

INDIA-US KNOWLEDGE INITIATIVE ON AGRICULTURE

**2nd Board Meeting
New Delhi, India
(13-14 February, 2006)**

WORK PLAN

EXECUTIVE SUMMARY

The Board met on 13th –14th February, 2006 in New Delhi, India. After the opening remarks by the Co-Chairs of the two countries and presentation of the Indian and US proposals, it was decided to identify the items of convergence under the 4 priority areas of co-operation for developing a work plan indicating the short and longer term deliverables. In its deliberations, the Board had the benefit of the guidance of Professor M.S. Swaminathan, Honorary Adviser to the Board.

Four **Working Groups** held detailed deliberations and presented their recommendations for the Work Plan under the Knowledge Initiative.

The Work Plan agreed to by the Board is described below:

(i) **Under Education, learning resources, curriculum development and training, the proposals on building, human and institutional capacity are included.** Mechanisms include establishing a standing Indo-US Joint Working Group, sharing the US experience in curriculum development to benefit the ongoing curriculum revision exercise in India, identifying the number of slots for training and faculty exchange during 2006 with consideration of additional slots in the coming years, organizing workshops for review and planning in certain identified areas, etc. With regard to building institutional capacity, the focus is on extension and outreach activities, library resources, networking and leadership development through sharing of experiences to take the knowledge initiative forward.

The modalities for implementation of the training and other activities were also finalized.

(ii) **Under Food-processing and Marketing**, the Work Plan targets **training, capacity building and joint research**, including quality assurance and food safety, reduction of post harvest losses, market information systems, value addition, strengthening grades and standards, facilitation of agro-business investment, advanced processing technologies, byproduct utilization and bio-fuels from bio-mass.

(iii) Under **Biotechnology**, a strategic alliance has been envisaged for **training and research** on development of transgenic crops with resistance to economically important viruses, tolerance to drought, heat and salinity and micro-nutrient utilization efficiency; molecular breeding and genomics in crops and animals, molecular approaches in plants and animal health protection have been agreed.

(iv) Under **Water Management**, research and training proposals on sustainable use of water resources, water quality management and remediation, use of modern tools in water management, integrated nutrient management and precision agriculture have been decided.

Funding: The proposed Work Plan will be supported by an allocation of Rs. 3500 million (about USD 80 million at current rate of exchange) by the Indian Government over a period of three years. The allocation from the US side will be determined.

The initiative is expected to offer a win-win situation for both the countries and will trigger benefits in perpetuity.

BACKGROUND

Pursuant to the understanding on cooperation in Agriculture reflected in the **Joint Statement** of US President George Bush and Indian Prime Minister Dr. Man Mohan Singh on **July 18, 2005** during the visit of Dr. Man Mohan Singh to the USA, the Ministry of Agriculture, Government of India and U.S. Department of Agriculture (USDA) agreed to work together for a new **India – US Knowledge Initiative on Agriculture Education, Research, Services and Commercial Linkages**, identified the **objectives** of this Initiative and **created the Board of the Knowledge Initiative on Agriculture (AKI)** for identifying areas of common interest, modalities of action plan and funding mechanism, etc. In the first meeting of the joint India-US AKI Board held on 15th & 16th December, 2005 in Washington, D.C., the Board agreed on the **following key areas:**

<p>a) Human Resources and Institutional Capacity – Building (cross cutting areas):</p> <ul style="list-style-type: none"> • Education, learning resources, curriculum development and training • R&D, commercialization • IPR, biosafety, food safety, investment conditions, and policy and regulatory frameworks 	<p>b) Agri-Processing and Marketing</p> <ul style="list-style-type: none"> • Food processing • Use of byproducts and bio-fuels • Post-harvest management/value addition • Food marketing, cold-chain/product handling
<p>c) Emerging Technologies</p> <ul style="list-style-type: none"> • Biotechnology • Nanotechnology • Nutraceuticals • Vaccines and diagnostics • Precision farming • Bioinformatics and information 	<p>d) Natural Resources Management</p> <ul style="list-style-type: none"> • Water management • Soil and management • Climate change • Air quality Waste management

technology	
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The Board further agreed that among the above identified areas, it would initially concentrate on (1) **Education, learning resources, curriculum development and training (cross cutting)**, (2) **Food processing, use of byproducts and bio-fuels**, (3) **Biotechnology**, and (4) **Water Management**.

As agreed above, the Secretariat on both sides of AKI Board developed detailed proposals in early 2006 in consultation with experts and stakeholders in their respective countries. The **Proposals** so prepared by both countries were exchanged and discussed at length during the **2nd Board meeting**. As a result of above deliberations, the following **Work Plan for the AKI has been developed** under the agreed priority areas.

A. EDUCATION, LEARNING RESOURCES, CURRICULUM DEVELOPMENT AND TRAINING:

BUILDING HUMAN AND INSTITUTIONAL CAPACITY

Agricultural education needs to be globally competitive. The contribution of US collaboration in the past to the Human Resource Development activities is widely acknowledged in India.

The present program envisages collaboration and mutual benefit by strengthening human resource development and research capabilities in niche/cutting edge areas for developing technologies relevant to national, regional and global needs.

In the changed context, importance has to be given to attaining excellence in agricultural education, to enhance employability of the graduates, developing human resources to fulfill commitments towards the Millennium Development Goals, and improving quality of life through sustainable rural development including innovative agricultural extension, agri-business programmes and wider participation of women.

With the rapid change in the technology environment, there is demand for preparing graduates to harness science and technology for the pursuit of attaining and sustaining the **'Evergreen Revolution'**. This calls for new courses as per changing market demand and new modes of delivery with effective use of electronic media. Efforts will be made to modernize course curricula and methods of delivery i.e., **moving from teaching to learning**. This would bring about substantial

improvements in the tools and techniques of imparting education in that **teacher and taught are more interactive and learning is for upgrading skills in real life situations.**

A **critical mass of faculty and scientists in subject domains and need based niche/strategic/emerging areas is required to be developed** through post-doctoral programs, faculty exchange, trainings, workshops etc. These select faculty and scientists, in turn, would serve as catalysts for further change and improvement. The proposed faculty and scientists exchange would reinforce the education and research by offering need-based courses employing innovative delivery mechanisms and initiating research with national, regional and global relevance.

The new information and communication technologies (ICTs) would enable reaching the un-reached anywhere, any time and at competitive cost. To make this most effective, **exposure** of faculty and scientists to the ICT experiences to **develop need-based entrepreneurship oriented programs assumes significance.**

There is need to **develop learning resources.** Faculty and scientists need to be trained to develop resources using multimedia, web based technologies and in the transmission and retrieval of digital resources. The digital resources can be made available across National Agricultural Research System. Access to digital learning resources would enhance quality of teaching, extension and research across the NARS institutions.

The **Work Plan** will have the main **following objectives:**

- To enhance quality and relevance of higher education through reorientation and refinement of course curricula, learning resources and delivery processes.
- To develop and enhance human capacity with due focus on gender balance in the emerging areas through training and faculty exchange
- To promote industry-academia interaction to enhance relevance of education and research on a changing time scale.

1. **WORK PLAN:**

(i) **CURRICULUM DEVELOPMENT**

- Establish a standing **India-US Joint Working Group**, by October, 2006, for **capacity building in curriculum development, design and delivery** with emphasis on need –

based, demand driven and market-oriented agriculture, and relevant tools such as in-service training and distance education

- The Indian Council of Agricultural Research (ICAR) is in the process of course curriculum revision. To benefit the ongoing exercise, the **US shall share its recent experiences in curriculum development by April, 2006** with ICAR.

(ii) TRAINING AND FACULTY EXCHANGES

- **Training (In-service and Group) and faculty exchanges:** This activity will include in-service training and participation in collaborative teaching/research. The duration may be up to 6 months.
- The **areas of training** under the identified areas include
 - (i) under **education, learning resources, curriculum development and training:** instruction, design and development, distance learning, teaching technology,
 - (ii) under **food processing, use of by-products and bio-fuels:** extraction technology, extrusion technology, food quality and safety, fermentation and enzyme technology, byproduct utilization, and fuel alcohol from biomass and market institution building and agri-business investment
 - (iii) under **biotechnology:** transformation in plants, molecular diagnostics and vaccines, allele mining, gene therapy and gene silencing and
 - (iv) under **water management:** water quality management and remediation, water-poverty mapping, soil/plant water relationships, marine population dynamics
- Under the **cutting-edge/niche areas, the key training areas** include climate change, carbon sequestration and trading, nanotechnology, protected and precision farming, bio-prospecting, valuation of biodiversity, biosafety, rural development, livelihood systems, gender issues, agri-business management, international trade or any other area to be identified.
- For these trainings, **24 slots** shall be considered **in 2006** and additional slots to be considered in subsequent years.
- Further, under (i) **biotechnology**, (ii) **water management**, and (iii) **food processing, additional** training slots shall be considered for **2006** and the following years.

(iii) PUBLIC - PRIVATE SECTOR PARTNERSHIPS:

- **Professorial chairs:** The **industry/private sector sponsored chairs** to be created in India or USA for R&D on **strategic/niche areas**. This will help in close collaboration between public and private sectors, which in turn will lead to commercialization of technologies at a faster pace.
- **Industry-Academia Interface Workshops:** Each year, faculty (premier US and Indian business /management schools and agri-business institutions) and industries will be invited to a **Workshop** to devise strategies, by which synergies can be induced to **explore emerging trends and needs for the agriculture sector** in both countries and orient education, training and research contributing to economic growth. This **workshop may be held in India or the USA, and may be co-sponsored by the private sector stakeholders**. The workshop will inventory, upgrade and build on existing agri-business programmes to match students or professionals with practical internship experiences.

(iv) BUILDING INSTITUTIONAL CAPACITY

(a) EXTENSION AND OUTREACH

- Jointly organize a workshop in India to **discuss innovations, e-extension, global lessons learned and best practices** relevant to the needs of India's agricultural sector by March/April, 2007.

(b) LIBRARY RESOURCES

- **Establishment of a virtual partnership** (National Agricultural Library, Beltsville and National Agricultural Library, New Delhi) towards strengthening the **library resources and electronic library networks in India** relevant to the agricultural knowledge system (subject to copyright regulations).

(c) STRENGTHENING ADMINISTRATION

- Leadership development – involving institutional leaders and administrators to create a **Research and Education Managers' Partnership** by **early 2008** that will share experiences, and

focus on leading, managing and taking the Knowledge Initiative forward.

2. MODALITIES FOR IMPLEMENTATION OF THE HRD PROGRAMMES:

- The **salary, travel cost, and health insurance** for trainees and faculty to be borne by the **sending country**.
- The **receiving country** is to provide **per diem (lodging & boarding), training cost and bench fees**.
- In the case of **post-doctoral programmes** (up to two years), the sending country will provide the **salary and the travel and related costs**; receiving country/institution will provide **fellowship support**.
- The above conditions may be varied with mutual agreement.
- For **Workshops**, the host country will meet the expenses related to organization of the event and the sending country will meet the travel and related costs of its participants.
- The right to publish and seek protection for any innovations/technologies would be in accordance with an agreement between the collaborating institutions and funding agencies.
- The number of slots offered **with adequate consideration given to gender in allocating the slots** will be mutually agreed upon subject to availability of funds.

3. PARTICIPATING INSTITUTIONS

Considering the needs in niche/emerging/cutting-edge areas, **selected institutions from the NARS** (viz. agricultural universities, CAU, Deemed Universities, ICAR Research Institutes, participating private sectors etc.) will participate.

Based on the past experience in collaborative efforts with Indo-US initiatives, established capabilities, lead in niche/emerging/cutting edge/strategic research, future potential, **and the capability enhancement** of different institutions of Indian National Agricultural Research System shall be undertaken in a phased manner.

The **probable partners from India** have been identified in the Indian proposal. The US side will also identify the US institutions for partnership in each activity.

B. FOOD PROCESSING, USE OF BY-PRODUCTS AND BIO-FUELS

The AKI Board agreed that the **development of agricultural marketing and processing industries is now a priority for India's increasingly need-based and demand driven, market oriented agricultural sector.** The Board agreed to work together on a range of capacity building initiatives and research activities in a framework of public-private partnership, wherever needed, and promotion of linkages between technology and the market

- **Post Harvest Management and Upgrading Cold Chain Practices and Operations:** Training and exchanges on improvement of the quality and safety of perishable food products would include temperature-related food-safety and product-quality-degradation issues faced by distributors, wholesalers and retailers. Training would also address reducing microbial contamination and maintaining constant product temperatures. In addition, U.S. private-sector and **university experts and potential investors in cold chain development would visit India** to meet counterparts, survey existing infrastructure, and identify weaknesses in cold chain practices and constraints to investment. **This 3-phase activity would commence in late 2006 and carry on through 2007.**
- **Strengthening Grades and Standards and Quality Control:** This would consist of **training, exchanges and workshops**, with involvement of the private sector and public sectors, on commodity grades and standards, the operation of grading and marketing programs, and inspection systems to maintain quality of crop and animal products. **This ongoing activity would continue through 2006-2007 and would be focused on specific crops and products.**
- **Supporting Development of Market Information Systems:** This would include **training and exchanges on institutional capacity building** related to market data collection, processing, analysis and timely distribution of market information to farmers, agribusiness, and policymakers. This would **build on the ongoing USAID/USDA projects in this area and continue through 2006-2007.**
- **Facilitating Agribusiness Investment in India:** This would be comprised of one or more **sector-specific "Trade and Investment**

Mission/s to India” in 2007-2008 for U.S. private agri-business companies to meet counterparts, survey agri-business and identify opportunities and constraints faced by investors. The mission(s) could be preceded by an **agribusiness investment-related conference in India in 2007** and technical exchange programs focused on relevant issues.

- **Drawing on the U.S. Experience with Contract Farming: Exchanges and workshops in 2006- 2007** would explore the **development of legal mechanisms for contracts**, alternative approaches to regulating contracts, and specifying contracts to meet the needs of buyers / sellers (farmers).
- **Establishing Food Safety and Animal and Plant Health Regulations To Facilitate Trade:** The United States and India would initiate cooperative activities to better understand each country’s Sanitary and Phyto-sanitary (SPS) systems, Technical Barriers to Trade (TBT) and food safety regulations. These activities would focus on consistency with relevant international norms and bringing further efficiency / transparency into the regulatory processes. The cooperative activities would include consultations with all stakeholders including the private sector.

JOINT RESEARCH PROGRAMMES

- **Technology for rapid detection and control of bio-toxins, chemical contaminants and heavy metals in agricultural produce and by-products:** Food quality and safety are essential for both domestic and export markets. Development/ acquisition of rapid test equipment and protocols for ensuring food quality at various points in the value chain would be developed through trainings and joint applied research programmes.
- **Advanced Extrusion Processing Technology:** To undertake training of scientists and applied research projects in the area of extrusion processing for development of fortified and nutritious food products.
- **Advance technologies for extraction of oils, oleoresins, biocolours and bioactive compounds from agro-produce and by-products:** Extraction technologies of oils, oleoresins, bio-colours and bioactive compounds such as super critical extraction would be developed for value addition to agro-produce and byproducts in the country.

- **Technology for cholesterol free milk and milk products: Development** of technology for diversification of dairy products into health foods through removal of cholesterol from milk.
- **By-products utilization:** Crop residues and agro-processing byproducts need to be utilized for obtaining food, feed, pharmaceutical, nutraceuticals, cosmetics and pesticidal products. Technologies for conversion of crop residues and byproducts into value-added products will be developed.
- **Modified Atmosphere Packaging and Storage of Perishable Food Products:** Post harvest management of perishable food commodities such as fruits, vegetables, meat, fish, etc, require suitable packaging and storage to maintain the quality until it is either consumed or processed. Development of technologies for Modified Atmosphere Packaging and storage for Indian commodities and conditions will be undertaken.
- **Biofuels:** Some of the agricultural residues, processing byproducts and non-edible oil seeds could be converted into gaseous and liquid fuels for subsequent utilization in agricultural and allied activities. Efficient technologies for conversion of agricultural biomass into fuel-alcohols would be developed.

In the above priority areas jointly identified for research, it has been agreed that **in the first instance, training** of the Indian participants - about **2-3 scientists** per programme (up to six months) in the **7 research programmes would** be undertaken (Funding for this would be as provided in HRD component). Specific training details will be drawn up by June 2006.

This would be a **prelude** to the implementation of actual research programme in the identified areas - to be undertaken over the next three years

C. BIOTECHNOLOGY

India and the United States agree that biotechnological tools can make an important contribution to the sustenance of the **'Evergreen Revolution'**. We share a common goal of translating the results of research in the lab into beneficial products that are delivered to farmers. Subject to funding from the U.S. and Indian governments

and bearing in mind possible private sector engagement, focus will be on the following areas:

1. Transgenic Crops:

(i) Harnessing the benefits of biotechnology: A **workshop** will be jointly hosted **in 2007**, involving all stakeholders, for promoting application of biotechnological tools to solve important agricultural constraints, addressing the continuum from molecular research to applied product development and commercialization, with a focus on delivering benefits to farmers.

(ii) Development of transgenic crops:

- **Resistance to viruses of economic importance:** Initial focus will be to (i) expand existing collaborations begun under the Joint Working Group on Agricultural Biotechnology (e.g. resistance to Peanut bud necrosis virus, Iris yellow spot virus, Tobacco streak virus, Tomato leaf curl virus) and (ii) include crops identified in the Indian proposal, such as banana, papaya and cassava. **Post-doctoral visits** and **faculty exchanges** to be arranged subject to availability of funds, **beginning in 2006 with at least one six-month in-service training visit.**
- **Tolerance to drought, heat and salinity.** Specific crops and genes to be identified during a planning session as part of the “Harnessing benefits” workshop.
- **Micronutrient uptake.** Specific projects will be identified during a planning session of the “Harnessing benefits” workshop, including iron and zinc utilization efficiency in rice and wheat.

2. GENOMICS:

India’s proposal on pigeon pea genomics will be considered at an appropriate time subject to availability of funds to be discussed further at the next Board meeting.

3. MOLECULAR BREEDING

India’s proposal to develop molecular breeding tools in crops and animals will be taken into consideration subject to the availability of funds. Projects could build on existing collaborations, e.g. in legumes and oilseeds. This will be discussed further at the next Board meeting.

4. DIAGNOSTICS AND VACCINES

Development of diagnostics and vaccines against selected animal, poultry and fish diseases, such as Avian influenza, Bluetongue, Newcastle Disease, Classical Swine Fever, Neosporosis and Coccidiosis. Collaborative research activities will be developed subject to availability of funds, beginning with **six-month in-service training in 2006 in the area of avian influenza**. Explore opportunities for private sector engagement.

5. ADDITIONAL TRAINING ACTIVITIES:

- (i) **Food safety** analysis in biotechnology for toxicity and allergenicity analysis, **faculty exchange** (beginning 2006 one U.S. faculty to visit India, **two Indian faculty to visit U.S., 2-12 week visits** determined by availability of funding and specific training needs of faculty).
- (ii) **Biosafety** of transgenic crops, **group training undertaken in India during visits by U.S. faculty** (beginning in 2006/07 with 2 U.S. visitors).
- (iii) **Licensing and Intellectual Property Rights protection:** Long-term (3-6 months) and short-term (2 – 8 weeks) **training** in the process of licensing biotechnology discoveries, hosted by U.S. universities and/or agricultural research institutes and licensing offices (**projects to be developed in 2006 for 4 visitors, training beginning 2007**).

D. WATER MANAGEMENT

The Board agrees that **improvement of water quality and water use efficiency** will be vital to the continued growth and productivity of the agricultural sector of both India and USA. The Board agreed to cooperate on capacity building and joint research activities to develop improved technologies and management practices in a framework that incorporates the needs of multiple stakeholders **from lab to farm**. The following have been agreed upon:

1. Water Quality Management and Remediation

The following activities will be undertaken:

- (i) Point and non-point source pollution
- (ii) Recycling and re-use of waste waters
- (iii) Productive use of marginal and poor quality waters including

- aquaculture
- (iv) Shallow aquifer remediation

2. Assessment and management of agricultural drought

The following activities will be undertaken:

- (i) Early warning systems
- (ii) Crop condition assessment techniques
- (iii) Impact of climate change on droughts and identification of hot spots
- (iv) Improved conservation agricultural techniques

3. Soil- Water- Plant Interactions

The following activities will be undertaken:

- (i) Water-integrated-tillage interactions on crop productivity and soil and water quality
- (ii) Carbon dynamics including sequestration and nutrient pools and fluxes in relation to investment in energy and inputs
- (iii) Modelling the impact of water-nutrients-tillage interactions on crop growth and sustainability parameters

4. Sustainable use of Ground Water Resources

The following activities will be undertaken:

- (i) Coastal aquifer management – creation of sub surface fresh water barrier for arresting salinity ingress
- (ii) Management of Aquifer recharge in water deficit areas
- (iii) Deep aquifers utilization and management

5. Use of Modern tools in water management

The following activities will be undertaken:

- (i) Integrating space and information technology with water management for planning and decision making
- (ii) Decision support systems for management of uncertainty and risk in irrigated commands and rainfed agriculture
- (iii) Cost effective water and energy efficient irrigation systems and automation

6. Capacity Building

- (i) Water quality management and remediation
- (ii) Water use management and policy making
- (iii) Watershed management and rehabilitation
- (iv) Soil -Water -Plant Interactions
- (v) Sustainable use of Ground Water Resources
- (vi) Use of Modern tools in water management

7. Implementation Strategies

- (i) Develop bilateral research agreement and implement a competitive grant programme
- (ii) Facilitate exchange of Professors through sabbatical arrangement
- (iii) Facilitate graduate student training by creating enabling environment for their entry and research work
- (iv) Provide seed grant for initiation of appropriate research project which would eventually lead to major research programme
- (v) Partner with private sector to conduct mutually beneficial research
- (vi) Develop training programmes for extension workers (India/US)

8. Action Plan

- (i) **Identification** of US universities/institutions: April 2006
- (ii) Indo-US **joint workshop in May 2006** for finalizing the technical programme and funding
- (iii) Initiation of **short term programs** from July 2006
- (iv) Items at 4 and 5 above will be undertaken subject to the availability of funds

CONCLUSION

The Board enthusiastically agreed to the above **Work Plan** focusing on capacity building in research, education and extension and forging public-private partnerships that will significantly **re-invigorate the US-Indian partnership in agriculture.**

The Board believes that the Knowledge Initiative will support the envisioned '**Evergreen Revolution**' based upon sustainable, need-based, demand-driven, market oriented agriculture towards increasing rural prosperity.

In reviving and further strengthening our partnership, the Board acknowledges the importance of robust market institutions, efficient, effective and relevant technologies and an enabling environment for investment in agri-business.

The Board agreed to have a digital dialogue immediately after the forthcoming visit of the US President to India in March and later meet in Washington in 2006.
