric tons.[1] Today, most of the world's soybeans are crushed or processed into soybean meal and oil. It is estimated that 2% of soybean production is consumed by humans directly as food, which amounts to an approximately 3 MMT. In Pakistan Soybean oil production increased up to 260 (Tons) in year 2017 as compared to 240 (Tons) in 2016.[2]

In Pakistan about 1.0 million tons of soymeal worth of 150 million US$ was imported for poultry and livestock in 2014-15.[3] In 2015-16 the demand slightly rose to1.1 million tons of soybean grain worth of $1.02 billion to fulfill the growing needs of poultry and solvent industry. The country's establishing feed industry has shifted to importing whole grain instead of soybean meal from United States and Brazil. The detailed information of soybean grain and products imported to Pakistan is given in (Figure 1). There is huge potential to tap the local demand of soybean by commercializing soybean crop in Pakistan. Moreover, the crop has been neglected for one reason or the other resulting in decline of its area under cultivation. Soybean Crop and two other non-conventional oilseed crops, viz. Sunflower and Safflower were introduced in mid-sixties and commercial cultivation began in 1970-71. Coordinated Research work was started at Pakistan Agricultural Research Council (PARC) and Provincial Research Institutes in 1977-78 and eight soybean varieties were developed. Efforts were being made to commercialize soybean crop among farmers and the area under soybean cultivation reached to 5980 hectares during 1986-87. Still the cropping area increased with very slow pace and frequent variations during the period of 1970-71 to 1997-98 and later declined to few hectares after 2005-06 (Figure 2). In the absence of a coherent production policy like other major crops, soybean could not be commercialized and area under its cultivation reduced gradually.

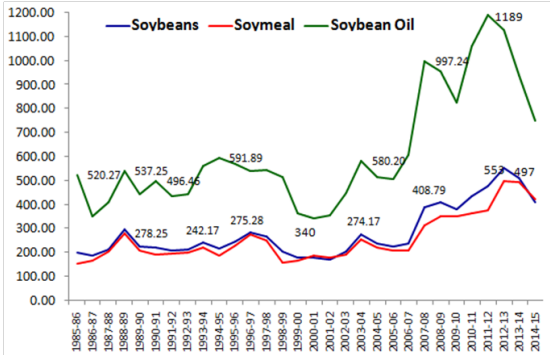

Figure 1 Soybean grain and products imported over the years (000 Tons).

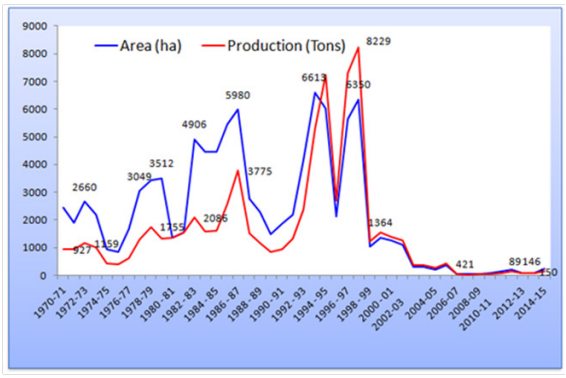

Figure 2 Soybean area and production in Pakistan.

Mainly issues like lack of marketing of produce and its by-products, absence of adequate skills, knowledge and production technology and low economic return hindered soybean commercialization.[4] Most importantly, the unavailability of high yielding, climate ready and pest resistant soybean varieties is the major bottleneck in crop adoption. The traditional varieties (William-82, Ajmeri, NARC-I, NARC-II and Rawal-I) introduced or developed in 1980s and 1990s have lower yield potential and susceptible to newly evolving pathogens of viral diseases. Among these, Soybean Mosaic Virus (SMV) is one of the most prevalent and destructive viral disease in soybean production worldwide. Similarly, the pest attack on soybean in irrigated plains of Punjab and Sindh is exacerbated by already prevalent wide range of cotton and fruit insects-pests i.e. whitefly (*Bemisia tabaci*), Army worm (*Spodoptera litura*), Green Clover worm Caterpillars (*Hypenas cabra*) and grasshoppers etc. Besides, weed infestation is a sever yield limiting problem mainly due to its plantation in Kharif season which is followed by monsoon and subsequent sustained outbreak of weeds. Integrated weed management approaches are recommended with primary focus on both pre-emergence and post emergence herbicides application at appropriate time.[5] At present the crop is planted on negligible area in the northern parts of the country for household usage of human

consumption and animal feed. The yield at different locations, from irrigated land in Punjab to hilly areas of Khyber Pakhtunkhwa, FATA and Hazara division, vary between 12 to 20 mounds/acre. As a non-traditional crop, the overall soybean production in the country is not sufficient to fulfill the demand.

However, despite challenges there is huge potential of soybean production under favorable agro-climatic conditions in potential areas. With a strong agricultural system and diverse ecologies, the crop can be incorporated in existing spring as well as summer cropping pattern (Figure 3). Various crop rotation combination i.e. Rice Soybean Rice, Cotton Soybean Cotton, Wheat Soybean Wheat, Wheat-Sorghum/Millet-Fallow-Soybean-Wheat and Intercropping soybeans with corn, sorghum, cotton, or sugarcane are proposed to be potentially successful (Table 1). In the rainfed area (*Barani*) most of the land remains fellow after wheat harvest till October or mid-November which can be efficiently utilized for soybean production. In addition to grain production, as a leguminous crop soybean increases soil fertility and help enhance yield of the next crop.[6] PARC is working along with ministry of national food security and agricultural research to provide a platform for promoting/improving high yielding adaptable soybean varieties in the country through research; and enhance technical capabilities of staff involved in basic seed production and development of new varieties. Under this program, the organization is running a project on commercialization of soybean crop at National Agricultural Research Centre (NARC), Islamabad, Pakistan along with provincial partners. The project aims at increasing yield and production of the crop through improved cultivars and new mechanized production technology. Developments of new soybean high yielding and adaptable varieties will offer new opportunities to small farmers whose land remain fellow after wheat crop in Kharif season. Under fast unfolding agro-climatic changes and weather patterns there is direct need to develop new varieties with higher yield potential that possess resistance against number of diseases. Strong government policies for promotion of local soybean production coupled with adequate research and development to make locally produced raw material competitive both in terms of value and quality will help in easing reliance on the time consuming costly imports.

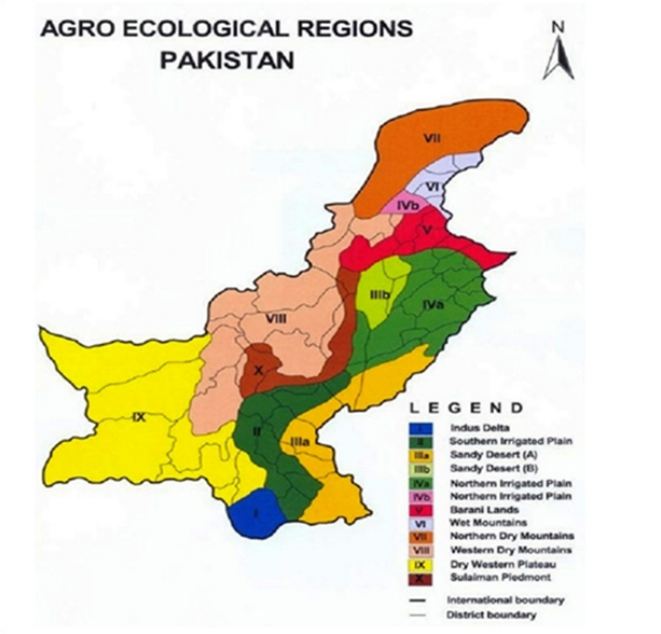

Figure 3 Different agro-ecological zones of Pakistan Rahim et al.[7]

Table 1 Potential soybean growing areas and cropping pattern of Pakistan

Province	Area/cropping system	Cropping system	
		Existing	**Proposed**
Punjab	Rice area	Rice-Wheat-Rice	Soybean-Wheat -Rice
	Rainfed area	Wheat-Sorghum/Maize-Wheat	Wheat-Soybean-Wheat
	Riverine area (Mianwali, Bhakkar, Layyah, Muzaffar Garh, DG Khan and Rajanpur)	Mixed Cropping System	Introduction of Soybean as spring crop
Sindh		Rice-Wheat-Rice	
	Lower Sindh (Thatha and Badin)	Rice-Fallow-Rice	Rice-Soybean-Rice
		Rice-Sunflower-Rice	
Khyber Pakhtunkhwa	Malakand, Hazara Divisions and DI Khan	Mixed Cropping	Introduction of Soybean as spring/late spring crop

Wide scale soybean production will not only ensure sustainable supply of raw material to feed industry but also improve socio-economic conditions and livelihood of farmers. It would further encourage the farmers to cultivate soybean and increase local production for animal and poultry feed industry as well as private soy industry which are the permanent consumers of this crop. Efficient utilization approaches also play major role to boost the production by providing small scale processing facilities around potential soybean growing areas. As incentivization strategy for farmers, economic return could be increased by applying new approaches for development of elite varieties and advanced production technology.

Conclusion

Soybean is a profitable crop with growing demand from poultry feed and solvent industry. In Pakistan, the demand for soybean oil and meal has increased many folds as a raw material for industry in the country. Although the country has suitable agro-climatic conditions for soybean cultivation but the absence of varieties with high yield potential is one of the major reasons of its marginal cultivation. Therefore, development of new high yielding soybean varieties, latest production technologies, and farmers training is imperative to incentivize crop adoption for farmers. Also, government needs to

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put in place soybean promotion policy in favor of local production and discourage heavy imports from north and South America. This will help agricultural industry to not only tape the local burgeoning demands of soybean but also enable export of the seed.

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Conflict of interest

The author declares no conflict of interest.

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