Agricultural Communication

Biosci. Biotech. Res. Comm. 9(4): 621-624 (2016)

BBRC Bioscience Biotechnology Research Communications

Role of seed and its technological innovations in Indian agricultural sector

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ABSTRACT

For sustainable agriculture, a good quality seed is the most basic and essential input. Other inputs are contingent upon quality of seed for being optimally effective. The Indian seed industry has played a very critical role in the growth of Indian agricultural. Agriculture in India is backed by a strong seed improvement programme involving both the public and private sectors. The Indian seed sector is highly vibrant and energetic and is well recognized internationally. Seed is the basic and most critical input for sustain agriculture. The response of all other input depends on quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15-20% depending upon the crop and it can be further raised up to 45% with efficient management of other inputs. The developments in the seed industry in India, particularly in the last 30 years, are very significant. Future of agricultural production will largely depend upon development of improved varieties/ hybrids in various crops, supported by efficient, cost effective seed production technology.

KEY WORDS: SEED, DEVELOPMENT, IMPROVEMENT, PROGRAMS, AGRICULTURE

INTRODUCTION

The agriculture is backbone of rural economy. Agriculture in India has made significant growth and we are on the path of second green revolution through modern agriculturical technology. For sustainable agriculture, a good quality seed is the most basic and essential input. Other inputs are contingent upon quality of seed for being optimally effective. The Indian seed industry has played a very critical role in the growth of Indian agricultural. Agriculture in India is backed by a strong seed improvement programme involving both the public and private sectors. The Indian seed sector is highly vibrant and energetic and is well recognized internationally. Our diverse agro-climatic conditions are conducive for producing high quality seed of tropical, temperate and

ARTICLE INFORMATION:

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Received 10th Nov, 2016
Accepted after revision 16th Dec, 2016
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007
Thomson Reuters ISI ESC and Crossref Indexed Journal
NAAS Journal Score 2015: 3.48 Cosmos IF : 4.006

Online Contents Available at: http//www.bbrc.in/

sub-tropical plant varieties. Our seed processing/conditioning industry has perfected post harvest techniques for quality up-gradation and maintenance to ensure high standards and quality of seeds. According to the recent report, the Indian seeds industry grew at a Compound Growth Rate (CAGR) of 8.4 percent in volume terms from FY 2009 to FY 2015 to reach 3.5 million tonnes in consumption. Double-digit growth for Indian seed industry. Similarly, TechNavio's analysts forecast the Hybrid Seeds market in India to grow at a CAGR of 14.1 percent during the period 2014-2019 (ICRA 2015 and TechNavio (2015).

Indian agriculture has earmarked significant advances and the seed industry has played a key role in this endeavor. The challenges confronting seed sector are now more than even before due to demand of quality seed of promising varieties to ensure food security. During recent past, seed technology has emerged as potent tool to achieve targeted agricultural production. India has one of the largest public National Agriculture Research System (NARS) in the world. (Wais Kabir Ibrahim Md. Saiyed SAARC Agriculture Centre, 2011)

The country is also a biodiversity hotspot. India's food, nutritional, livelihood and socio-economic security depends largely upon agriculture and land resources. This situation is not likely to change in the near future. The production of hybrid seeds is to a large extent the prerogative of the private sector. Of all improved cutivars bred and marketed by private companies until 1993, nearly 70% were hybrids. Since hybrid seeds can not be multiplied in farmers' fields, they must be bought from the company every time they are raised. This high seed replacement rate ensures firms good sales. That is not the case with high yielding varieties of crops like wheat or rice, for which the replacement rate fluctuates between 9 and 14%.Apart from hybrids, the private sector is also largely involved in the commercialization of low volume, high value crops such as vegetable seeds. With some 500 companies of various sizes, 24 of which with links to multinationals, the private sector contributes a little less than 50% of the commercial seed requirement for the country today, (Agritex 2016).

Future of agricultural production will largely depend upon development of improved varieties/ hybrids in various crops, supported by efficient, cost effective seed production technology. Without good seed, investment like fertilizer, water, pesticides and other input will not pay the desired dividends, (Lal 2008).

Scientifically speaking, seed is an "embryo", a living organism embedded in supporting the food storage tissue. An improved seed is a most dynamic instrument for increasing agriculture production and also economical input. The fact that a genetically pure seed alone could increase crop production by 20 percent and provide resistance against several menace states the importance of this basic input in agriculture. In order to face the challenges of the international seed trade vis-à-vis to ensure the availability of quality seed to Indian farmer, there is urgent need that the Indian scientist, policy makers, seed quality regulators and public and private sector seed producers may join their hands to make India a seed hub on global map.

The growing population of India along with its changing food habits needs around 130 million tonnes of rice by 2025. Seed is the basic and critical input in crop production. The increase in rice production can be achieved through quality seeds. With an extensive and rich agricultural genetic resource base, coupled with the associated knowledge and cheap labour India provides a fertile ground for the seed production. The Indian seed industry, which used to be dominated by public sector seed companies, has shown an appreciable rise in the role of private sector seed companies in seed development and marketing de-regulation and the implementation of a New Seed Policy in 1988. More recently, the government's decision to embrace the biotechnology as a means of achieving food security has attracted several leading biotechnology-focused multinational seed companies to India. The composition of seed industry, by volume of turnover, has reputedly reached a ratio of 60:40 between the private and public sectors.

Seed is the basic and most critical input for sustain agriculture. The response of all other input depends on quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15-20% depending upon the crop and it can be further raised up to 45% with efficient management of other inputs. The developments in the seed industry in India, particularly in the last 30 years, are very significant, (NSC 2012).

Coupled with biotechnology and other crop improvement technologies, seed offer tremendous opportunity for improving the productivity of Indian Agriculture. In the significant advances that India made in agriculture in the last four decades, the role of the seed sector has been substantial. The expansion of seed industry has occurred in parallel with growth with in agricultural productivity. Given the fact that sustain growth to cope with increasing demand would depend more and more on the pace of development and adoption of innovative technologies, the seed would continue to be a vital component for decades to come.

A robust seed system guarantees the sustainability of its agriculture to ensure that the products of modern plant breeding and local farmer ingenuity are widely available. National seed system usually include several elements. A commercial seed sector is necessary to ensure efficient seed supply. Both the public and private seed systems are relatively well developed in India; hence the

possibilities of delivering plant-breeding innovations to farmers are better. An unanswered question however is: how to resource–poor farmers react to a complex commercial seed provision system?

Recent innovations in adaptive and participatory research go a long way in addressing the first concern, but much remains to be done regarding seed system diagnosis. Even in a relatively mature seed system such as the Indian one, the movement of information between farmers and seed providers leaves much room for improvement. Seeds secure farmers to tend to maintain their own varieties with limited influx of new varieties. In addition, awareness about variety selection is not always well developed in traditional farming communities. It may also reflect the fact that in traditional self-contained seed systems, the same genetic material may be easily available from neighbors, thus reducing the risk of seed procurement and accesses.

Further, seed industry is in the process of rapid change in post WTO era in view of important changes: (1) changing technologies and legislations, (2) restrictions on free exchange of germplasm and (3) introduction of transgenic crops. Again, spiralling food prices, climate change issues and the importance of agriculture in economic growth has provoked a renewed interest for investment to develop commercially viable innovative seed technologies, in order to provide value added seeds for wide range of environments is recognized to be a critical step for the development of agriculture production and productivity.

Future of agricultural production will largely depend upon development of improved varieties/hybrids in various crops, supported by efficient, cost effective seed production technology. Diversification of areas of seed production and development of appropriate seed production technology needs to be focused for expansion of seed production system in the country. Identification of alternative/ specific areas for quality seed production and mapping of disease free seed production zones may go long way in popularizing seed production technologies in non-traditional areas. Under AICRP-NSP, alternative areas were identified for hybrid seed production of rice, sunflower, sorghum and pearl millet, which shall help in horizontal expansion quality seed production per se. Promoting local seed enterprises to address global food security : Success stories from Africa, Asia and Latin America and other developing nations have been reported by FAO (2016)

SEED TESTING AND DEVELOPMENT PROGRAMS

Traditionally seed production programs in India have remained labour intensive and most of the seed production activities handled by skilled and unskilled labours. Farm mechanization may provide answer to the shortage of skilled workers during crucial period of field preparation, intercultural operations and harvesting thereby increasing efficiency and reducing mechanical damage to seed. Perpetuation and conservation of traditional varieties in seed chain through community seed systems and establishment of seed village banks to serve farming community in times of natural calamities like flood, drought, cyclone and disease and pest epidemic. Revising certification standards to meet current needs and harmonization of these standards as per international norms, so that Indian seed market curves its own niche in international seed trade under the backdrop of OECD scheme of seed certification and UPOV convention.

Priority need to be given for standardization of appropriate invigoration protocols as well as seed coating and pelleting technologies, for enhancing planting value and storability of high value and poor storer seeds. Seed quality enhancement through second generation drying, packing and quality enhancement technologies viz. intelligent coating molecules, time & target oriented seed additives, electron treatment, magnetic treatment, plasma coating and its commercial application holds the promise to deliver seeds with high vigour and better adaptability to biotic stress for external as well as internal designing of seeds will increase efficiency of delivery system, (Copeland and McDonald 2001).

Seed Testing is the art of science of evaluating seed quality for agricultural purpose. Although initially developed for evaluating the planting quality of field and vegetable seeds, it is also valuable for determining the quality of lawn, flower and tree seeds (Copeland and Mc Donald, 2001). The Expression seed quality is used loosely to reflect the overall value of seed for its intended purpose. Seed quality is usually a composite of several factors, all of which contribute to the desirability, or planting value of the seed. The key question is “why do we test seeds? There are several reasons. First, and most obvious, is that the dry seed’s potential to establish a seedling cannot be determined until the seed has been germinated. However, we also test seeds to determine the genetic (varietal) and mechanical (weed / other crop) components of the seed lot. Seed testing results provide important information to both the seed producer and purchaser. The seed producer wants to ensure that only a quality product is marketed so that consumer will return for their future seed needs.

During the past four decades of seed testing in India, the number of seed samples analyzed in various seed testing laboratories has considerably been increased. However, desired level of perfection in seed testing has yet to be achieved. Additional laboratories in private/ public sector are in the process of establishment to cater the need of seed testing for increased seed production targets. Most of the laboratories in India are either ill

equipped or without adequate infrastructural facilities and trained manpower resources. Hence, in order to train the Human resources and equipping all the laboratories, Govt. of India, Ministry of Agriculture, Department of Agriculture and Co-operation, Quality Control Wing giving more emphasis by providing required funds for the SSTLs and training the personnel who are involved in the Seed Quality Control Laboratories. Besides at least one laboratory of public sector in each and every state should obtain ISTA membership to getting accreditation for movement of seed in international market.

In view of the globalization of seed trade, it would be desirable to update the seed testing rules and procedures in conformity to the international level. It is so far newly private Seed Testing Laboratories in India is accredited with ISTA. The importers from various countries like America, Europe and Australia, etc., insist for this certificate. Seed producers who want to have their seed tested have to be sure that the results produced are reliable and reflect the true quality of the seed to be sold. These results are influenced by many factors, such as competence of analysts, use of appropriate equipment, use of validated methods, accurate recording and reporting, etc. Accreditation is a process through which a laboratory's technical competence is verified through assessment by an experienced audit team against established audit criteria. Factors that influence the test results are subjected to assessment to verify if these criteria are met. Criteria are formulated in the ISTA Accreditation Standard which is based on the internationally agreed generic accreditation standard for testing and calibration laboratories ISO/IEC 17025 Standard.

Seed is a wonder in this universe, though it looks tiny, it encapsulates the life for the future progeny, it encapsulates the inherited Characters and it posses the vigor and viability to establish. Seed is the vital basic input in agriculture for ensuring increased yield and quality. Use of good quality seed alone ensures a 20% increased yield apart from other inputs.

Seed certification is a process designed to maintain and make available to the general public continuous supply of high quality seeds and propagating materials of notified kinds and varieties of crops, so grown and distributed to ensure the physical identity and genetic purity. This objective paved the way for the developments in the seed industry in India, particularly in the last 30 years which enables the supply of good quality seeds to the farmer. Seed certification of feed and fodder crops in hilly, coastal and arid zones need to be undertaken on priority basis. Normalization of seeds certification standards should be given priority, because of increased importance of fodder seed in global trade. Facilitating validation of standards for OECD certification to promote our hybrids/varieties especially SARRC countries.

CONCLUSION

In summary, the Indian Seed Development Programme has now occupied a pivotal place in Indian agriculture and is well poised for substantial growth in the future. National Seeds Corporation, which is the largest single seed organization in the country with such a wide product range, has pioneered the growth and development of a sound seed industry in India. NSC, SFCI, States Seeds Corporations and other seed producing agencies both private and government backed are continuously and gradually expanding all their academic research industrial and social activities especially in terms of product range, volume and value of seed handled, level of seed distribution to the un-reached areas especially the poor farmers with quality seeds. Hard work of these seed producing agencies have built up a hard core of competent and experienced seed producers and seed dealers in various parts of the country and have adequate level of specialization and competence in handling and managing various segments of seed improvement on scientifically sound and commercially viable terms.

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