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A Look to the Worlds 6th Biggest Seed Market: India

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Abstract

Total acreage is 200 million ha and number of people depend on agriculture and related activities is 600 million in India. Indian seed industry is strong and is 6th in the World. Rainfed dominated agriculture has deficit of water, energy and labour; higher production costs, low farm profitability, low cropping intensities, unstable and low yields problems related to unpredictable rainfalls, biotic and abiotic stresses, traditional farming practices and low amount of certified seed distribution. But India is a dynamic country and solving the problems step by step with the help of international investors. Here in this review we take a look to Indian seed market to reveal some opportunities and threats for seed sector investors in this tropical country.

Keywords: India, agriculture, seed, market, industry

INTRODUCTION

Deficit of water, energy and labour; higher production costs and low farm profitability are main problems of farmers in South Asia (Jat et al., 2019). Approximately a 1/4 of the world's underfed people live in South Asian country India (Kadiyala et al., 2021). Rainfed agro-ecosystems are dominant in Indian agriculture. Low cropping intensities and unstable and low yields are related to unpredictable rainfalls, biotic and abiotic stresses and to traditional farming practices (Pradhan et al., 2018). Indian agriculture is vulnerable to climate shocks, floods, droughts and high temperature stresses. Diversification improves resistance of production system to climatic shocks (BIRTHAL and Hazrana, 2019).

Seed security is highly related to food security as the seeds are in the core of agriculture. Availability of adequate and quality seed at required time at the affordable price increase both production and yields (Singh, 2013). Fertilizer and hybrid seed usage increase agricultural productivity significantly (Bold et al., 2015). None of the inputs has the ability to affect productivity in agriculture like seeds. By its genetic properties, seeds push yield potentials to upper limits and effect the productivity of other inputs (Mloza-Banda et al., 2010).

Selecting and stocking seed is the basic and oldest agricultural practice. In modern and capital-intensive agriculture, seeds are treated like a chemical input (Kraft et al., 2010). Demand for agricultural intensification increasing the use of improved inputs such as improved seeds (Edson & Akyoo, 2020). The seed is the carrier of the genetic improvements and breeding efforts are mainly related to the growth and development of the plant but, commercial success of agronomically

superior cultivars are also related to competitive price of the seed (Boelt et al., 2015). Global consolidation of agricultural industry increases new challenges for competition with the emergence of new powerful companies at the input production level (Lianos et al., 2016). Agricultural biotechnology added opportunities and challenges to the seed sector over the last few decades. Rapid adoption of biotechnology in United States agriculture since mid 1990s associated with mergers and acquisitions led to a more concentrated agri-industry (Zhang, 2014).

Indian market is the 6th largest seed market in the world (Kulkarni et al., 2017). Indian seed sector has a pivotal role in Indian agriculture. Seed market is segmented by type, crops, seed treatment, trait, competition, geography and advanced technology content. Seed sector in India consist of big public sector and growing private sector. India has a bright future for seed market. Open varietal seeds dominate Indian seed business but this is changing by evolving consumers preference for high-value crop well adopted to processing and long distance transport. Acceptance of hybrid corn and *Bt* cotton is enormous in India. Biotechnological methods (markers for plant selection, application of genomics and germplasm data etc) usage is a common practice among government research institutions and major seed manufacturers in India (Tiwari, 2020). Indian seed sector is conducting many research and development activities now after penetration of large scale private firms. Indian seed industry is strong and is 6th in the world with US \$ 2 billion, in international seed market valued at US \$ 45 billion (Chauhan et al., 2016).

Acreages of rice was 44 million ha, 30 million ha for wheat, 16 million ha for cotton, 13 million ha for dry beans, 11 million ha for soybeans, 10 million ha for

chickpeas, 9 million ha for maize, 8 million ha for millet, 6 million ha for rapeseed, 5 million ha for sugarcane, 5 million ha for groundnuts, 5 million ha for pigeonpeas, 4 million ha for sorghum, 3 million ha for fresh vegetables, 2 million ha for mangoes, 2 million ha for potatoes, 2 million ha for coconuts, 2 million ha for pulses, 1.5 million ha for Anise (badian, fennel, coriander), 1.5 million ha for sesame seed, 1.3 million ha for lentils, 1 million ha for onions as major crops in year 2019. Total acreage is 200 million ha (Faostat, 2021).

Technological developments and policy reforms emerged new opportunities for private investments in seed and agricultural biotechnology sectors in India since late 1980s. The changes increased cotton yields and production in the country, but less effected the main cereals (rice and wheat) (Spielman et al., 2014). Indian agriculture is dominated by very small land sized farms. Regular and on time supply of high quality seeds of all crop species at low prices at local level is important. The formal seed sector, supply the quality seed partially (Singh & Agrawal, 2018).

India is the largest producer, consumer and importer of pulses in the world. Demand for pulses grow at 2.8% per year. 27.5 million tonnes of pulses is estimated to be required in 2025. Also 80% of the pulses growth areas are under stressed rainfed environments. High quality seed of improved varieties is vital to enhance production of pulses in the country. As pulses are grown in diverse severe biotic and abiotic stress conditions, varietal diversity in seed chain is very important. Currently 236 improved varieties of six major pulses exist however only 44 are dominant in seed chain. There is a need of high yielding and disease resistant varieties of

all pulses mainly chickpea (*Cicer arietinum* L.), pigeonpea (*Cajanus cajan* L.), mungbean (*Vigna radiata* L. Wilczek), urdbean (*Vigna mungo* L. Hepper), lentil (*Lens culinaris* L.) and fieldpea (*Pisum sativum* L.) (Chauhan et al., 2016).

Rainfed areas are mostly ignored by the formal seed sector in India where legumes, especially groundnut have high seeding rates and low multiplication rates than major cereals. Result is higher seed prices and seeding costs which force farmers to home-saved seeds. Re-sowing and gap filling is common in these areas (Singh, 2013). Legumes seed sector in India includes informal, formal and integrated parts. Informal seed sector dominates the legume seed production system. Majority of farmers who grow pulses keep a part of their product as seed material. But private sector is increasing its share in the market. Farmer-saved seed and exchange systems produces 70% of the quality seed labeled as ‘truthful’ seeds (Mula et al., 2013).

In a study including 100 farmers in Chitradurga district in Karnataka in 2013-14 showed that total cultivation cost for groundnut seed production was 18% higher than grain production. The gross return was 27% higher and net return was 44% higher in seed production than grain production (Pal et al., 2016).

Pigeonpea is a major pulse crop in India and local landraces dominate the cultivation of it. Yield is low (700 kg ha⁻¹) due to low quality seed. A survey in Fatehpur and Kanpur Dehat districts in Uttar Pradesh in India showed that farmer preference was towards the disease resistance, higher yield, attractive seed size and color. Farmers were locally organized as cooperative societies to for seed production, processing and marketing (Singh et al., 2013).

Rice covers 33% of the acreage and supplies 42% of produced food grains in India in 2016. 20% increase in rice production is needed by 2020 under pressure of land degeneration. Increasing seed and varietal replacement rates is important to bridge this gap. A strong seed system is essential for food security and growth in agriculture in India (Chauhan et al., 2017).

Many eastern Indian states employed hybrid rice cultivation on a massive scale after 2000. This increased demand for good-quality hybrid rice seeds. Karimnagar and Warangal districts of Andhra Pradesh produce about 85% of the hybrid rice seed produced in India. Benefit-cost ratio of hybrid rice seed production is 1.82 (economically viable). Hybrid rice seed production employs 35% more labor than normal cultivation of high-yielding varieties (Nirmala & Viraktamath, 2011).

Maize and pearl millet yields increased during last two decades in India mainly by private investment in seed industry in India (Kolady et al., 2012). To reduce climatic risks, maize production may be an alternatives to intensive rice-wheat rotation in western Indo-Gangetic Plains (IGP) (Parihar et al., 2018).

Increases in yields and production amount for cereals are low and stabil in India (Spielman et al., 2019). 1200 farmers included in a survey in five states of Indo-Gangetic Plains. Factors responsible for the adoption of new wheat seed varieties were age, land size, educational level and source of purchase of seed (access to seed from different sources). Most of the farmers selfproduce or take it from neighbours so are not able to use new varieties and use old varieties for many years. Reason for this was inefficient seed production and replication of new varieties; weak distribution channels and unavailability

of high quality new seed varieties in the public segment. There is the need of quality controlled and timely available seed production and distribution in partnership of public-private. Information on new varieties and benefits might be disseminated by extension services (Ghimire et al., 2012).

Bt cotton is the first agricultural biotech crop commercialized in India. Monsanto and Indian firm Maharashtra Hybrid Seed Company (MAHYCO) released three Bt cotton hybrids for commercial cultivation in India in 2002. Then, Bt cotton area was increased to 8.4 million hectares in 2009 (Arora & Bansal, 2012).

Seed is a critical input for jute crop because crop can not be targeted to produce both seed and fibre and bast fibres are the economic product. This is why, seed scarcity is a big problem for jute growers for the lower Gangetic plains zone of India which is a major fibre growing region (Bhandari et al., 2018).

Potato (*Solanum tuberosum*) is an important crop of India. Unavailability of quality seed tubers is a major problem for potato cultivation in Deccan Plateau of India. Many certified cultivars are available, but their quality check for viral infection is unregarded.

Market liberalization impact structure of economies significantly by changing the roles of public and private sectors and improving innovation in countries (Flister & Galushko, 2016). Seed sector regulations determine producers, sellers, marketable varieties, quality of seeds on market. Flexible regulatory approaches build bridges between formal and informal seed systems to guarantee existence of quality seed of farmer-preferred varieties in the market (Kuhlmann & Dey, 2021).

Seed quality assurance in India managed by Seeds Act 1966. Seeds must

comply with Indian Minimum Seed Certification Standards (IMSCS). For seed export, Organization for Economic Cooperation and Development (OECD) standards and International Seed Testing Association (ISTA) methodology of seed testing is valid (Prasad et al., 2017).

In 2004, Indian Government revised and replaced many of the policies related to seeds in India. The 2004 National Seed Policy force registration of domestic and foreign all seeds by the government before commercialise. New policy was also supporting easy foreign direct investment in seed market mainly for the genetically modified traits (Trauger, 2015).

Only 10% of the seeds sold in India are under certification. 600 million people dependent on agriculture and related activities. Approval of WTO agreement in 1995 promoted private sector research and development of varieties. To regulate such varieties and to prevent poor Indian farmers from multinational corporations, the Protection of Plant Varieties and Farmers Right Act, 2001 was approved (Ramamoorthy et al., 2013).

Data of 27 private companies and 9 public organizations from vegetable seed sub-sector analysed in India. India's most important vegetables (tomato and chili pepper) surveyed. It was determined that sales of varieties containing international germplasm in its pedigree was 11.6 t (14 % of the total market) for hybrid tomato seed and 15.0 t (13 %) for hybrid chili pepper in 2014. Approximately 0.5 million farmers use such seeds (Schreinemachers et al., 2017). Disease free, healthy and genetically pure vegetable seed production has challenges. Conventional open field vegetable seed production faces problems like isolation deficit, insects, diseases and viruses. Instead, protected cultivation deliver higher seed

yield and quality. After 2000, research on seed production under protected conditions was initiated in India to standardize the technology. Hybrid seed production of vegetables under various protected and open field environment has shown significant results in quality seed production and in increasing yield per unit seed in many vegetable species in India. Protected cultivation is highly economical and profitable to provide best quality seeds of many vegetables cultivated in India (Balraj & Tomar, 2015).

Farmers' participation in contract farming mainly depends on firm criteria than farmer choice. Analysis of 295 both contract and non-contract farm households from two districts of Andhra Pradesh showed that contract farmers are generally has higher education, productive assets, access to market, larger land, better irrigation facilities, bigger family compared to non-contract farmers (Swain, 2012).

Cash is often used in economic experiments however, in many less developed countries, where the use of cash is not feasible, an alternative type of payment is required. In Orissa in India as an alternative payment method, in-kind (exchange of household items) are used in place of cash. Farmers are willing to pay less for seeds when they are paid cash than when they are paid in-kind. Bids are higher by 1.18 Indian Rupees when farmers are paid in-kind (about 7% higher valuation) (Hossack & An, 2015).

CONCLUSIONS

Due to the big an diversified scale of the climatic, geographic, social, agro-cultural conditions and market scale of India, it is better to enter this market in a new consortium including companies from different segments. This consortium may target to improve its

export volume and income in a big market by offering:

- Highly diversified crop species
- Highly diversified varieties
- Highly diversified stress tolerance
- Stabil & high yields & quality
- Medium-low price policy for small-medium profits per seed pack.

A second consortium consisting of small and medium Indian partners may also be beneficial to build a stable and complex network capable of evolving to a more locally-adopted international agglomerate. This system may not just sustain sustainability of commerce but also to improve the local agricultural knowledge for the benefit of low income farmers. This win & win strategy will probably feed this system in an increasing trend with improving farmer incomes.

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