

Strategies for promotion of production and trade of sunflower and sesame in China for human nutrition

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In this article, the key drivers for enhanced productivity of oilseed crops with particular reference to sunflower and sesame in China vis-à-vis India are discussed. Some of the approaches followed include intensive agriculture, value addition and product diversification, integration of all stakeholders from grower to industry in the product chain, establishment of technology parks to boost trade, viable public-private partnerships, creation of awareness of the crops through establishment of crop museums, skill development at all levels, etc.

Key words: Oilseeds, Public-private partnership, Sesame, Sunflower

INDIA and China are the top producers and consumers of oilseeds in the world. The major oilseeds of both the countries are soybean, rapeseed, groundnut, sesame and sunflower. In China, oilseeds consumption continues to grow, not only for oil *per se*, but also for confectionery purpose. There is a great demand in domestic market for confectionery sunflower, soybean, groundnut and sesame in China. Therefore, oilseed sector is supported by government and

production technologies to increase the production. It is necessary to understand the strategies adopted by China to improve oilseeds industry in both production and processing. The productivity of China is much higher than Indian productivity for the oilseeds, which stimulates oilseeds researchers of India to relook into the technologies (Table 1). The article gives the detailed report of about the progress made by China not only in production of confectionery sunflower and sesame

but also the developments to boost agriculture production and trade in the country. There were several aspects that were common to both the crops such as, crop specific museums depicting the history and development of the crop; creating awareness to public about the crop through the technology parks; integration of agriculture with processing industry and trade; extensive utilization of different plant parts for varied uses; development of diverse products to meet the

Table 1. Area, productivity and production of major oilseed crops in India and China during the last decade (2007-08 to 2016-2017)

Crop	Country	Area (lakh ha)			Production (lakh tonnes)			Productivity (kg/ha)		
		2007	2017	Increase (%)	2007	2017	Increase (%)	2007	2017	Increase (%)
Groundnut	India	62.92	53.38	-15	91.82	74.61	-19	1459	1398.0	-4
	China	39.68	46.28	17	130.79	171.50	31	3296.2	3705.8	12
Linseed	India	4.67	3.25	-30	1.63	1.84	13	349	567.0	62
	China	3.4	2.83	-17	2.68	3.62	35	789.4	1278.5	62
Rapeseed	India	58.25	60.73	4	58.33	79.17	36	1001	1304.0	30
	China	56.42	66.53	18	105.75	132.74	26	1873.8	1995.2	6
Safflower	India	3.2	1.44	-55	2.24	0.94	-58	701	651.0	-7
	China	0.21	0.23	10	0.32	0.33	3	1523.8	1429.0	-6
Sesame	India	17.99	16.6	-8	7.57	7.47	-1	421	448.0	6
	China	4.86	2.62	-46	5.57	3.67	-34	1145.8	1400.7	22
Soybean	India	88.81	111.83	26	104.68	131.39	26	1235	1177.0	-5
	China	87.53	73.43	-16	127.25	131.52	3	1453.7	1791.0	23
Sunflower	India	19.11	3.81	-80	14.63	2.51	-83	765	660.0	-14
	China	7.19	9.04	26	11.86	25.8	118	1650	2851.5	73

Source: India (Directorate of Economics and Statistics, DAC, GOI; https://eands.dacnet.nic.in/APY_96_To_06.htm); China (FAOSTAT, 2017; <http://www.fao.org/faostat/en/#data/QC>)



consumer and market demand besides giving a fillip to the associated industries.

Agriculture development is focused and concentrated

In China, research, production and marketing are integrated in a viable public-private partnership mode. The enterprise culture is being promoted and the varieties are bred for grower needs and grower prosperity. Regions which show better performance with high productivity due to adaptability of the crop to certain climatic conditions are identified. These regions are encouraged and supported by the government to grow the best performing crop which gives higher productivity in low cost technology. For example Wuyuan county for confectionery sunflower and Pingyu county for white sesame were identified and supported.

Confectionery sunflower in Wuyuan County: Confectionery Sunflower cultivation is predominantly carried out in the Wuyuan County in Inner Mongolia. Wuyuan County with a 2,400 years of long history is at the northernmost part of the Z-shaped bay of the yellow river with a total population of 300,000 of which 66% are engaged in agriculture. The county has 1.5 lakh ha of cultivated land which is mostly under irrigation. This county has been appraised as the demonstration county of the national rural industrial integration, rural demonstration county of the national e-business, national leisure agriculture and rural tourism and national rural entrepreneurship-innovation. Besides several other products, Wuyuan county is hometown for sunflowers and a center of the Chinese Sunflower Industry as well. The county plants around 1.7 lakh of sunflower every year and has set up the sunflower industrial “aircraft carrier” of the whole industry chain. “Wuyuan Sunflower” has been granted trademark registration of the National Geographic Indications Mark. Confection sunflower research and trade is lead by Sanrui Agritec company which is located in Wuyuan County and has the breeding base with about 3000 accessions in Gansu,



Plan of Pingyu Sesame Food Scientific and Technology Innovative Park

hybrid testing base in Hainan province and seed production in 30,000 ha in Xinjiang.

Sesame in Henan Province: Henan province of People’s Republic of China, is located in the Central part of the country. Henan is the birthplace of Chinese civilization with over 3,000 years of record history. Henan has temperate climate that is humid subtropical to the south of the Yellow River and bordering on humid continental to the north. It has a distinct seasonal climate characterized by hot, humid summers due to the East Asian monsoon, and generally cool to cold, windy, dry winters that reflect the influence of the vast Siberian anticyclone. Temperatures average around the freezing mark in January and 27 to 28 °C in July. A great majority of the annual rainfall occurs during the summer. Agriculture has traditionally been a pillar of its economy, with the nation’s highest wheat and sesame production and second highest rice output, earning its reputation as the breadbasket of China. The province is known for its food production and processing industries. White sesame is predominantly grown in this province. Henan province is recognized for its best quality sesame production. World’s best quality white sesame comes from Pingyu county (32°57'24.73" N 114°37'20.83"

E) in the southern part of Henan Province. A total of 23,000 ha is under white sesame cultivation with a productivity of 1500 kg/ha. The climatic condition of Pingyu county determine the best quality sesame seed for which, “Pingyu White Sesame” has been granted trademark registration of the National Geographic Indication Mark.

Development strategies

The Main motto of Chinese Agriculture is “Grower Needs and Grower Prosperity” and all the efforts are directed towards this goal in a “Together We Win” Concept. The prime objective is to make China the world leader of the respective industries and in this context there is no demarcation with regard to the developmental activities of the public funded or private firms. In case of sunflower, a private firm is the innovation leader while in sesame, Pingyu County Party Committee Government is the leader.

Confection sunflower: There is an accelerated pace of confection sunflower in China. About 80% of the total sunflower production is confection and used for snack consumption, with around 2 million acres, making China the largest confection sunflower producing country in the world, with a large proportion of hybrids developed



locally with superior agronomic quality, high yield, and tolerance to adverse environmental conditions that have been widely accepted by the farmers. The Chinese Sunflower Community is devoting more resources for research to sustain this success making further progress on agronomic characteristics, as well as tolerance to major pests such as broomrape and *Sclerotinia*, and improved techniques for sunflower cultivation. The sale of hybrid confection sunflower seed in China has an annual value of close to \$160 million USD, with an annual seed production valued at \$2.3 billion, and a total market value of \$6.3 billion after processing. The export of confection sunflower seed has reached 300,000 and 400,000 tonnes in 2016, and 2017, respectively. The Chinese confectionery sunflower has witnessed two technological revolutions in terms of the high yielding hybrids and improved quality. Right now, the Chinese confection sunflower is at the forefront in terms of scientific research, variety advantages, planting area, export quantity and quality, and the number of people (@1.0 lakh) engaged in sunflower. All these have contributed greatly to the wisdom and strength to the great revolution of the International Sunflower Industry.

In case of confection sunflower, the PPP Company in Wuyuan County, Bayannur is the innovation leader and moving ahead aggressively based on three strategies for increasing farmers' income—strengthening enterprises, improving enterprises efficiency and economic development; (i) The first priority on the research front is to develop high yielding, high resistance and good quality confection sunflower seeds followed by development of healthy confection sunflower seeds with nutritional value which will replenish the essential amino acids and vitamins for consumers. (ii) The second priority is to improve the planting management ability of growers and improve the commercial quality of sunflowers. To achieve this, at least 30,000 farmers are trained each year on techniques such as

planting, field maintenance, plant protection and detached head drying and harvesting. In addition, for the benefit of the farmers, a comprehensive four-level technical information service network is established for the provinces, county, township and village levels which allocates professional technicians providing advisories throughout the planting to harvesting process to produce good and high quality sunflower seeds and thereby increasing the income of the farmers. (iii) Promotion of brand and it has established a green brand of sunflower seeds so as to obtain economic benefits from brand name products.

Sesame: China is the largest country in sesame consumption; 1,000,000 metric tonnes of sesame is consumed annually, out of which 60% is in the oil form. The per capita consumption of sesame is 1.1 kg/year in China when compared to 0.4 kg/year in India. Therefore, China is compelled to import sesame from other sesame producing countries. The government has implemented several programs to reduce sesame import. Implementation of a national program on "Oil Doubling" in 2009 has resulted in an average of 5% increase in acreage of sesame, which showed significant economic growth and development in the county. The local Pingyu Party County and Zhumadian government have come with strategies for increasing the farmers' income, strengthening sesame enterprises and trade. The local government is instrumental in bringing together different farmers' industries and technology which they term as "Five Pillar model". Farmer's co-operative societies with 300 members were established to produce white sesame. Sesame planting and production technology are supported by scientists of Henan Sesame Research Centre under Henan Academy of Agriculture Sciences, Zhengzhou. Research and development of high yielding varieties and planting technology are carried out at Henan Sesame Research Centre, Zhengzhou. Leading industries and other food processing industries have come

forward for procurement of the raw materials. A professional sesame trading e-commerce platform has been created to expand the business both online and offline. Thus, China is aimed at creation of its brand excellence in white sesame in World market.

Innovation and value addition are the key to success

Industries for roasting the seeds have been established for processing the seeds for varied purposes. Based on the market demand, seed colour (black, white, striped), flavor, taste, and levels of roasting are decided. At the local level, small roasting units for processing the seeds are also available. Same is the case in sesame where such processing facilities have been established.

Value addition in sesame: China is one of the major producers and consumers of sesame. China imports sesame from countries like Sudan, India and Myanmar. Sesame, in China is consumed in various ways apart from sesame oil. In China, different products are developed using sesame, due to which the crop value has increased tremendously. Sesame leaves are edible and used as fresh leafy vegetable and also pickled and stored. Sesame paste constitutes an important part of famous hot pot meals in China; roasted sesame oil is used as salad dressing oil.

These products are tested for their safety and human consumption for which they are registered and patented. Products such as sesame flower tea, sesame sauce, sesame protein drink, lignin chewing tablets, lignin meal replacement powder, etc., are also prepared and attracting development and investments in subsidiary industries. The industry driven agriculture is necessary for increasing the value of the crop, sustainability of the crop among the farmers which further leads to increase in the farmer's income.

Confection sunflower: In case of confection sunflower, the whole seed snack foods have gradually transitioned to the seed kernels, baked sunflower kernel desserts like moon cakes and candies that have promoted the sunflower industry to



flourish. It is worthwhile to note the value of the processed products. For confection sunflower, the grower fetches an average price of ₹ 80/kg kernels; in the grocery shop it is sold at ₹ 140/kg kernels and the roasted and processed kernels are priced from ₹ 1,150 to 2,500/kg kernels depending on the quality and flavor.

Technology parks

The industry driven agriculture is necessary for increasing the value of the crop, sustainability of the crop among the farmers, which further leads to increase the farmer's income. Enterprise and entrepreneur development is inbuilt in the whole process chain. Visit of the Indian scientists to two technology parks are described.

Hetao E-commerce Industrial park in Wuyuan County to boost agricultural trade: Wuyuan County, hometown for sunflower, relies on its unique agricultural and livestock products resources and vigorously develops green industry. In this county, industrial parks, agricultural machinery manufacturing industrial park, food industrial park, urban parks, small and micro-enterprises, college students entrepreneurship, employment parks, state level technology business incubators are being promoted so as to make country the leader of green organic high-end agricultural and livestock products production and processing output base. A visit was arranged to the Hetao E-commerce Industrial Park in Wuyuan county of Bayannur League which has helped the farmers sell their agricultural goods online and increase their incomes. It is a State-owned enterprise that was founded in 2015 with 100 million yuan (\$15 million) funding to increase distribution channels for agricultural products including livestock, sunflowers, wheat, corn, and tomatoes. Farmers entrust their crops or livestock to 2,000 staff involved in e-commerce transactions, logistics and financial services. They can also use one of the 220 e-commerce companies at the park. These online outlets tend to place produce on popular live internet and TV shows in which a host will show



Lianxing new village as part of rural land transfer

viewers where it was planted or processed so that consumers will not worry about food safety. Apart from the industrial park, 110 e-commerce service stations in nine county towns have been established to help provide information and guidance to farmers, and villagers and assist in online sales. Wuyuan has become one of the country's pilot regions for rural economy e-commerce. It was interesting to see the China post for transport of the goods, a cold storage facility for preserving the perishables, a quality control lab, etc in this park.

Crop based technology park for sesame: Henan province is recognized for its best quality sesame production. World's best quality white sesame comes from Pingyu county in the southern part of Henan Province. The local administration is actively involved in developing sesame crop industry and is instrumental in establishing "Pingyu Sesame Food Scientific and Technology Innovative Park". The crop based technology park is one of its kind to promote sesame as a crop, an industry, an enterprise and as business investment. The park is established in 200 ha in Lantian Sesame Town with the total investment of 510 million USD. The technical support for the crop is given by "Henan Sesame Research Centre" which is a part of Henan Academy of Agricultural Sciences, located at the capital city Zhengzhou, Henan Province. The centre is involved in selection and breeding of best genotypes for cultivation.

Pingyu Sesame Food Scientific and Technology Innovative Park is attracting business investments by medium and large enterprises by providing creating infrastructure for processing, storage, centralized marketing and continuous supply of sesame raw materials.

A Cultural Museum of White Sesame was established in the premises of technology park of Lantian sesame town. A tour inside the museum gives an understanding of sesame cultivation, oil extraction and various uses of sesame in ancient China and the modern changes and upliftment of the crop in present day.

Creating awareness about the crop of their region

The government has taken up initiatives to set up crop based parks and crop museums as a leisure for the local folk. This makes people understand the importance of the crop of the region. It is interesting to note that the inaugural session of the International Sunflower Symposium was held at the Town Square where all the local residents participated in the event.

Solar energy

Solar power is extensively used and most of buildings and households are powered by photovoltaic cells. A visit was arranged to the new village of Linaxing in the Wuyuan county. Villagers of 457 families in Lianxing were relocated to new houses with photovoltaic (PV) equipments in



2015 with the help of government's poverty relief policy and PV enterprises. Those villagers now are beneficiaries of rural land transfers and development of cultivation industry.

Ecological restoration and controlling pollution

Soil conservation in China: In China, approximately half of the land area in agriculture, which accounts for 10.7% of the world's cropland (FAO, www.fao.org/statistics/en). The agriculture land in China exhibits vast carbon (C) sequestration potential. Studies based on soil surveys and regional simulations indicated that from the 1930s to the 1980s, there was a slight decrease in nationwide soil organic carbon (SOC) storage in China. Extensive farm management is considered as the major cause of continued SOC loss over this period. China has given importance for conservation and sustainable management of its natural resources. Soil is considered very precious and all the measures are taken to conserve it. The Chinese government began to promote conservation tillage and better management practices, including irrigation, fertilizer application and the use of crop residues, beginning in the 1990s. Ministry of Agriculture of P.R. China, 2009, reported that since the late 1970s, the mechanization of water-saving irrigation has increased at an average annual rate of 9%, and the effective irrigation area increased by 12% from the 1980s to the 1990s. Among the adopted farming reforms, changes in the ratios of chemical/organic fertilizers and crop residues were important improvements in agricultural technology in China in the second half of the last century. These management measures began to reverse the decline in SOC, and SOC began to accumulate due to the reforms of agricultural technology in the 1990. The ground is covered with nylon nets to avoid soil erosion due to wind and water. Soil organic

carbon of China is much higher than in India.

Greening: Lot of importance is given for conservation of nature, natural resources and proper use of the available natural resources. Urban green coverage rate in Wuyuan County is 47.2% to realize the concept of Open the door to see green, 500 meters into the garden.

Factors affecting agriculture production and trade

- Integration: Rapid progress and integration of agriculture with industry, tourism and culture; integration of urban and rural areas; integration of governmental policies with entrepreneurs involving different stakeholders all along the production-processing-marketing value chain.
- Top ranking technological standards, diversified products for different niche markets and economic value of the crop are the driving forces for success.
- As the crop is cultivated in a sizeable and contiguous area, crop management, farm mechanization and exploitation of latest technologies like use of drones for foliar sprays becomes easy and saves farm labour and time.
- Training and capacity building at all levels including the growers on improved cultivars, planting methods, field management and harvesting time procedures.
- Formation of Chinese crop based communities that include different stakeholders like growers, processors, traders (national and international) and consumers led to agriculture based economic development.
- Tourism in India is mainly to historical places and heritage sites. However, China has integrated agriculture into rural tourism and cultural festivals. Establishment of agricultural museums and folk culture villages are few such initiatives for creating awareness and sustained interest of the local

communities in the crop.

- Protection of crops and livestock of different regions of the country by granting national geographical marks which is ascribed to the brand value of the products.
- Going green with regard to the agriculture, protection of environment and saving the natural resources for a better future.

Futuristic outlook to improve the oilseed situation in India with particular reference to sunflower and sesame

- High productivity zones for oilseeds should be identified and supported with superior quality seed, resources, management and market.
- Large scale production of sunflower, sesame should be encouraged on the basis of community agriculture in these zones which can facilitate mechanized harvesting, sorting, grading and storage.
- The processing unit can be established in key crop production zones for production of value added products like ready to eat confectionery sunflower, sesame, groundnut in savories or sweets form similar to chocolates.
- An oil expeller can be established at block level where sesame production is >100 tonnes per year. The expelled oil can be supported with online market using digital India platform. The value and the quality of oil production and consumption increases with local production and processing.
- For superior quality seed, seed villages can be established with proper network of timely seed distribution for production.
- Keeping in view the increasing demand, export value and minimum support price for sesame, organic sesame cultivation could be encouraged in the NEH region.



*Plant trees, Conserve water,
Protect environment.*

