BioSpectrum the business of Bio & Health Sciences

A billion dollar opportunity unfurling

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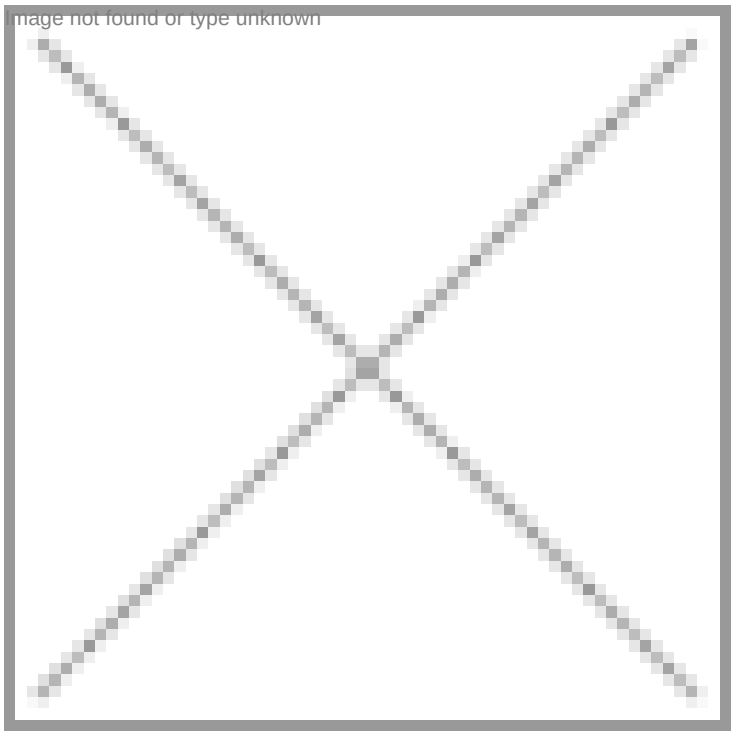

Agriculture is an ever-shine growth area. After all, the number of people to be fed decent meals increase every year. The nation now has mountains of food grains in its godowns, 48 millions to be precise. But the pile up has occurred due to lack of purchasing power and not due to declining demand. And with production dipping in the last two years due to drought, there is an urgent need to increase productivity.

Modern technologies, new farm practices, genetically modified seeds, bio-pesticides and fertilizers, and high-yielding hybrid varieties are looked upon as saviors of the farmers. We are entering the age of biotechnology products.

The bioagriculture market is looking up. A recent Confederation of Indian Industry (CII) study has predicted that the agribiotech would grow rapidly in the next five years and would account for at least 15 percent of the total indigenous market. Its current share is around two percent. Among the biotech companies, the agriculture sector accounts for 24 percent. Agribiotech share is expected to touch 33.7 percent of the total biotech companies in a few years.

Deepak Mallik, CEO, Advanta India Limited, an agri-biotech company based in Bangalore, has a different viewpoint. "BioPharmaceutical is the leading sector in biotechnology industry in India. The contribution of biopharmaceuticals is 75 percent and bioagriculture is 25 percent. In terms of business potential, biotechnology based agriculture industry has tremendous scope in the country as agriculture is the back bone of the country with over 70 percent of the population depending directly or indirectly on it."

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The table gives a clear picture about the future consumption of biotech products in India.

Consumption of genetically modified (GM) plants/seeds are expected to increase in the coming years. This would offer the opportunity of investments to the tune of Rs 1500 crore in the next five years in specific sectors of seed industry. Field experiments have been initiated for evaluating the environmental risks and human health. Initial results have not shown any unmanageable risks either to environment or human health.

Indeed the good news is that there has been significant rise in the agronomic benefits, besides reduction in the use of chemical pesticides for plants engineered for resisting the attack of insect pests. In addition to the high yielding hybrids/ varieties, farmers are have started using the GM seeds in cotton. The first GM product, the Bt cotton was permitted for use in India in March 2002. Monsanto's Bt cotton has been planted in some 40,000 hectares in the first year. The results of the first crops of Bt cotton are mixed with farmers not realizing the full potential. However, experts attribute this below par performance to other factors such as drought. A national debate is now on about the efficiency of Bt cotton crop.

Besides cotton, we may find GM seeds in maize/corn, mustard, soyabean and rapeseed by 2005. It is estimated that the Indian farmers may use two tons each of GM maize/corn, mustard/rapeseed, soyabean seeds out of 1000 tons of all types of seeds by 2005.

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"Since biotechnology is new in the country, it is necessary to educate the public about this technology. India must be aware about the benefits Government, as well as other players in the field, have to take initiatives. This can be done through a variety of mediums ranging from scientific seminars to inclusion in school curricula", says Dr. TM Manjunath, director Monsanto Research Center, Bangalore.

Besides the private sector seed companies, many government funded institutes and organizations are also getting ready with transgenic crops of rice, rapeseed/mustard, potato, brassica, moonbean, pigeonpea, cotton, tomato cabbage, and cauliflower. The process of field assessment of some of these crops is likely to be completed in few years and some of them would be ready for commercial production by 2005. It is also expected that a protein rich wheat with a higher lysine content will also be introduced in the farmer's field soon. Indian research efforts in developing a trasnsgenic rice variety is also going on well as part of a global effort. Indian scientists have sequenced 2.7 mega bases (Mb) of chromosome-11 in rice. India's commitment to sequence 10 Mb of chromosome-11 in five years is expected to open the market opportunities for private companies.

Global companies like Monsanto, Bayer Crop Science, Dow Chemicals, Du Pont, Syngenta, BASF dominate the agribiotech sector in India. These were the first companies to introduce a host of GM products in tomato and cotton. They have huge market and mind share and leverage every opportunity to extend their intellectual property rights (IPR) to Indian market. Mahyco is a major Indian players in the GM seeds market. A recent study by Rabobank India has predicted that seven more Indian companies were expected to become players in the GM seeds market. These are: Mahendra and Paras of the Emergent Group, Nath Seeds, Ankur Seeds, Ajeet Seeds, Raasi Seeds, Krishi Dhan and Nuziveedu Seeds.

These companies may release Bt cotton hybrids by 2006. Nath Seeds is sourcing the gene from the Biocentury Transgene Company, China while others are licensing it from Monsanto.

However, Prof. M D Nanjunda Swamy, prominent farmers' movement leader has a different view. He says, "agriculture biotechnology is devastating one. The failure of Bt crops has forced many farmers in Maharashtra, Gujarat and Andhra Pradesh to take drastic steps. Considering these facts, I would urge the Government of India to encourage the use of traditional crops instead of GM seeds."

Sush a statement need not lead to any panic. The bioagricutlure provides opportunities in other sectors such as biofertilizers, biopesticides and bio fuels, where biotechnology has tremendous applications.

Bio-fuel

With the world experiencing an energy crisis, the search for alternative fuels has been on. Biofuels offer an attractive opportunity to conserve and economise conventional fuels like petrol and diesel. Biofuels are being used as admixtures with conventional fuels at levels that do not require modifications of Internal Combustion (IC) engines. Pure biofuels can also be used.

However, this requires a modification of IC engines. In general, blends containing 25 percent biofuels can be effectively used, resulting in lower cost of fuels, nearly half of petrol costs with low polluting emission characteristics. Ethanol in sugar molasses is used as a raw material to produce gasohol, petrol blended with 5 percent ethanol. It is beneficial to the country as a whole, besides the farmers, the sugarcane related industries and the environment.

India being a major sugar producer in the world with production of 18.51 million tons in 2001-02, the total supplies of sugar during the year stands at 28.2 million tons, (with a huge stock of 10.7 million tons by the end of the crop season in September 2002). But the offtake in the local market is 16.5 million tons during 2001-02 leaving a surplus of 10.7 million tons.

Looking at this, the ministry of petroleum has decided to supply gasohol to cover the entire area of nine states and four Union Territories fully by June, 2003. The project was launched last January. Though oil companies have completed their arrangements in this regard, the state governments other than Maharashtra and Uttar Pradesh could not develop the infrastructure to produce anhydrous ethanol and sought more time. As the current total consumption of gasoline in these states and union territories is about 4.6 million tones per year, the requirement of ethanol at 5 percent blend ratio works out to 320-350 million litres.

So the scope in biofuel sector is very big. That not only helps the sugarcane farmers, but also helps in building up the oil security apart from benefiting the environment. It also saves the country's foreign exchange in the tune of Rs 80,000 crore as India imports about 70 percent of the its requirements of crude oil. The farmers gain with better returns as sugarcane finds a new avenue since ethanol is produced from the sugarcane molasses hitherto going waste. The emission of pollutants are lower from ethanol-blended fuels as ethanol acts as an oxygenate helping better combustion.

Benefits of agri-bio

Feeding a Growing Population: hunger is a complex issue and biotechnology is among the approaches to address this challenge

Benefits for the Environment: discoveries will allow certain key crops to have their own protection against insects and disease

Nutrition, Quality and Taste: research into numerous improved food products include food crops with higher levels of nutrients, vitamins and antioxidants. The better balance of amino acids (in proteins) and fatty acids (in oil and fats) will better the nutritional content and may also help to reduce the risk of heart disease and certain cancer.

Bio-fertilizers and pesticides

Bioagri sector is looking up from the increasing use of biofertilizers and biopesticides. Formulations based on Bt, viruses like NPV and GV as well as neem-based pesticides are finding more takers. Experts predict that to meet the increasing demands, industry would have to scale up their investments. Rough estimates show that the level of investments required are : Rs 20 crore in biofertilizers, Rs 50 crore in pheromones, growth stimulants /promoters and Rs 60 crore in botanical pesticides.

The integrated nutrient management (INM) program initiated by the Department of Biotechnology at 17 centers has provided technology packages for many cropping systems. Through these studies, it has been established that a combination of biofertilizers resulted in significant increase in yield of crops and such packages could replace 25-30 percent nitrogen. There was a conspicuous improvement in soil structure due to combined application of organic matter. The CII has estimated an increase in the use biofertilizers in the next five years. The estimated consumption of biofertilizers â€" rhizobium, azospirillum and azotobacter â€" in 2000 stood at 11,200 tons against 10,470 tons in 1997. A 25 percent increase in consumption of these products to 14,900 tons is expected by 2005.

On a conservative estimate, even a 10 percent saving through the use of biofertilizers is expected to result in an annual saving of 1.094 million tons of nitrogenous fertilizers costing around Rs 550 crore.

According to CII, the prospect for Bio-pesticides sector in India is bright with the demand for biopesticides expected to increase to 200 tons by 2005 from 120 tons in 2000. Already 50,000 farmers have benefited through the training programs and extension held by government. Several bio-pesticide technologies have been developed on the basis of large-scale field efficiency. Patents have also been developed for the mass production technologies of biocontrol and their product formulations.

Future Perfect

The future of agri-biotechnology is very bright. The use of modern technology in the form of genetic engineering is helpful in producing crops that are pest-resistant and resistant against diseases and herbicides. Crops that are tolerant to drought, cold, salinity and other harsh environments can be produced. Of these, the first generation of biotech products comprising crops that are resistant to pests, diseases and herbicides have already been commercialized since 1996 and by 2002 these occupied 52.6 million hectares in 13 countries (including both developed and developing countries), cultivated by about 5.5 million farmers. The estimated global market for transgenic crops is projected to increase from $3 billion in 2000 to $25 billion by 2010.

Dr AM Krishnappa, vice chancellor, University of Agriculture Science, Bangalore, is very optimistic about the future of biotechnology in agriculture. He says, "Bioagri is a boon to the country to fulfill its domestic requirements in the foodgrains sector. The scope for biotechnology in India is tremendous. But due to lack of funds and support from the government, it is difficult to run the show. My university's department of biotechnology since its opening in 1996 has added more students to its list. At present 16 students are pursuing the biotechnology course at the department. Though there is demand from the

student community, the lack of infrastructure is not allowing enrolment of more students for the course. "

On the scope of bioagri in India, Dr TM Manjunath, director, Monsanto Research Center, Bangalore, says, " India is predominantly an agrarian country with more than 60 percent of the population dependent on agriculture directly or indirectly. Our population has already exceeded one billion and it is expected to reach 1.5 billion in 2050. At the same time, resources like arable land, water and fertilizers are diminishing. Therefore, the challenge before us is to produce more food to feed the ever-increasing population with less land, water, fertilizers, labor and other resources. Biotechnology has the potential to offer solutions. Biotechnology will benefit a highly populous, agriculture dependent and a developing country like India than the developed countries. "

Manjunath added that as biotechnology was new to the country, it was necessary to educate the public about this technology. Public must be aware about the benefits. Government as well as other players in the field have to take initiatives. This could be done using a variety of mediums ranging from scientific seminars to inclusion in school curricula.

The Central Board of Secondary Education (CBSE) has introduced biotechnology as an optional subject in Class XI from June, 2002. Some 125 schools in the country are offering this option now.

Kiran Mazumdar Shaw, chairperson and managing director, The Biocon India Group finds a very different future for biotechnology related to agriculture. "Agribiotech has a very questionable future largely because of the various sentiments about GM crops. I think we can make agribiotech in to a very big business. Companies should not concentrate on edible or nutrition products as they may encounter regulatory hurdles. Bt cotton is a good example. Using the same tech for growing of trees for paper production, or for the production of medicinal plants will have a different view point and that will push the sector to a greater extent."

If the bioagri sector has to succeed, a lot of awareness campaigns have to be done to reach out to the farmers. The mixed results of GM crops in the first year of sowing may not exactly be the correct indicator of its potential. After all, the water stress and other environmental factors too may have played a role in the relatively low output. The potential of the crop, a harbinger of the new technology, should be monitored over a longer period before a final decision is taken.

Narayan Kulkarn