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A Quarterly Publication

ABSP II

Agricultural Biotechnology Support Project II, South Asia

Supporting Agricultural Development Through Biotechnology

NEWSLETTER

October 2007 I Volume 2 No 4

About ABSPII

The developing world can benefit from advances in biotechnology, but much needs to be done to make bio-engineered products available in forms that formers can use. The Agricultural Biotechnology Support Project II (ABSPII) believes that farmers and consumers worldwide should have the opportunity to make informed choices about using bio-engineered products. ABSPII focuses on the safe and effective development and commercialization of bio-engineering crops as a complement to traditional and organic agricultural approaches in developing countries. The project helps boost food security, economic growth, nutrition and environmental quality in East and West Africa, Indonesia, India, Bangladesh and Philippines. Funded by the United States Agency for International Development (USAID) and led by Cornell University, ABSPII is a consortium of public and private sector institutions.

The consortium develops innovative, pragmatic solutions, building on the successes of the Agricultural Biotechnology Support Project (ABSP) that was led for a decade by Michigan State University.

In South Asia (India and Bangladesh), ABSPII supports development of expertise in the areas of research, policy development, licensing and outreach to help reduce poverty and hunger through agricultural biotechnology.

Message from K.Vijayaraghavan, Regional Coordinator, South Asia, ABSPII.

AUGMENTING GAINS FROM PARTNERSHIP – THE ABSPII WAY

ABSPII consortium was formed in October 2002 and during the last five years we have accomplished significant progress in South Asia, South East Asia and Africa in establishing public-private partnerships for the development of genetically modified seed traits that can provide socio-economic impact in the region. We have carefully chosen our priority areas after exhaustive consultations. We formed consortiums that would help pooling vital technologies and human resource capabilities for accelerated product development. We focused on capacity building initiatives that would bridge the gap in knowledge and skill levels. We pooled research funding so that the advantage of investment in such research can be multiplied manifold. We were overwhelmed by the support that we received from national research organizations in the public sector and leading private sector in India, Bangladesh, Philippines, Indonesia and Africa. The support from US partners in providing pro bono access to highly guarded, patented technologies opened access to technology partnerships for the development of products that can significantly enhance the income levels of resource constrained farmers.

While it is true that on the product development front we have accomplished significant progress, we need to focus on enhancing the capacity of the public sector partners in delivering value to the farm community through extension and outreach efforts. Their ability to provide seed access to resource-constrained farmers will be another pre-requisite for the success of ABSPII projects. Our efforts in the near term and medium term will be to support our partners in augmenting their capability to multiply quality seeds and deliver such seeds to resource constrained farm communities through innovative supply chain mechanisms. A software tool has been developed by ABSPII that will significantly enhance the capability of public sector partners in multiplying and delivering seeds to farmers. Our public sector partners have also developed sound capabilities for technology stewardship and monitoring adoption. Our partners are geared to address these challenges and we look forward to implementing exciting programs in augmenting such capabilities even further.

I am glad to convey that the "transgenic events" supported by ABSPII are being approved by Regulators in various countries for large-scale field trial or multi-location trial. The products being tested in these trials, when successfully brought into use, will bring enormous advantages to resource constrained farmers and consumers.

PROSPECTS OF AGRI-BIOTECH IN INDIA

By *Dr.M.S.Kuruvinashetti, Professor and Head of the Department of Biotechnology, Institute of Agri-Biotechnology, University Agricultural Sciences, Dharwad, Karnataka, India.*

Bt- cotton in India is house hold. Though started late, India has made significant progress in the adoption of GM cotton following an elaborate regulatory process. Official figures from just of 0.05 million acres in 2002 to over 9 million acres in 2006-07 crop season speaks volumes about the adaptive enthusiasm of the Indian farmer, whenever he sees value. Starting off with licensed cry 1Ac gene in a few hybrids of MAHYCO, we have over 60 commercial hybrids of more than a dozen seed companies grown across the country. In the process, four more genes/events have been added; one by a public Institution, a fusion gene construct from China and one by a private company, Metahelix and a stacked gene product. A stacked gene product is also in the market. Current focus of Ag-biotech in India is on insect control, though work is on many genes that may confer resistance to diseases and abiotic stresses, marker development and genome mapping, QTL detection and transfers through marker assisted selection. The developments will certainly improve the GM and non-GM options available to the breeders for crop improvement.

GM crops are here to stay. While the area under GM cotton will expand, the other crops, including GM food crops may hit the market once the society finds that the genes deployed are safe and beneficial.

In India, we started late in this area and sill continue to lag quite a bit. There are at least three major stages in science driven products. The first one is deep rooted in the science of it and the pursuit of knowledge, unmindful of the applications per se and opportunities it may generate. Second stage is about recognizing applications and commercial opportunities in new information and knowledge, as it comes, and the third happens to be the actual applications relevant to the needs of the society. History has shown more often than once that the science leaders are also technology leaders! Countries which had technology culture and pursued science seriously naturally accumulated intellectual property (IP) to a leadership position in different domains of biotechnology as in other areas. Others, who had technology base, had a quick grab on it and the rest lagged. This is true for modern industry that we know off. Biotechnology is no exception. In this context, we need to look at the Ag-biotechnology space of India, the problems and the prospects.

AREAS OF CONCERN

1.Intellectual property: Most, if not all, IP in Ag-biotech space is held by non-Indian multinationals. While it has to be honored and the value shared, if employed for commercial activity, some sections of the society do not seem to realize the basic fact that we cannot wait and depend on native IP, whenever it may appear on the scene. At such times, usually the scientific community is at the receiving end of the blame game. IP generation depends on the long term commitment of quality resources, institutional support structure, human resource development and many other factors. In fact it is a smart habit, carefully nurtured as part of the cultural ethos of a country over long periods of time, and on a sustainable basis. IP is not the exclusive domain of any country or region. Then, are our institutions designed and provided for IP generation is a moot question. If suitable technology is available to meet the needs of the society, it needs to be adopted and the value is to be shared between the contributors. This is the order of things in the present day world. Many public and private institutions in India do have the necessary facilities and manpower to pursue, own, acquire or absorb any IP in biotechnology. Some of the Bt- cotton hybrids have genes developed in India as well. And many more will be developed indigenously.

a) **Public Institutions :** Except for some islands of excellence, much is desired if institutions have to come up to the stage of being leaders globally. Universities are the places where it should all begin in the first place. Reality is that our Universities in general are not in the race at all. Look at the spending pattern on science and technology of the country, vis- a- vis the Universities. It is not good enough. The situation is similar in sector specific research organizations in the area of biotechnology.

Though the resources allocated to certain sectors appear huge at a given point of time, it is not sufficient and much of it is not directed towards generating excellence. A useful parameter could be- how much of GDP we spend on science and per capita per scientist/faculty. I do not have the figures to quote here, but it is critically low. The administrative structure of the institutions also matters.

Intellectual property does not arrive at the scene on demand or by spending when the need arises; it has to be pursued and cultivated, in spite of uncertainties associated with it over a long time period. Then and only then shall we be at stage 'one' of the product path of some or at least be a part of stage 'two' for sure. As of now we have the potential to be at stage 'two', thanks to the sustained funding for HRD and investment on research by the central institutions like Department of Biotechnology, Indian Council of Agricultural Research, Department of Science and Technology and Scientific and Industrial Research; we have well trained manpower.

b) **Private companies:** The only GM crop in the country, Bt- cotton started with a Monsanto cry 1Ac gene construct licensed to Mahyco. In the present day world it is perfectly in order to develop a business and make profit while creating value for the clientele; farmers and consumers, irrespective of the source of the technology, within the framework of the laws of the land. Success and value created by Bt- cotton to the seed companies, has stimulated many to invest part of their earning in biotechnology. In fact, four gene constructs recognized in India against the cotton boll worm (Monsanto's cry 1Ac, fusion gene of Chinese origin, cry 1F from a public institution and modified cry 1Ac of Metahelix) two are home grown. This is a welcome trend and should be encouraged.

c) **Private–public partnerships:** It is well known that the private companies operate in the high value segment of the seed business. Seed companies have been doing a great service in certain segments, especially with hybrids in commercial, food crops and vegetables. There are many crops and problems which may not attract the attention of the big private industries at all. For instance, ground nut is an important crop for the stability of edible oil supply in the country. Some problems in ground nut viz., leaf eating caterpillar (Spodoptera sp), bud necrosis, may require biotech intervention. The gene constructs are already available with prominent private institutions to tackle these problems. Conditional grant of rights to public institutions in such cases may attract good will and benefits to the society, without affecting the business of the company. Similarly, wherever varieties are important along with hybrids, this mechanism could be explored and facilitated. ABSP II sponsored fruit and shoot borer resistant (FSBR) brinjal (egg plant) is one such example, where select public institutions are allowed by Mahyco and Monsanto to use a cry 1Ac based event in varieties while Mahyco itself is interested in developing FSBR brinjal hybrids. This partnership itself is promoted by USAID, Dept of Biotechnology and ICAR. There is scope for many such partnerships.

In Bt- cotton, many private seed companies have commercialized their own hybrids through a sub-license arrangement. Why this time honored method could not be tried by public institutions, for their own hybrids and varieties? A relevant question here!

2.Regulatory process: Regulatory process in any country will have to evolve, depending on the issues before the society. India in fact has the most elaborate regulations as it applies to biotech research, product development and commercial use. In the release process of the first Bt- cotton, could get a sample of regulatory regime including field trials, biosafety data to be generated and conditions for the release. The process itself and the regulators appeared to be extremely cautious. Most of it was necessary with the first case at hand. Anti-GM NGO activity also contributed to the process. In any case, biosafety considerations are very important. Rationalization of regulations based on scientific facts rather than feelings is necessary.

3.NGO Activity: Recognizing the fact that every issue before the society has views and counter views, NGOs in India have done a commendable job on the GM crops debate. Quite active right from the beginning on GM crops, their focus appeared to have had two dimensions. One, to oppose the dominance by the multinationals and the second to oppose the GM crops per se. Whatever their support base, they have done a yeoman service in sensitizing the Indian public to the GM crop issue. One may not agree with them in entirety, but they did raise several points on regulatory issues and helped the country to evolve a sound regulatory frame work of rules and regulations. As a matter of fact the debates do generate absurdities; for instance, the fact that that cry protein gets into clay matrix and does not degrade as well as when free in the soil was picked up by the NGOs and the media and came up with a statement like 'BT-cotton makes the soil sterile' and 'soil will become unfit for cultivation of any crop'! Well then they had to be convinced, and the debate must go on!

Can Owners Afford Humanitarian Donations in Agbiotech- the Case of Genetically Engineered Eggplant in India

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Introduction

Facilitating access for the poor to new products and technologies has received considerable attention in recent years. Much has been focused on pharmaceuticals and AIDS drugs in particular, contributing to such changes as agreements by major firms to sell drugs at cost in developing countries and to investments by the Gates Foundation and others for developing pharmaceuticals focused on diseases of tropical countries, like malaria. Similar concerns over access have been expressed for agricultural technologies, with particular scrutiny of biotechnology. To date, small cotton farmers in India and China have been able to adopt those products at market prices, but the situation for food crops for home and local consumption may be quite different from cash commodity crops like cotton.

The costs of developing the novel traits and, particularly, satisfying national human and environmental safety regulations has meant the majority of the investment worldwide in these new products has been made by the private sector (except in China), a complete change from the public sector-driven Green Revolution. Private sector firms nonetheless have expressed a willingness to make full and partial donations of technologies for small farmer use. For example, the public sector may be able to negotiate non-exclusive licenses for use of the proprietary technologies at no or low cost in markets that are not of interest to the private sector. Such efforts have included full donations, such as all developing country farmers (Byerlee and Fischer, 2002). However, such gifts place a significant cost burden on the public sector in each recipient country for environmental and food safety regulatory reviews. Conversely, donations for mixedhz public/private use within the same country allow the public sector to piggyback on the private sector regulatory reviews. The private donor benefits from an increased impetus for a timely review process, as well as from general good will.

Here, we examine ex ante another approach to enable the co-existence of a donated and marketed technology. The case applies to the use of a Bt (Bacillus thuringiensis) construct for controlling shoot and fruit borers in eggplants (Eggplant shoot and fruit borer-ESFB) in India. Eggplant is an important non-seasonal vegetable produced throughout India. Yet ESFB reduce yields by up to 70 percent by destroying either the plant or the fruits (Dhandapani et al., 2003).

The particular arrangement to be evaluated here provides for Mahyco (an Indian seed company partly owned by Monsanto) to donate the technology to public institutions for use in open pollinated seeds while selling Bt hybrid seeds with a premium (http://www.bic.searca.org/news/2005/nov/phi/27b.html).

In this paper we focus only on whether the existence of lower cost Bt open pollinated variety (OPV) competitor product will cannibalize the Bt hybrid market to the extent that the donor has no incentive to donate the technology, thereby posing a threat to the feasibility of the donation project. The economic question then is if the willingness of farmers to pay a sufficient premium for hybrid Bt seed when open pollinated varieties with the same Bt gene construct are available without a surcharge compensate the firm adequately to ensure the feasibility of the project. Here we examine the conditions under which that apply, and project when similar arrangements will be viable/ feasible in other countries and for other crops.

Data Collection

The research team comprised of two enumerators and one of the authors conducted a farm-level survey using structured questionnaires in Maharashtra, India, in 2004-2005. The districts included in the study were: Jalgaon, Nagpur, Ahmad Nagar, and Nanded .These districts were chosen to represent the four major geographical zones of the state, and to collect information on different market segments of the eggplant. Farmers were selected randomly from lists of eggplant farmers or from lists of all farmers provided by village administrative authorities. The sample included 249 eggplant farmers and 41-non eggplant vegetable farmers. In addition, general information on the sample villages was collected from village administrative authorities. The research team used separate questionnaires to interview eggplant growers, non-eggplant growers and village administrative authorities. In addition to collecting costs and production data, eggplant farmers were asked to state their willingness to purchase Bt seeds under different price and performance scenarios. Many area farmers were familiar with Bt cotton, so questions were not unduly abstract for them.

Field trial data of Bt hybrid eggplant provided by Mahyco indicate a 52% decrease in insecticides use, and a 39% decrease in the number of insecticide-sprayings compared to non-Bt counterparts. The average yield from Bt trial plots was 117% higher than that of non-Bt counterparts.1

Methods

We use partial budget analysis to estimate the expected returns from adopting the two variants of Bt technology (i.e. Bt hybrid and Bt

OPV) for hybrid and OPV farmers. Production costs other than pesticide savings and seed costs are assumed to be identical to non-Bt seed. Non-hybrid Bt benefits are assumed to be proportionally similar to those for hybrids.

According to the scientists working in the project similar benefits could be expected for Bt OPV and Bt hybrid, as the Bt construct used is same. However, the proportionate benefits will be based on the current performances of hybrid and OPV eggplants. As with all field trial data, commercial performance may under-perform field trials. Due to annual and unpredictable variations in pest loads, the economic benefits from adopting Bt technology will be higher in high pest infested areas and years, while leading to lower gains when pest pressures are low. In recognition of the lower yield effects and pesticide savings achievable in commercial operations, a modest yield increase of 48%, and limited savings of 40 % for pesticide expenses are used in our analysis of estimated returns from adopting Bt eggplant.2 We estimated farmers' willingness to pay (WTP) for Bt eggplant using data from the farm-level survey. Given that most of the surveyed farmers knew about Bt cotton in India, and during the survey farmers were told about the potential benefits and risks associated with the technology, using the estimated WTP as a proxy for seed markup (including seed premium and technology fee) for the technology not yet commercialized is reasonable.

Results

Current Practices in Eggplant Production

About 60% of the eggplant growers in the sample use hybrids, purchasing seeds annually at an average price of Rs 75/10g (1 US $ was equivalent to 44.5 Indian Rupees at the time of survey). Other farmers grow open pollinated varieties (OPVs), which are produced by natural pollination, and use farm-saved seeds for succeeding years. Since our sample includes different groups of eggplant farmers in the different agro-climatic conditions in the survey districts our sample is representative of the state. The average market price of OPV seeds is Rs 3/10 g. OPV seeds are marketed in 50g packets compared to 10g packets for hybrid seeds.

Overall, our data suggest that hybrid and OPV growers follow quite different production systems. Hybrid growers use more purchased inputs with higher yields compared to OPV growers. For example, in our survey, hybrid growers spent Rs 32,692/ha on pesticides compared to Rs 12,913/ha for OPV growers. The average yield of hybrid growers (16.8 metric tons/ha) was 47% higher than that of OPV growers (11.4 metric tons /ha). Since the average price of hybrid and OPV eggplant fruits is similar, the high variable costs (mainly on pesticides) incurred narrows the profit range net of variable costs between hybrid and OPV growers

Our results suggest that hybrid farmers have larger farms, better access to banks, and larger households compared to OPV growers. Moreover, hybrid farmers rely more heavily on irrigation, in part because they produce crops during the kharif (monsoon) as well as the summer (dry) seasons. Irrigation is a loss/ risk-reducing technology relatively more important for high than for low input crops. Hence, better access to irrigation is a notable distinction between the two producing groups. Our analysis does not include land costs which are unavailable. Typically, land situated closer to urban areas (which in our study applies to the hybrid growers) is higher valued than land in more remote locations. However, we have data on market size and use it as proxy for land value (i.e. population of the market in which the eggplant is marketed. For example, if it is a village market, population of the village is taken as the market size). Overall, current hybrid growers have better access to larger markets implying higher land value or cost. Hence they may invest in Bt hybrid technology to reduce the land cost/unit of output. Resource-limited farmers located in marginal areas may be further restrained by limited access to credit needed for hybrid production as well as lacking the management requirements of a more resource intensive technology, as well as possibly having limited market access. Determining which combination of these factors is more pertinent in inhibiting the adoption of hybrid technology by resource-poor farmers exceeds the scope of our analysis.

Potential benefits from Bt eggplant and feasibility of humanitarian donation

The average estimated WTP for Bt hybrid seed was Rs 298/10 g packet for the full sample, which is more than four times the conventional hybrid seed price. Results from our analysis showed that the company profit decreases with a seed price (estimated WTP) above Rs 540/10g packet due to decrease in the projected adoption rate. Hence, we included Rs 540/10g packet as the upper level of Bt hybrid seed price in our analysis. Results from our analysis show that hybrid growers gain more from adopting Bt hybrid varieties than from low priced Bt OPVs, due mainly to the yield effect of hybrid technology. Hence there is no incentive for the hybrid growers to shift to low priced Bt OPVs when they become available and suggests the feasibility of the donation project for the technology owner.

We also estimated the additional benefits and returns for OPV growers from adopting Bt OPV and Bt hybrid varieties. Our analysis suggests that resource-limited farmers could gain more from adopting Bt hybrid mainly because of the expected yield benefits. Indeed, the analysis indicates that current OPV growers could earn a higher return over variable costs by adopting Bt hybrids, which raises the question of what inhibits change. In an earlier work Kolady and Lesser (2006) used standard economic techniques to project the adoption of Bt eggplant in both its hybrid and OPV variants under different scenarios of productivity and seed prices. The authors reported that hybrid farmers have higher probability to adopt Bt hybrid while OPV farmers have higher probability to adopt Bt OPV. The results reported in Kolady and Lesser (2006) also showed that with the introduction of low priced Bt OPV there will be a reduction in the expected adoption rate of Bt hybrid (from 46% to 39%) . However, most of the early adopters of Bt hybrid are more likely to continue with Bt hybrid eggplant.

However, increased total production due to the Bt technology may lower the market price of eggplant, making Bt hybrid less profitable. To analyze the robustness of the estimated returns in this study, a sensitivity analysis was conducted assuming a 25% reduction in the average market price. Our analysis suggests that although a reduction in the commodity price narrows the benefits between Bt hybrid and Bt OPV for hybrid growers, adopters of Bt hybrid are likely to gain more than those adopting Bt OPVs. Hence what is evident from our current analysis is that differences in the farm and farmer characteristics of hybrid and OPV growers imply that Bt hybrid and Bt OPV target different groups of farmers, and segmentation of the market is possible. Further, the productive merit of hybrid technology enables the co-existence of Bt hybrid and Bt OPVs by avoiding farmers' switch to low priced Bt OPVs from Bt hybrids. In the long run, the private donor benefits from an increased impetus for a timely review process, as well as from general good will.

Conclusion and policy implications

Overall, our data and analysis suggest that due to the differences in the production characteristics of hybrid and OPV growers, hybrid growers have a willingness to pay more for Bt hybrid and gain more from adopting Bt hybrid varieties than from adopting Bt OPVs. Thus, the donation plan adopted by Mahyco appears to allow for low cost access by small farmers while being commercially viable in the sense of allowing Mahyco to maximize revenues according to farmers' willingness to pay more for higher productivity. Whether that price will allow for a profitable venture requires firm cost data beyond our access to determine. Conversely, the success of the donation plan depends heavily on the seed price charged for Bt hybrid by the private company. While our analysis suggests Mahyco can charge the estimated maximum WTP in our study as price without causing a shift from Bt hybrids to Bt OPVs, it is possible that the actual price set could cause more switching than is projected here.

The attribute which allows for the simultaneous existence of a premium price and no cost technology for eggplant growers (i.e. the feasibility of the donation project) in India is the existence of two distinct levels of production technology, one high input/yield, one low. A key condition for those two management systems being viable for the same crop is differences in access to irrigation. Related factors include land cost, itself associated with proximity to major markets in a country with a slow and costly transportation system. Many developing countries share the characteristics of limited access to irrigation, along with few major markets and high cost internal transportation systems, leading to a premium price for land closest to major markets. Clearly, alternative approaches will be needed for other crops and conditions, but this preliminary analysis does indicate one viable approach is being implemented.

(This article has been accepted for publication in the forthcoming Electronic Journal of Bio Technology)

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[1] The details of the field trials of GE eggplant can be found at (http://www.envfor.nic.in/divisions/csurv/geac/information_brinjal.htm).

[2] These vales were selected comparing the field trial results of Bt eggplant with that of commercial performance of eggplant and Bt cotton in India.

Bioengineering groundnut genotypes with the CP gene for conferring TSV resistance

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BACKGROUND INTRODUCTION:

Groundnut or peanut (Arachis hypogaea) is a staple oilseed crop grown for food as well as for forage in India. It is cultivated on ~7.5 million hectares* with an annual production of ~8 million tons.* Over 5 million small and marginal farmers depend on this crop for their livelihood.

During the monsoon season of year 2000, a new groundnut disease emerged in India, which grew to epidemic proportions causing crop loss over US$65 million. The causal agent of this devastating new disease was found to be Tobacco Streak Virus (TSV), which caused stem necrosis in groundnut plant resulting in complete destruction of the crop. TSV also infects several economically important crop plants such as Sunflower and Marigold, and survives on many weed hosts. Parthenium, a widely distributed weed, is a symptom lessz carrier of TSV and plays a major role in the perpetuation and spread of the disease. The constant threat of a TSV outbreak is causing the groundnut farmers food and financial insecurity.

The Technology

By nature, groundnut plants have shown a very low level of resistance to TSV. Moreover, all the currently grown cultivars are susceptible to TSV infection. Therefore, a non conventional method of incorporating disease resistance in the cultivars was the only solution to control the disease. Transgenic crop plants that express the coat protein (CP) gene of the target virus pathogen have been shown to provide a high degree of resistance to many plant viruses. The Agricultural Biotechnology Support Project II (ABSPII) which focuses on the safe and effective development and commercialization of bioengineered crops in developing countries, to benefit the resource poor farmers, decided to fund the Bioengineering of groundnut genotypes with the CP gene for conferring TSV resistance.

The Licensing arrangement

The CP technology for conferring resistance to viral infection is owned by Monsanto Company. Sathguru Management Consultants, the regional coordinator of the ABSPII project in South Asia approached Donald Danforth Plant Science Center (DDPSC) for the development of a vector construct containing the TSV resistance gene for conferring viral resistance to the groundnut plants. With a letter of patent non-assert from Monsanto for the CP technology to be used for non profit public good, Donald Danforth Plant Science Center (DDPSC) developed the technology for TSV CP mediated resistance in groundnut.

With Sathguru Management Consultants as a facilitator for this technology transfer, an arrangement was conceived for nonexclusive licensing of this technology to public institutions free of royalties and upfront payments for the development of varietal groundnut, and to private organizations for the development of hybrids with upfront and royalty payments, with an understanding for benefit sharing.

A consortium of public institutions was formed by ABSPII with International Crops Research Institute for Semi Arid Tropics (ICRISAT) as a primary licensee for the technology so developed by DDPSC and Acharya N G Ranga Agricultural University (ANGRAU) in the state of Andhra Pradesh and National Bureau of Plant Genetic Resources (NBPGR) for development of TSV resistant groundnut cultivars. The development efforts of TSV resistant groundnut cultivars by the public research institutions are underway.

EVENTS

ABSPII project in Bangladesh reviewed by senior science administrators.

Dhaka:

A review meeting of the USAID sponsored ABSP-II supported project conducted in partnership with Bangladesh Agriculture Research Institute, Dhaka was carried out at BARI on the 26th of August, 2007.

residing over the meeting, Dr. Nurul Alam, Chairman of Bangladesh Agriculture Research Council highlighted the key elements of partnership forged by Bangladesh Institutions with leading research institutions of the world under ABSPII. He indicated that Bangladesh would not have got access to vital technologies without the support of ABSPII.

The Principal Investigator and Senior Scientists at BARI presented the development activity being pursued at BARI under ABSPII. Dr.Harun –ur- Rashid, Director General, BARI expressed satisfaction at the progress being made by the teams and assured that BARI would provide all support to accelerate the project progress. He appreciated the efforts of ABSPII in providing global exposure to Bangladesh Scientists through international training and product development partnerships.

The consortium members discussed strategic steps involved in product validation through field evaluations. ABSPII Regional Coordinator outlined the progress achieved by partners in other countries. Options for further enhancing capacity of BARI in product validation, seed production and seed dissemination were discussed.

ABSPII partners meet to discuss the development of Virus resistant groundnut.

Hyderabad:

A partner level meeting was held at Acharya N. G. Ranga Agricultural University (ANGRAU), Hyderabad to gauge the development of Tobacco Streak Virus (TtSV) resistant groundnut.

By nature, groundnuts have a very low level resistance for TSV, therefore, a non conventional method of incorporating disease resistance in the cultivars was the only solution to control the disease. Transgenic crop plants that express the coat protein (CP) gene of the target virus pathogen have been shown to provide a high degree of

(In the picture) Dr.S.Raghu Vardhan Reddy - Vice-Chancellor, ANGRAU, Dr.P.Raghava Reddy, Director of Research, ANGRAU, K.Vijayaraghavan, Regional Coordinator, ABSPII - South Asia and others.

resistance to many plant viruses.

A consortium of public institutions was formed by ABSPII with International Crops Research Institute for Semi Arid Tropics (ICRISAT) as a co-developer for the technology with Donald Danforth Plant Science Center (DDPSC) and Acharya N G Ranga Agricultural University (ANGRAU) in the state of Andhra Pradesh as the Licensee for product commercialization and delivery. The development efforts of TSV resistant groundnut cultivars by the public research institutions are underway. Stressing on the significance of ANGRAU in the project, Dr.Raghu Vardhan Reddy, Vice Chancellor, ANGRAU, said, "We have a very significant role to play in product testing and commercial seed delivery." Dr. Sankara Reddy, a senior scientist from Agricultural Research Station Kadri, Andhra Pradesh will lead this project from ANGRAU. ANGRAU a renowned public Institution can provide its expertise in testing and seed delivery. The meeting was attended by representatives from International Crop Research Institute for Semi-Arid Tropics (ICRISAT), National Bureau of Plant Genetic Resources (NBPGR), Agricultural Research Station (ARS), Kadri from ANGRAU and ABSPII management team.

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