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EDITORIAL

Application of biotechnology in agriculture has assumed a global dimension and advances in this field are taking place at rather much rapid pace now, even in the developing countries. However, a range of biosafety, legal and ethical issues need to be resolved for fully harnessing biotechnology to achieve food security and alleviate poverty. Though several developed NARS are aware of such problems, many small NARS are skeptical about the use of such new technologies. Thus, overall, in regional perspective, there is need to assess the positive effects of biotechnology, focusing equally on policy implications.

Realizing these emerging concerns on the role of biotechnology in agriculture, the Asia-Pacific Association of Agricultural Research Institutions (APAARI) as a regional forum, with funding and technical support from FAO-RAP, organized a joint FAO-APAARI Expert Consultation on the Status of Biotechnology in Agriculture in Asia and the Pacific. The Consultation held at FAO-RAP from 21-23 March 2002, dealt with all possible issues encountered for promoting biotechnological applications in improving agricultural production (see article inside). About 50 participants from regional NARS, CG Centres/IARCs, FAO, NGOs and Private Sector presented their view points in the five technical sessions, three working groups and in a round-table discussion.

Common concerns were highlighted for a follow up action on several issues based on sub-regional presentations, country reports, and presentations of the private sector. These concerns relate to: the need for collaboration and partnerships; capacity building; greater private sector involvement (to be more socially responsible); sound policy framework (most countries with weak IPR framework); effective biosafety mechanisms and information sharing. Also, the issues of trust and the need to improve public awareness were highlighted which targets the policymakers and the consumers. Further, noting the lack of effective national regulations on biosafety and IPR, which are crucial for the promotion of biotechnology, the Consultation supported FAO-initiatives in developing guidelines on these issues.

The meeting also called for a broad-based dialogue involving all stakeholders to take up different issues and identify areas of convergence/common concerns equally focusing on future strategies for international/regional cooperation and networking for harnessing biotechnology.

Another important decision to address the promotion of biotechnology was that a consortium approach be adopted by bringing together relevant partners/stakeholders by pooling synergies, using comparative advantages and ensuring judicious use of resources. It was further suggested that APAARI could serve as a neutral forum for the establishment of this consortium.

APAARI looks ahead to implement the above recommendations in collaboration with FAO, IARCs, NARS-members, NGOs, private sector and the other stakeholders.

Editors

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FAO-APAARI Expert Consultation on the Status of Biotechnology in Agriculture in Asia and the Pacific

21-23 March 2002, Bangkok, Thailand

The Food and Agriculture Organization of the United Nations (FAO) and Asia-Pacific Association of Agricultural Research Institutions (APAARI), jointly organized an Expert Consultation from 21-23 March 2002 at FAO-RAP, Bangkok, in order to assess the needs and capacity of countries in the Asia-Pacific region pertaining to agricultural biotechnology.

Participants at the Expert Consultation

The major issues were to assess the positive effects including the areas of potential concern, on policy advice, information and technical assistance required, training and capacity-building including possible options to meet such needs, assessment of technology available and relevant for meeting such needs, identifying useful regulatory environment to ensure biosafety and harmonization with international standards, identify important institutions and individuals involved in biotechnology including their specialities and strengths, reconfirmation of the need and arrangements for the establishment of a regional mechanism for cooperation in agricultural biotechnology.

There were about 50 participants representing regional NARS, IARCs/CG Institutions, NGOs, and Private Sector. The expertise of three leading biotechnologists in the region was availed of to prepare the discussion papers on sub-regions i.e. West and South Asia, the ASEAN region and China. The deliberations were conducted in five technical sessions and a round-table discussion cum plenary session.

Inaugural Session

Dr Malcolm Hazelman, of the FAO-RAP and nodal officer for the expert consultation, welcomed the participants on behalf of the organisers. Dr R.S. Paroda, Executive Secretary, APAARI, presented the objectives of the expert consultation and urged participants to develop a consensus to facilitate smooth adoption of biotechnologies. He called upon the participants to suggest suitable mechanism of cooperation to overcome the problems that cannot be addressed at institutional level, individually. Dr R.N. Sapkota, Chairperson, advocated the need to dispel the apprehensions attached to agricultural biotechnologies, through scientific dialogue and public awareness programmes. He desired that the countries in the region must ensure proper testing and regulatory and policy mechanisms to take care of biosafety and bio-ethical concerns. Dr R.B. Singh, Assistant Director General and Regional Representative of FAO Regional Office for Asia and the Pacific, in his inaugural address elaborated on issues such as transgenic crops, livestock, food security, loss of biodiversity, harmonizing of biosafety standards, and IPRs. Dr Singh emphasized that the role of partnerships and scientific alliances whether public, private, local, national/international, intergovernmental, with NGOs, farmers' associations, educational institutions, developed and the developing nations, will assume paramount importance in the fast changing R&D environment.

Technical Sessions

Sub-regional Status Reports

Three papers namely on the *"Status of Biotechnology Applications in Agriculture and Allied Sectors in the West and South Asia"* by Prof. Asis Datta, *"Agricultural Biotechnology Development, Policy and Impacts in*

China" by Prof. Jikun Huang, Centre for Chinese Agricultural Policy, Chinese Academy of Sciences, and *ASEAN Agro-Biotechnology: Overview and Recommendation on Regional Collaboration*" by Dr S. Bhumiratana, NCGEB, Bangkok, Thailand were presented.

Concerns Highlighted

The presentations highlighted that biotechnology is a strategically significant tool to improve national food security, a means to raise agricultural productivity and create a competitive position in international agricultural markets but simultaneously concerns relating to biosafety as well as intellectual property rights (IPRs) cannot be ignored. Effective regulatory mechanisms and safeguards were needed so that the impact of agricultural biotechnology is both productive and benign. There is a moral imperative to make GM crops readily available to developing countries that want them, so as to help combat world hunger and poverty. The review of the current institutional arrangements also shows that the coordination among institutions and consolidation of agricultural biotechnology programmes will be essential to create a stronger and more effective biotechnology research programme in the future.

Meeting in progress

Success of Bt cotton in China was cited as an example. The farmers who grew most popular *Bt* varieties reduced their costs of production by 20 to 23 per cent over new non-*Bt* varieties. More importantly, the use of *Bt* cotton has substantially reduced pollution by pesticides in the regions where it has been adopted. Farmers' and farm labourers' exposure to pesticides has been reduced. Biodiversity of insects also appears to have been enhanced by the adoption of *Bt* cotton.

It also proposed possible mechanisms/arrangements for the establishment of a regional biotechnology network and recommended collaborative activities to strengthen agricultural biotechnology as a tool for regional development.

The most urgent need identified is building local and regional capacity. In most countries lack of awareness at the political level coupled with weak management infrastructure, is the major hindrance to this development and should be improved.

The countries must therefore, work together and utilize where appropriate, expertise from outside the region to strengthen capacity specially in areas of policy and decision making processes, developing legal frameworks for biosafety, training in implementing risk assessment, developing data-management and information-sharing, upgrading technology to implement a biosafety regulatory framework, and developing biosafety clearing house mechanism which should facilitate cooperation amongst countries.

Country Reports

A total of 14 country reports were presented. The countries included Australia, Pacific Islands, Bangladesh, China, India, Indonesia, Iran, Nepal, Pakistan, Sri Lanka, Malaysia, Philippines, Republic of Korea and Thailand. Representatives of International organizations/Research institutes such as FAO, ICRISAT, ISNAR, ICGEB, ILRI and AVRDC presented the biotechnology related programmes.

Salient Outcome/Commonality in Issues and Needs

From the reports presented, it was quite evident that all the NARS and agricultural research institutions in the region have recognized the importance of biotechnology to meet the future demands for food and to fight hunger and malnutrition and have taken initiatives matching their capacity. However, it was very clear that the agricultural research institutions in the region are at various stages of development and thus differ in their capacity to develop agriculture through biotechnological applications and also to handle the implications of new technology.

Concurrent with general acceptance to adopt biotechnology, there were several concerns that restrict application of biotechnology. A striking commonality

in issues of concern was observed. These were primarily related to biosafety, bioethics, environmental conservation, human resources, capital investments, regulatory mechanisms, biosafety protocols and IPRs, and information sharing.

Institutional capacity building and HRD programmes need to be undertaken. Networking of agricultural research institutions to address the common issues/needs was felt to be crucial for future development in agriculture using biotechnological tools. In this fast changing scenario, regulatory aspects being equally important, it calls for formulation of framework of rules that are effective and expeditious.

Private Sector Programmes

Biotechnology Programmes of Private Sector were presented by representatives from Syngenta, Monsanto, Aventis and APSA. These presentations generated considerable discussion, and the main issue raised was that the papers had not addressed the problems that crop up during collaboration between the private and public sectors. Investment from the private sector in the region is disappointing to say the least; at the most it is 2% in some countries. Why is there this lack of investment? It was suggested that the priority of the private sector is profit and not people. It could be that current IPRs are not genial for their investments, and similarly biosafety regulations are inadequate. If one considers the USA, investment from the private sector is 95%.

Need for Collaboration

The meeting recommended that collaboration between the private and public sectors in the Asia-Pacific region required urgent attention. Perhaps this could be resolved by the formation of a "body", which involves all the stakeholders to facilitate dialogue and establish trust. FAO could possibly drive the formation of this alliance. Such a combination of stakeholders could work at developing a strategic plan, aimed at attracting the private sector to collaborate in the development of biotechnology in the region.

Management Issues

Dr Malee Suwana-Adth from Approtech Asia, Dr Tanit Changthavoran from BIOTEC, Dr Devinder Sharma from Forum for Biotechnology and Food Security, and Dr Roel Ravanera representing ANGOC, discussed the management issues associated with regulatory aspects of development and adoption of biotechnology. Generally the level of management that exists within adopting countries is low, because this new knowledge/technology requires new management skills. IPR is an issue that was mentioned frequently at this meeting, and was obviously one of the concerns for all participants. IPR has to be considered in all contexts; international, regional, national and institutional. Within the international context, there are several treaties, all with an impact on IPR.

These presentations further emphasized the need to identify the controversial debatable issues, and to establish a forum in which all stakeholders can be involved in dialogue. Without this dialogue, problems resulting from misunderstanding and miscommunication will continue. It was suggested that biotechnology being a "new technology", training in its management was required among NARS partners. Along with this requirement, issues relating to IPR had to be resolved. This is a difficult area because of the agreements involved, and countries had to seek advice on this and collaborate where possible. Also, there was a request from the NGOs to consider the relevance of biotechnology to some countries, and that it should not be seen as the sole means to solving the problems of hunger and poverty.

Group Discussions on Major Concerns and Suggestions

Three groups from among the participants were constituted to deliberate on the following themes:

Group I : Institutional Research Framework and Capacity Building: Public, Private, NGOs and Civil Society.

Group II : IPR, Biosafety and Ethics.

Group III : Future Strategies: International/Regional Cooperation and Networking for Harnessing Biotechnology.

The groups suggested that emphasis be laid on the following:

- Strong networking using electronic media and synergy among the nations is required in the form of an Asia-Pacific Biotechnology Consortium or Asia-Pacific Network on Agricultural Biotechnology. It was observed that the scientists have a responsibility to communicate the broader implications of their research. The scientific community often hasn't really addressed IPR and biosafety at the national level – individual institutional IPR policies and national frameworks

need to be developed. A more proactive role of APAARI was visualized, being a neutral stakeholders' forum rather than inter-governmental forum.

- Dialogue on maximising benefits and minimising risks of biotechnology provided further opportunity to determine the areas of convergence despite differences in perceptions. The discussion laid strong emphasis on biosafety assessments and the development of appropriate partnerships.
- The issue of trust among partners/collaborators and the need to improve public awareness was discussed. Presently, mistrust does exist regarding the risks associated with GMOs and hence it is proving to be a serious impediment towards adoption of this technology. Scientists must generate enough evidence to eliminate this mistrust from the minds of the public and the policy makers. There is also a mistrust concerning the present role of the private sector, though the public sector research will have to take the lead in this sphere to provide both an alternative as well as healthy competition. Also, research collaboration is to be built among private and public research institutions in the field of GMOs and the transgenics. In this context, the initiative should start preferably with local companies first before establishing partnerships with the multinationals, wherever possible.
- There is need to evaluate the broader impact of biotechnology on society, and to identify bottlenecks and critical points, and the search for new options/solutions has to continue. Biosafety and regulatory frameworks have to be established, and a consensus reached as to which comes first, the regulatory framework or the technology or should it be a hand-in-hand approach. Private and public sector partnerships will have to be developed. Regional/International collaboration and capacity building is crucial so that significant progress is made, and all associated benefit from it.

Need for Biotechnology Consortium for Asia-Pacific Region

- An important decision to address the promotion of agricultural biotechnology by pooling synergies, harnessing comparative advantages and ensuring judicious use of resources, was that a consortium approach be adopted by bringing together relevant partners and stakeholders in the region. A consortium approach was deemed to have better stability than that of donor driven networks, which often continue as long as the donor support is available. The idea to establish a "Biotechnology Consortium for Asia-Pacific Region" received a unanimous acceptance from the participants. In this regional endeavour, the role expected of APAARI was to serve as neutral facilitator/supporter for the establishment of such a consortium, in partnership with international agricultural research centres, FAO, GFAR and other private, NGOs and farmers' organizations.

ICAR-IWMI Collaboration in Water Management Research

Indian Council of Agricultural Research (ICAR) and the International Water Management Institute (IWMI), Colombo, signed an agreement for cooperation in various programmes for integrated water management on February 15, 2002. The agreement was signed by Dr Panjab Singh, Director General ICAR and Dr Frank Rijsberman, Director General IWMI. The collaborative programmes shall include integrated management of land and water resources for enhancing productivity in Bihar and eastern Uttar Pradesh, farmers' decision making processes in water allocation and distribution at the farm level, improvement of water productivity in river basins, improving groundwater governance and management systems and livelihood impacts of watershed management in selected agro-ecosystems. ICAR institutes shall also be participating in the CGIAR Challenge Programme on "Water and Food". The two organizations also agreed to organize workshops/ training programmes in the areas of drought management, groundwater governance, and groundwater-energy policies nexus.

[For more details contact Dr R.C. Maheshwari, Assistant Director General (TC), Indian Council of Agricultural Research, Krishi Bhawan, New Delhi 110 001, India]

Executive Committee Meeting of APAARI

24 March 2002, Bangkok, Thailand

The Executive Committee of APAARI held its meeting on 24 March 2002 at Bangkok, Thailand soon after the FAO-APAARI Expert Consultation on the Status of Biotechnology in Agriculture in Asia and the Pacific. Dr R.N. Sapkota chaired the meeting. Dr R.S. Paroda, Executive Secretary, APAARI welcomed the participants and thanked them for their participation. Dr Paroda, presented the follow up of the action taken on the decisions of the Sixth Executive Committee meeting held on 14 November 2001 at Bangkok. In order to provide continuity to the ARD Priority Setting exercise, it was informed that an assessment of the networks and gap analysis is imperative. In view of the extensive spread of the Asia-Pacific region, the members were requested to identify suitable resource persons who could undertake this gap analysis at sub-regional level. The assessment of past performance, present status and future of regional networks would form the theme for the Expert Consultation to be organized along with the Seventh General Assembly in December 2002.

Meeting in progress

Brief Report

The members were apprised of the progress of various APAARI activities and new agenda items were taken up for discussion.

Publications

The members were informed that APAARI brought out the following publications and circulated these widely:

- A NARS Perspective Supplement on Country Status Report – Australia revised and published.
- APAARI Newsletter – December issue, 2001.
- Success Story on Rice-Wheat Consortium.
- Proceedings of the Sixth Executive Committee meeting and Expert Consultation on ARD Priority Setting.

The Executive Committee members appreciated the efforts being made by APAARI Secretariat to ensure timely printing of publications.

Success Stories

The topics for the success stories 'Diseases Free Citrus Plantation in Taiwan' from COA. 'Coldwater Trout Production' from NARC, Nepal and 'Technology Developed to Control the New Castle Disease in Poultry' in Australia, were approved.

Membership Enhancement

As per the decision of the Sixth Executive Committee Meeting, requests for enrolling as APAARI members were sent to IFPRI, CGPRT, CIP, ICBA, CAAS and New Caledonia. ICBA and IFPRI have responded to the requests and are now associate members of APAARI.

It was suggested that in future some recent APAARI publications be attached along with the requests for new membership.

Reciprocal Associate Membership

As per the decision of the Sixth Executive Committee meeting, other ARD fora, viz. NACA, APSA, APAFRI, AARINENA, GFAR, and South Pacific Commission were invited to join APAARI as associate members and also accept APAARI as their associate member with mutual waiver of the annual membership fee. APSA, AARINENA, APAFRI and NACA have enrolled as associate members under this arrangement.

ICT Manager

The members were informed that the ICT Manager with APAARI had resigned since 31 Jan 2002 and in order to provide continuity and further thrust to the APARIS programme, it was essential that the vacancy be filled up at the earliest. AIT, Bangkok, an associate member of APAARI, is to be approached to select a suitable person for the post.

Executive Secretary

The issue of having a regular Executive Secretary was discussed. For several reasons, the members felt that appointment of an Executive Secretary on regular basis may not be in the interest of APAARI. Following a detailed discussion and after weighing the pros and cons, the Executive Committee felt that it would be better if an Assistant Executive Secretary is employed to support the Executive Secretary and also to carry out the day to day functions of the APAARI Bangkok office.

The Executive Committee members reposed their confidence in the leadership being provided by Dr R.S. Paroda and agreed that he continue as Executive Secretary for a further period of two years i.e. 2003-04.

Status of Membership Fee

The committee was appreciative of the continued support from the members. Most of the members have paid their annual contribution till 2001 and the contributions for 2002 are being received.

Budget for 2002

The budget was presented and the members were informed that the same was earlier approved in the General Assembly of 2000. Regarding the financial situation, it was brought to the notice of the members that APAARI plans to achieve a fixed bank balance of US$ 700,000 by the end of 2002.

The Committee appreciated the regularity on part of the members in honouring their financial obligations and also the gradual build up of finances by APAARI while conducting its activities.

Seventh General Assembly of APAARI and Expert Consultation-2002

In the Expert Consultation on ARD Priority Setting and the Sixth Executive Committee meeting, it was decided that regional research networks would form the theme for next Expert Consultation to be organized along with the Seventh General Assembly-2002 and the venue could be in the Philippines or Malaysia.

New Items

The members proposed the following new items for discussion. These were:

a) Support from APAARI to initiatives by members

b) Feedback from members about their expectations from APAARI

c) Review of APAARI constitution

d) Resource Generation activities

Support from APAARI to Initiatives by Members

The members welcomed the suggestion. It was informed that APAARI has been supporting representation of members in the ARD-related activities undertaken by other NARS/organizations/ networks etc. in the region. The committee agreed to the suggestion to support any such activity organized by member NARS in the region should any proposal be received conforming to APAARI mandate.

Feedback from Members about their Expectations from APAARI

The Committee agreed to solicit the views on the subject from the members on the performance and expectations from APAARI so as to improve the functioning and further development of the Association.

Review of APAARI Constitution

It was informed that the APAARI Constitution was formulated at the inception stage and over the period has witnessed several changes i.e. diversification of membership (associate; reciprocal), change in the annual contribution, creation of APARIS, links with other organizations, etc. All such developments have necessitated that the constitution be revised. It was agreed that the revised draft will be circulated first for the approval of the Executive Committee following which it would be placed for the endorsement of the General Assembly.

Resource Generation Activities

It was proposed that resource generation efforts/ activities need to be initiated to further consolidate the financial position. Dr Paroda informed that he has been trying to obtain support from other organizations and European Union has agreed to support through GFAR, the regional fora, and APAARI is expected to get support for APARIS networking.

Member NARS are requested to contribute short research articles, news/notes or other important information on their R&D activities. Please send your contributions to APAARI Secretariat.

ICBA – An International Research Centre Devoted To Growing Plants with Salty Water on Marginal Lands

A Profile

ICBA Headquarters at Dubai

Setting up of ICBA

The need for establishing the International Centre for Biosaline Agriculture (ICBA) arose from the Islamic Development Bank's (IDB's) realization that fresh water resources are overexploited in most parts of the developing world and its determination that other sources of water must be utilized for further agricultural/horticultural expansion. Expert consultations concluded that one source of such water is saline water, which has not been optimally utilized for irrigated agriculture or horticulture. ICBA was thus established in Dubai in September 1999 with an outlay of $22 million from the IDB to generate more knowledge and technology in saline irrigated agriculture as well as to gather, synthesize and disseminate information already generated elsewhere in this field. It is hoped that pooling this knowledge and making it available to poor farmers who have access to saline water to grow their crops will contribute to increased food and feed production from their farms as well as improving their living conditions. Along with the IDB, support for setting up ICBA came from the OPEC Fund for International Development and the Arab Fund for Economic and Social Development. Both donors initially provided $1 million apiece. The host government provided 100 hectares of land while the Ruler of Dubai Emirate graciously provided water (estimated to cost $0.5 million per annum) free of cost to ICBA. Additional project-based support comes from the International Atomic Energy Agency (IAEA) and the public and private sectors in Oman, Saudi Arabia, and UAE.

Mandate

ICBA is an international centre working primarily to benefit 54 member countries of the Islamic Development Bank and other developing countries. Its mandate is to develop sustainable management systems to irrigate food and forage crops and greening plants with saline water, and to provide resources of salt-tolerant plants for socio-economic development in the arid, semi-arid and salt-affected areas of the Islamic and other developing countries.

Research for Development

While ICBA was designed as a research and development (R&D) centre, the thrust of the centre is strategically more on development than on research.

Screening of salt-tolerant plants in a shade-house at ICBA, Dubai

In the words of its Director General, Dr Mohammad Al-Attar, "ICBA will be learning from experiences from all over the world regarding these programmes and will contribute its own experience as it listens to its partners, beneficiaries and donors. The centre's programmes are dynamic and will continue to evolve as ICBA responds to present and future challenges in biosaline agriculture, be it biological, physical, social or cultural."

ICBA's Four Programme Areas: R&D Approach

Any organization is faced with making strategic choices when it comes to selecting its R&D programmes. ICBA selected its R&D programmes based largely on the nature of its 'market' (the problem of salinity in irrigated agriculture), its client-base, its core strengths, its geographical coverage and beneficiaries. Based on these factors, four-programme areas have been identified. These are:

1. Plant Production and Management Systems
2. Genetic Resources
3. Information Management and Networking
4. Training and Extension

Plant Production and Management Systems

The programme focuses on four key systems:

Sustainable land and saline water use

- Identifying effective irrigation systems and methods
- Providing irrigation scheduling methodology
- Developing root-zone salt management strategies

Horticultural crop production

- Testing salt tolerance of vegetable and tree crops
- Evaluating economic productivity of candidate material
- Defining conditions for successful saline irrigated horticulture
- Developing plants and management systems for greening with saline irrigation water

Forage and field crop production

- Evaluating and selecting forage and field crops under saline irrigation
- Evaluating current varieties under saline conditions
- Selecting and developing new cultivars of salt-tolerant species
- Developing techniques that maximize crop production in saline systems
- Evaluating economic greening potential of salt-tolerant plants
- Testing salt-tolerant forages in livestock feeding systems

Sustainable economic production of annual and perennial forage and fodder crops requires reliable methods for seedling establishment, including soil and seedbed preparation, seeding; effective management during seeding and early growth; appropriate nutrition and fertilizer application; well-managed irrigation; good crop harvesting and handling practices; integrated pest (diseases, insects and weeds) management; and other management practices. This is specially true under saline conditions. Management practices for a wide range of forage and fodder crops have to be developed and tested under production conditions using varying salinity levels of irrigation water. Currently, ICBA is conducting collaborative experiments on germplasm collections acquired from genebanks worldwide and from international centres such as ICARDA and ICRISAT. An ICRISAT-ICBA collaborative cropping systems experiment involving ICRISAT pearl millet accessions is ongoing. Studies

Sporobolus experiments at ICBA, Dubai

on ICARDA's barley accessions are another facet of collaboration with international agricultural centres.

ICBA, in collaboration with IAEA and the UAE Ministry of Agriculture and Fisheries, is conducting studies on the sustainable utilization of saline groundwater for plant production systems under rangeland conditions to demonstrate the value of saline water and salt-affected lands in producing economically viable agriculture. In collaboration with ICARDA, ICBA is evaluating irrigation practices and fertilizer requirements for optimizing productivity of three indigenous grass species *Coelachyrum piercei*, *Cenchrus ciliaris* and *Lasiurus scindicus*.

Genetic Resources

While many plants are salt-tolerant, few are in use in agriculture or greening programmes. Some 1560 plant species show varying degrees of salt tolerance. Among these, there are some 885 species of halophytic angiosperms distributed over 250 genera. Salt-tolerant species exist in about 30% of the 354 families of flowering plants. Of the 500 halophytic genera listed in Aronson's database, almost half belong to only 20 plant families. The Gramineae and Cyperaceae have the highest percentages of halophytic genera among the Monocotyledoneae, whereas Chenopodiaceae has the highest proportion in the Dicotyledoneae. Halophytes have been used as forage in arid and semiarid areas for millennia. Some salt-tolerant shrubs and grass species have been used in pasture-improvement programmes in salt-affected regions throughout the world. There have been advances in selecting species with high biomass yields and protein levels in combination with their ability to survive a wide range of environmental conditions, including salinity. Many attractive halophytes could be used as ornamentals and landscape plants, especially in areas where fresh water is not available for irrigation. These halophytes include trees, shrubs, succulents and semi-succulents, biennial and perennial ground cover and lawn grasses. ICBA's role is to identify halophytes that have potential for use in productive agriculture or greening programmes based on irrigation with saline water and to make them available to farmers and landscape managers in its mandate region.

ICBA's Genetic Resources programme focuses on five key systems:

- Collecting and characterizing germplasm in the Gulf States
- Establishing a regional plant genetic resources system for salt tolerance
- Maintaining an international collection of genetic resources of salt-tolerant plants
- Undertaking and coordinating the supply, introduction, exchange and use of salt-tolerant plant genetic resources in the Gulf region and beyond
- Conducting training in plant genetic resources work relating to salt-tolerant germplasm

Gene Bank for Salt-tolerant Germplasm

Today, ICBA's genebank has over 6000 accessions of salt-tolerant or potentially salt-tolerant plants. Salt-tolerant germplasm is the key element in any programme for the development of salt-tolerant crops. The Middle East is the centre of origin and centre of diversity for many crop and forage species. ICBA intends to repatriate germplasm originally collected in the Middle East and those that have been evaluated for salt tolerance elsewhere. ICBA will organize joint collection missions with its cooperators in Gulf Cooperation Council (GCC) countries. ICBA will identify and acquire accessions with potential use as forages, field crops, fodder shrubs, sand stabilizers, fuel wood, fruit trees, landscaping and coastal greening plants, etc. At present, ICBA's genebank has short- and medium-term storage capabilities and plans are being made for long-term storage of these materials. ICBA is thus well on its way to develop a unique gene bank of salt-tolerant plants.

Information Management and Networking

ICBA's Information Management and Networking programme focuses on ensuring that ICBA's technical programme is effective and builds on the existing body of knowledge and effort by:

- Acquiring information on past, present and future programmes on saline irrigated agriculture
- Developing collaborative research networks and a Global Biosaline Network
- Creating a biosaline agriculture information centre – a focus for information exchange worldwide
- Acquiring, producing, and disseminating technology and information on saline irrigated agriculture

Two web-based information networks are supported by ICBA. The first one is the Global Biosaline Network, which can be accessed on ICBA's website *www.biosaline.org* This network is supported by core funds of the IDB and special funds from the OPEC Fund. The second is the Inter-

Islamic Network on Biosaline Agriculture, supported by funds from COMSTECH. This is currently being developed and is expected to be operational soon.

Many centres around the world have conducted and are conducting research in fields related to biosaline agriculture. However, these efforts are generally conducted in isolation of each other. Many of those working in this field, especially in the developing world, are unaware of who else is working on similar topics and what is already known. This leads to uncoordinated activities, fragmented efforts, and waste of scarce resources.

From its initial conception, ICBA was intended to act as a focal point for these efforts, gathering information on what has already been done and what is already known in the field, and bringing this knowledge and information to bear on the problems facing farmers and landscape managers in the developing world. Also, building on this knowledge, ICBA will develop networks among those involved in research on biosaline agriculture to focus and align efforts to address common problems occurring across regions and countries.

Evaluation of Salicornia varieties

Training/Capacity Building

Clearly, there is good potential for irrigated agriculture to expand with increased utilization of saline water. However, there are too few people trained in the field of biosaline agriculture. Hence, training in technical aspects of this discipline is a key responsibility for ICBA. This will include short collaborative on-the-job training courses, and workshops and symposia on specific relevant topics. Currently three training courses are held in each calendar year. Participation and implementation of these training courses receive financial support from the OPEC Fund, IAEA, and the core funds of the Islamic Development Bank.

The irrigated agriculture sector has been increasing by between 10% and 15% a year for the past 20 years. There are too few trained people working in irrigated agriculture research and development in most parts of the world, and fewer still who are trained in the special skills and techniques of saline irrigation.

ICBA's Partnerships

ICBA needs well-trained and qualified partners if it is to establish effective collaborative research and development projects.

ICBA has forged formal partnerships at the international level through Memoranda of Understanding with the Food and Agricultural Organization of the United Nations (FAO), the Global Water Partnership, and with two CGIAR institutes – ICARDA and ICRISAT. The CGIAR has recognized ICBA as a partner research institute. At the regional level formal links have been forged with the Arab Authority for Agricultural Investment and Development (AAAID), the Arab Organization for Agricultural Development (AOAD) and APAARI. At the national level, formal partnerships are already in place with Iran, Pakistan, Sudan, Saudi Arabia and UAE and others will follow. ICBA is also attracting investment from the private sector in Oman and Saudi Arabia and the public sector in UAE to conduct contract research that are in line with ICBA's mandate. These initial activities are expected to provide more insight into ICBA's core research areas.

The Road Ahead

ICBA is only two years young and with the help of its partners expects to make a difference on greening marginal lands. ICBA is confident that it can use salty water to green marginal lands that are now barren and bring a smile on the faces of the farmers by growing crops that bring revenue. The "crops" that ICBA will deal with are not conventional food crops such as rice or wheat but less-discussed salt-tolerant forages, cereals like barley, sorghum, and pearl millet, turf grasses for leisure resorts, and ornamental plants. The list could grow longer with strengthened networks and partnerships that emphasize "research for development." At ICBA, we underline development as we do research and pool the research already done elsewhere.

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Recent Activities in Agricultural Research and Development by RDA Korea

RDA Launches Ambitious Biotechnology Programme

The Rural Development Administration (RDA) has launched several programmes designed to help improve the state of biotechnology in the country. Foremost of these programmes is the establishment of the National Institute of Agricultural Biotechnology (NIAB), and the nationwide programme Biogreen.

National Institute of Agricultural Biotechnology (NIAB)

Established in March 2002, the NIAB serves as an extension and reinforcement of the Biological Resource Division of the National Institute of Agricultural Science and Technology (NIAST) and is attached to the Rural Development Administration. The RDA is to develop the NIAB as the largest biotechnology research base in Korea.

Basically, the institute aims to manage biological resources and promote its use, develop and secure the sources of agricultural biotechnology, and develop agricultural material to practical use.

The NIAB is composed of 7 divisions housed in 23 modern research laboratories. These divisions are: the General Service, Bioinformatics, Genomics, Plant Biotechnology, Molecular Physiology, Metabolic Engineering, and Genetic Resource. There are 97 researchers manning the institute.

Bio Green 21 Programme

The RDA also launched a nationwide research programme on biotechnology. Branded as Bio Green 21, the programme initiated as a national project puts together specialized researchers in the different industries, universities and institutes. In line with this research programme, a total of seven hundred billion won will be invested for 20 projects in 5 core fields from 2001 to 2010. The project is hoped to bring an economic benefit of one hundred billion won yearly. If Bio Green 21 Programme is completed successfully in 2010, the state of South Korea's Agricultural Biotechnology will rank fifth in the world from its fourteenth place presently.

National Institute of Agricultural Biotechnology

RDA International Collaborative Research Activities Finalized

In its desire to strengthen international cooperation for the country's agricultural development, the Rural Development Administration (RDA) carried out its programmes in mutual cooperation with several countries in various fields such as joint research, exchange of experts and genetic resources. For this year (2002), the RDA's Research Management Bureau is supporting 32 International Collaborative Research projects. These projects are undertaken through the coordination and assistance of different RDA offices and institutes (numbers given in parentheses) which consist of the following:

- Farm Management & Information Office (3)
- National Institute of Agricultural Science & Technology (7)
- National Institute of Agricultural Biotechnology (4)
- National Horticultural Research Institute (6)
- National Livestock Research Institute (4)
- National Crop Experiment Station (4)
- National Honam Agriculture Experiment Station (1)
- National Yeongnam Agriculture Experiment Station (1)
- National Jeju Agriculture Experiment Station (2).

Twelve institutes and seventeen universities from eight countries are involved in these undertakings. These countries are: USA, England, China, Japan, Canada, Holland, Italy and the Philippines. RDA continuously plans to expand its international

collaborative research activities with other countries including Russia.

RDA Invites World-renowned Scientists

Better linkages and exchange of technological information between the Rural Development Administration (RDA) and its foreign partners has always been an important concern for the RDA. Along this line, every year RDA invites as honorary scientists, world renowned scientists committed to the goal of cutting-edge technology development. They hold seminars and symposia for RDA personnel and conduct research. At present, RDA has committed 115 honorary scientists. This includes the 22 scientists previously committed for this year.

Early this year, the National Institute of Agricultural Science and Technology (NIAST) invited Dr Edouard Piagai, Sub-Director of Dokuchaev Soil Institute of the Russia Academy of Agricultural Science for a lecture on "Technology Development for Recycling of Used Water in Irrigation" from 30 January to 5 February, 2002. He also conducted seminar on "Planning and Managing of Field Soil" on February 2 and attended a symposium on further improving bilateral research between Korea and Russia.

[e-Newsletter, Rural Development Administration, Vol. 1, No. 1, May 2002, Homepage: http://www.rda.go.kr; For details contact Dr Dae Guen Oh, Director, International Technical Cooperation Centre, Rural Development Administration, 250 Seodundong, Suwon, Gyeonggido 441-707, Republic of Korea].

Regional E-Governance Activities - PCARRD's Initiatives

The desire to create an integrated and more responsive service in the agriculture, forestry and natural resources sector through information, communications and technology (ICT) has produced a rippling effect in the Philippines.

Responding to the government's call for e-governance, the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) has included in its Information Systems Plan 1997-2002 strategies to uplift ICT nationwide. These strategies fall under the Agriculture and Natural Resources Information Network (AGRINET), which was developed to consolidate all information and communication technology initiatives in this sector to provide its clients a consistent, sustainable information and technology delivery system.

Since 1997, PCARRD has been empowering the 14 regional R&D consortia in the country on e-governance technologies. To date, these consortia have been the recipient of servers and in-house developed major application/systems such as the Agriculture and Resource Management Information System (ARMIS) and Farmers' Information Technology Services (FITS) databases. Likewise, technical services on server set up and system installation/maintenance have been provided. Various ICT trainings were conducted on office applications, website and multimedia development, geomatics, statistical packages, and database management.

The last half of 2000, therefore, saw the emergence of the 14 regional consortia websites within the PCARRD portal, innovations that were products of PCARRD's continuing capability build-up and upgrading of ICT skills, which tested local talents and creativities.

In the second half of 2001, PCARRD launched the first *National E-Governance Workshop* in four knowledge centres from north to south of the country to host the trainings with some help from private ICT companies. Trainings were conducted in state colleges and universities in Northern Luzon, Southern Luzon, Mindanao, and Visayas. The training comprised of three parts, namely, Geomatics, Statistical Packages, and Multimedia Development. All 74 participants were representatives from member-agencies of PCARRD's regional R&D consortia. The participants chosen for the training are applied communication officers, regional management information systems (MIS) coordinators, technology disseminators, and top officials of PCARRD's regional consortia.

In October 2001, web-enabling of the ARMIS data entry and report generation modules were completed. ARMIS was pilot-tested successfully in two areas of the country, at the Cavite State University (CavSU) and the University of the Philippines (UP) Visayas, both member agencies of the PCARRD network.

The web-enabled ARMIS was launched during the recently conducted *Regional Management Information System (RMIS) Coordinators' Meeting* on 4-5 April 2002 at the PCARRD Headquarters in Los Baños, Laguna.

Showcased during the meeting were the 14 regional outputs of the e-governance training, significant of which were the Interactive *Techno Gabay* Kiosk in three dialects (Eastern Visayas Region) and the GIS-based Mapping of Banana Bunchy-Top Virus (Cagayan Valley). These consortia have developed the capability in conducting echo training and seminars for their member agencies, thus, creating a multiplier effect.

Issues and constraints on meagre resources and implementing mechanisms were discussed, revealing the different levels of ICT accomplishments primarily attributed to the leadership and technical skills of regional coordinators; the acceptance of ICT in the regions; and the support of its organization and member agencies to this initiatives.

With the lessons learned, PCARRD will continually enhance policies and regulatory framework at the regional level so that local leaders will continue to move forward towards an ICT culture.

[Cotributed by: Dr P.S. Faylon, Executive Director, PCARRD, Los Baños, Laguna 3932, Manila, Philippines]

Strengthening Agricultural Research – Extension System Linkage in the Philippines: Unsettled Issues and Concerns

Strengthening research-extension linkages has been an ongoing concern of agricultural research in the Philippines. In fact, the causes of weak linkages in this area have been studied and analyzed. Until this time, however, the country is still struggling to overcome the same issues and problems, which should have already been addressed in the past.

Dr Virginia R. Cardenas of the University of the Philippines Los Baños (UPLB) and Dr Danilo C. Cardenas of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), during the APO-PDC Meeting on Integration of Agricultural Research Extension on 18-22 March 2002, extensively discussed some fundamental precepts in research-extension linkage that the country has failed to adequately address in the past.

Current Status of Agricultural Research

There are a number of limitations to the conduct of agricultural research in the Philippines. Some of these concerns are: 1) incentives and disincentives for researchers (the relatively low number of research output per involved expert especially in the regional research centres reflect conditions which put severe disincentives to undertaking research); 2) low funding levels of research projects; 3) quality of research output (there is not much information available on the quality of the research outputs as measured by the following criteria – relevance to either local, regional or national concerns, robustness of research results, and extent of technology/information utilization); 4) disjointed research output (while research output could be classified under particular headings signifying areas of specialization, there is insufficient evidence that the various researches were consciously guided by a common theme or direction); and 5) misallocation of budgetary resources.

Current Situation of Agricultural Extension

In the Philippines, the Agriculture and Fisheries Modernization Act (AFMA) and the Local Government Code of 1991 are two policy instruments that have affected governance in agricultural extension. AFMA emphasizes the role of the private sector by encouraging the participation of farmers and fisherfolk cooperatives and associations in certain extension services like community organizing, skills training in agribusiness and management, popularization of training materials, promotion of regenerative agricultural technologies, and the use of participatory approaches. Under Rule 921 of AFMA, the extension functions of the Department of Agriculture (DA) have to be delegated to regional field units and Agricultural Training Institute (ATI) training centres which design and implement agricultural training programmes that are consistent and functionally integrated with the regional agriculture and fisheries development strategy and programme.

On the other hand, the Local Government Code of 1991 decentralized the management of extension programmes in the country, which resulted to the devolution of agricultural extension function to local government units (LGUs). It provided for the devolution of power to administer extension services and to access resources from the central agencies to the provincial, municipal, and *barangay* (village) authorities.

After the devolution, two modes of extension management emerged. Model I (Figure 1) characterizes local extension management of LGU-supported/initiated programmes. Model II (Figure 2) characterizes the implementation of production programmes initiated by other extension providers such as the DA, state colleges and universities (SCUs), non-government organizations (NGOs) and others (both models based on Cardenas study – 2000).

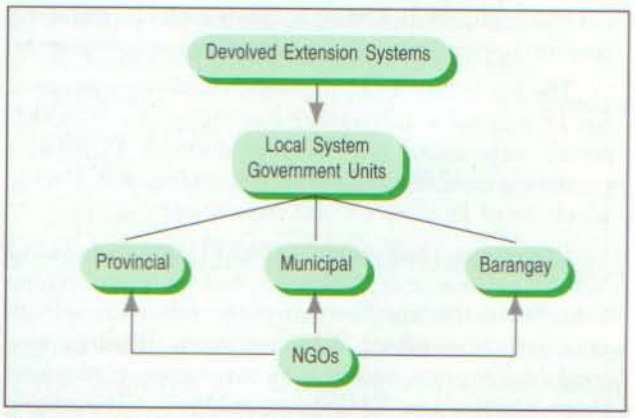

Figure 1. *Model I: Local government initiated agricultural extension management in the Philippines under the devolved extension systems*

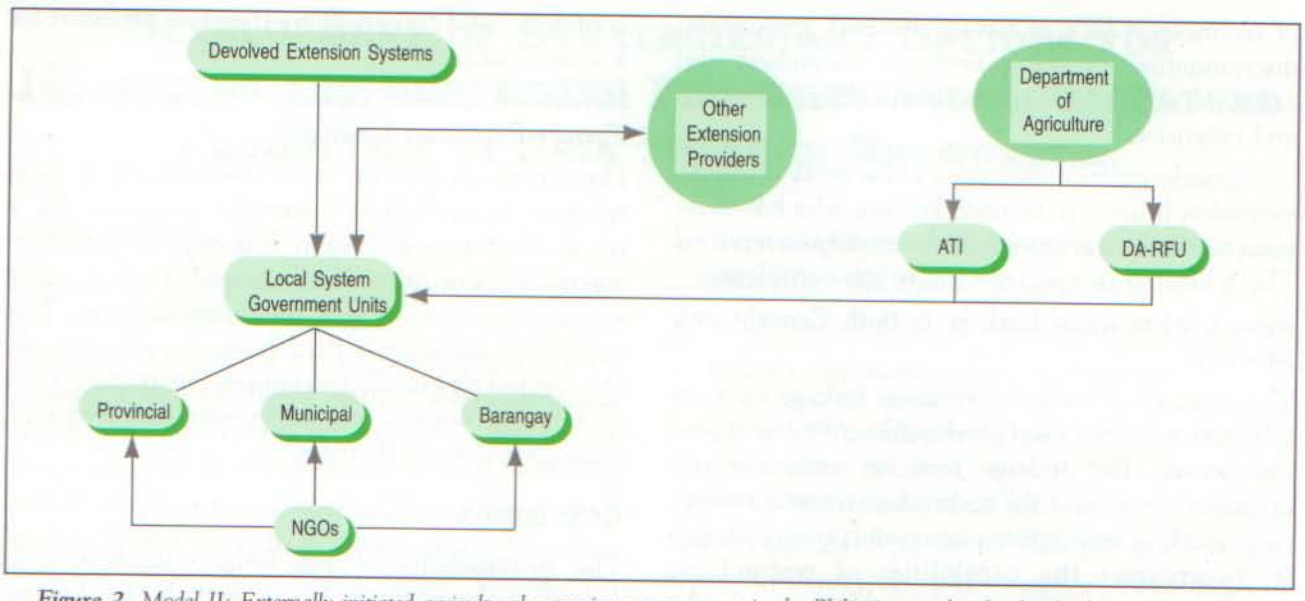

Figure 2. Model II: Externally initiated agricultural extension management in the Philippines under the devolved extension systems

The Department of Agriculture, which customarily undertakes the pre-devolution era extension service particularly training and production functions, can no longer link directly with farmers. As Model II shows, it must now consult and formalize arrangement with the LGUs. This transition of powers and functions has significantly affected the sustainability of research-extension linkages. Only a few cases of linkages with LGUs are successful. This has to do with the nature of the linkage (*ad hoc*): it is not possible to gain substantial knowledge and experience on a given innovation in a limited term (at most 5 years) and work on its institutionalization successfully.

Results from the study by Cardenas (2000) reveal that research and extension linkages under Model II can be strengthened by the following: information-gathering on local farming systems and transforming it to research problems; production of technology packages incorporating farmers' indigenous knowledge; and performance-evaluation of technologies under farmers' conditions.

Because of the reorganization of the Philippine agriculture and fishery sectors, and the devolution of extension functions, the relationship between research and extension suffered some setbacks. Experience, observations, as well as related literature, reveal the absence of a unified framework (due to a multiplicity of extension providers – government agencies, NGOs, private sector, people's organizations – who are guided by multiple concepts of extension), inadequate support services (which are not quite organized to properly respond to users/industry needs), ad hoc institutional linkages and missing tasks, and lack of people's participation (because learning levels and styles do not fit potential beneficiaries).

Analysis of the Research and Extension Linkage (REL) Issue

Analysis of the REL issue can be divided under two historic periods: the pre-devolution and post-devolution stages. Before the devolution of extension functions to the local governments, the dominantly understood causes of the weak linkages (according to the study by Dar and Cardenas 1997) were structural fragmentation of research and extension institutions; unresponsiveness in research by the academy regarding extension needs; lack of communication among researchers, extension workers and farmers particularly in programme planning; top-down/linear communication flow; separate definitions of policy objectives; slow (and even missing) process of transferring research results; inadequate funds, manpower and incentives; and the absence of a participatory system for doing research and extension.

In the post devolution era, explanations for the weak REL were the meagre support of extension by local executives; lack of local government officials' technical know-how and skills in monitoring and evaluating extension activities; political interventions; disproportionate allocation of resources across activities where extension gets lower priority; absence of a systematic data base; immature technologies and the slow translation of research results into popular language; lack of understanding of the technology transfer context among researchers, extension workers, and policy makers; inadequacy of professional training of extension practitioners; slow process of certification

of technology; lack of farmer-centered approaches; discrimination in status between researchers and extension workers; and, inadequate funding for research and extension.

Considering that the causes of the weak research-extension linkage have been known, why has there been no improvement in the delivery of basic services? The following perspectives are worth-considering:

Research-Extension Linkage is Both Concept and Practice

The concept of research-extension linkage vis-a-vis its practice has not been given sufficient focus in past discussions. The linkage function enhances the operationalization of the technology transfer system, particularly in agenda formulation and priority setting. It incorporates the capabilities of researchers, extensionists and farmers in addressing needs; mobilization and effective utilization of resources; development and maintenance of a critical mass of researchers, change of agents and farmers, working collaboratively; assurance of information flow between researchers, extension workers, farmers, policy makers and the public; and monitoring and evaluation of extension-research programme.

Research-Extension Linkage is Both a Management Issue and a Technology Issue

Linkages serve as devices for managing the interdependence of institutions and as social processes in which extension managers, farmers, extension workers and other actors have a clear idea of the distribution of expected gains and costs, which could further guide strategy building. Transparency, confidence and consensus are therefore necessary for a sound linkage.

Research-Extension Linkage? Why not Research-Farmer-Extension Linkage?

Discussions focused on research-extension linkages relegate farmer-related issues to a corner. By a researcher-farmer-extension linkage, the farmer is situated at the centre and linkages are defined according to social interactions that the farmer initiates. This implies a redefinition of the role of extension not only as a conduit for knowledge transfers but as a facilitator to increase farmers' access to available resources, institutional and otherwise.

Conclusion

The sustainability of any linkage mechanism is judged in the context of how well the mechanism contributes to a synergetic and effective working relationship between research and extension institutions over the long term. The most successful cases of integration on research (on-farm) and extension are those in which links have been forged simultaneously at several levels of the administrative hierarchy. Philippine experiences show that on-farm research alone, which constitutes a large chunk of the inter-phase within the devolved extension function, cannot solve the linkage problem. The issue is wide and deep-rooted: it is conceptual, political, economic, social and managerial.

[Contributed by: Dr P.S. Faylon, Executive Director, PCARRD, Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, Los Baños, Laguna 3932, Manila, Philippines].

News from the South Pacific

- A two-member mission from FAO headquarters in Rome, visited Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu in the first fortnight of March to assess agricultural development and food security priorities of the region in order to formulate a Regional Programme for Food Security in the South Pacific. Likely to be funded by the European Union (EU), the programme would support the implementation of the action plan of the World Food Summit (WFS) in the 12 FAO member countries in the South Pacific, which had just seven FAO members at the time of the November 1996 summit.

  The mission members – Muller Praefcke and Stefano Gavotti from FAO's investment centre division (TCI) – held talks with the governments in the six countries, which included ministries of finance, planning and foreign trade, as well as with donors. They identified three 'pillars' of a regional food security programme – it would have to be country specific, address trade-related issues as well as policy constraints.
- Leading exporters, FAO experts and government extension services officials met at the February workshop, which was organized under FAO's technical cooperation project to train extension staff in Fiji in post-harvest handling and marketing of fresh horticultural produce.
- Under a technical cooperation agreement, FAO will help the department of agriculture and livestock improve farm management and agricultural expertise in the highland provinces of Papua New Guinea, where lack of these skills is keeping farmers from getting the most from their lands.

[Abstracted from: Maliwan Newsletter FAO-RAP Jan-March 2002].

Development of Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production in Asia through Networking

Introduction

Recognizing the importance of policy research for the sustainable management of aquatic resources, ICLARM – The World Fish Centre is implementing a project, "Strategies and options for increasing and sustaining fisheries and aquaculture production to benefit the poor households in Asia through networking". This Project involves nine Asian countries: Bangladesh, Sri Lanka and India from South Asia, Indonesia, Malaysia, Philippines, Thailand and Vietnam in South East Asia and China in East Asia (Table 1), funded by the Asian Development Bank (ADB) and ICLARM – The World Fish Centre.

The Project programme (Table 2) will enable the partner countries to:

- Improve policies on fisheries that affect resource allocation and choices about technology, and
- Set investments and development targets to address poverty and increase fish production.

Projections of trends and prospects for the fisheries sector in Asia will provide the partner countries and development agencies with a reliable and disaggregated picture of fisheries in the region. This information will enable development agencies to both formulate country strategies and options for fisheries development, and set development and investment priorities geared toward poverty reduction and food security improvement.

Table 1. Countries and Institutions involved in the Project

Country	Institution
Bangladesh	• Department of Fisheries (DOF); Bureau of Socioeconomic Research and Training (BSERT), Bangladesh Agricultural University (BAU); Rural Economic Programme (REP), University of Chittagong (UC)
China	• Centre for Chinese Agricultural Policy (CCAP); Freshwater Fisheries Research Centre (FFRC)
India	• National Centre for Agricultural Economics and Policy Research (NCAP); Indian Agricultural Research Institute (IARI); Central Marine Fisheries Research Institute (CMFRI); Central Inland Capture Fisheries Research Institute (CICFRI); Department of Fisheries Economics, University of Agricultural Sciences (UAS); Gujarat Agricultural University (GAU)
Indonesia	• Research Centre for Marine and Fisheries Product Processing and Socio Economics (RCMFPPSE); Directorate of Fishing Enterprise Services, Directorate General of Capture Fisheries (DGCF); Directorate of Aquaculture Enterprise and Quality Development Services, Directorate General of Aquaculture (DGA); Department Pendidikan dan Kebudayaan, Fakultas Ekonomi Universitas Diponegoro; Institut Pertanian Bogor (IPB); Hassanudin University (HU)
Malaysia	• Ministry of Agriculture (MOA); Department of Fisheries (DOF); Lembaga Kemajuan Ikan Malaysia (LKIM); Faculty of Economics and Management, Universiti Putra Malaysia (UPM)
Philippines	• College of Economics and Management, University of the Philippines Los Baños (CEM, UPLB); Bureau of Fisheries and Aquaculture Resources, Department of Agriculture (BFAR-DA)
Sri Lanka	• Department of Fisheries and Aquatic Resources (DFAR); National Aquatic Resources Research and Development Agency (NARA); National Aquaculture Development Authority (NAQDA)
Thailand	• Department of Fisheries, Ministry of Agriculture and Cooperative (DoF); Coastal Resources Institute, Prince of Songkhla University (CORIN)
Vietnam	• Institute of Fisheries Economics and Planning (IFEP); Vietnam Agricultural Science Institute (VASI); An Giang University (AGU); Research Institute for Aquaculture No. 2 (RIA2)

Table 2. Research components and their methodologies

Research Component	Areas Covered/Methodology
• **Profile of key aquaculture technologies and fishing practices**	• Aquaculture – Farming practices, areas, production level, costs and return, adoption pattern among others – Cultured major fish species - carp, tilapia, milkfish, seabass, shrimp, shellfish, grouper, ornamental fish, etc. both from inland and marine waters – Post-harvest handling and processing including type of product, available technology, existing research, etc for key fish species • Capture fisheries – Structure of fisheries, gear type, profile of fisheries, cost and return, CPUE and others.
• **Analysis of policies, institutions and support services to fisheries and aquaculture**	• Analysis of the current fisheries and aquaculture policies, feed policies, and other sectoral and macroeconomic policies • Institutional arrangements i.e., existence and application of co-management, formal and informal regulations for fisheries, role of local organizations, etc. • Assessment of support services and infrastructure by examining credit/delivery, marketing of input/output, extension, research and training, role of private sector and others
• **Socioeconomic profile of major stakeholders in fisheries (producers, consumers and traders)**	• Stratified random sampling of households to collect primary data. Food consumption assessment including information on quantity of fish consumed and preferred species, size of fish, price of fish, other food and non-food expenditures • Producer survey - farm area devoted to crops and to aquaculture (ponds, cages), general characteristics of the aquaculture system, pond management, other farm specific cost of aquaculture, total fish production and other social aspects (problems/ issues/conflicts related to aquaculture, future plans of farmers, etc.)
• **Analysis of fish supply and demand and projections**	Estimation of supply and demand functions • Supply function – Major fish species groups and sources (i.e., aquaculture or capture fisheries). Supply function for capture fisheries will be a function of prices of inputs and outputs, stock conditions, environments, management options/policies. – For aquaculture supply, profit function approach will be used for estimating species/species group specific supply function. – Following the envelope theorem, supply functions for different species groups will be estimated. • Demand function – Estimation of demand elasticities - species group/fish type, income class and location (rural vs. urban). As fish is not a homogenous commodity, demand function will be estimated by species group/fish type. – Methodological framework, multistage budgeting framework would be used to estimate a demand function for food in the first stage, a demand function for fish or animal protein (as a group) in the second stage, and a set of demand functions for fish (or fish and meat products) by type in the third stage. • Projection and Simulation – A 15-year projection of the supply of and demand for various types of fish will be carried out after the finalization of demand/supply elasticities.
• **National Action Plan**	• Policy recommendations, strategies and options to increase and sustain the fisheries and aquaculture resources will be drawn out based on findings of the different research components.

Objectives

The objectives of the Project are to assist its nine partner countries in:

i. formulating strategies and action plans for increasing fish production, improving nutrition and income, and sustainably managing fisheries resources – to benefit poor fish producers and low-income consumers;

ii. determining the most viable and sustainable aquaculture and fisheries practices that are of critical importance to poor fish farmers, fishers as well as low-income consumers. These include prioritization of fish species, farming systems, fishing technologies, and management practices;

iii. analyzing and forecasting fish production and consumption by fish species and income groups – to evaluate the market potential for alternative fish products of poor farmers and fishers and to identify fisheries management options to increase participation of small-scale fishers; and

iv. strengthening the capacity of the developing country institutions in fisheries policy research.

Scope

The Project is working on five interrelated research components as described in Table 2.

Expected Output

The expected outputs of this project are:

i. strategies and options to assist resource poor fishers and farmers of the participating countries to adopt viable and sustainable production technologies, and appropriate fish species that have been identified based on demand potential and biotechnical and socioeconomic viability;

ii. strategies and options for increasing the participation of small-scale producers and the poorer members of the community in fisheries resource management;

iii. methodology and operational database on the supply and demand outlook to be used by analysts and policy makers to design appropriate fisheries and aquaculture development strategies; and

iv. strengthen capabilities of participating country agencies and institutions – for fisheries policy research and economic analysis, technology evaluation and transfer, and improve policy decisions for resource allocation and pro-poor growth in fisheries and aquaculture.

Achievements of the Project

The Inception Workshop

The first workshop of the project organized at ICLARM – The World Fish Centre in Penang, Malaysia from 21 to 24 August 2001 was attended by 60 research scientists; composed of 45 representatives from the partner countries, two from JICA and 13 from ICLARM. The Workshop discussed and finalized the methodologies, analytical framework, survey design and implementation arrangements including a detailed workplan for the Project.

Research Activities

Secondary information was gathered from government agencies and other institutions in each participating country for Component 1, which deals with culture and capture fishery technology, and Component 2, which covers the analysis of the current fisheries and aquaculture policies, feed policies, and other sectoral and macroeconomic policies.

In order to implement the research activities of Component 3 in each of the participating countries, primary data is being collected using a stratified random sampling of households through surveys or rapid appraisals. Data collection started in the last quarter of 2001.

Initial outputs from the project were presented at a special session on "Economics of Asian Aquaculture" in the World Aquaculture Society (WAS) Meeting in Beijing, China in April 2002.

The project webpage, *http://www.cgiar.org/iclarm/demandsupply/index.htm*, is a useful communication and information tool not only to the project collaborators but also to other research scientists. This will be updated every six months to incorporate the current activities of the project, and to provide the progress report to partners, the donor and other research organizations.

[Contributed by: Madan Mohan Dey, Rowena Andrea Valmonte-Santos and AKM Mahfuzuddin Ahmed, ICLARM – The World Fish Centre, Jalan Batu Maung, Batu Maung, 11960 Bayan Lepas, Penang, Malaysia].

APAARI PUBLICATIONS

SUCCESS STORIES

- **Baby Corn Production in Thailand** (1994/1)
  by Dr Chamnan Chutkaew and Dr R.S. Paroda
- **Tilapia Farming in the Philippines** (1994/2)
  by Dr Rafael D. Guerrero III
- **Hybrid Rice in China** (1994/3)
  by Mr Lou Xizhi and Dr C.X. Mao
- **Dairying in India** (1994/4)
  by Dr R.P. Aneja
- **Hybrid Cotton in India** (1995/1)
  by Dr A.K. Basu and Dr R.S. Paroda
- **Palm Oil Industry in Malaysia** (1995/2)
  by Dr Y.B. Basiron
- **Transformation in Korean Farming – A Success Story of Effective Linkages** (1996/1)
  by Dr Chae Yun Cho
- **Cotton Production in Pakistan** (1996/2)
  by Dr Badaruddin Soomro and Dr Parvez Khaliq
- **Orchids in Thailand** (1997/1)
  by Dr Kanchit Thammasiri
- **Wheat Production in Iran** (1997/2)
  by Dr Abbas Keshavarz and Dr M.J. Mirhadi
- **Agro-Tourism in Australia** (1997/3)
  by Dr Tom Connors
- **Direct Seeded Rice in Malaysia** (1998/1)
  by Dr Cheong Ah Wah
- **Groundnut in China** (1998/2)
  by Dr Duan Shufen, Dr Hu Wenguang and Dr Sui Qingwei
- **Oilseeds in India** (1999/1)
  by Dr Mangala Rai
- **Integrated Pest Management in Rice in Indonesia** (1999/2)
  by Dr Soejitno
- **Bivalve Mariculture in India** (2000/1)
  by Dr V.N. Pillai *et al.*
- **Farming of Carrageenophytes in the Philippines** (2001/1)
  by Dr Rafael D. Guerrero III
- **Resource Conserving Technologies: Trasforming the Rice-Wheat Systems of the Indo-Gangetic Plains** (2002/1)
  by Raj K. Gupta *et al.*

OTHER PUBLICATIONS

- APAARI. 1999. National Agricultural Research Systems in the Asia-Pacific Region – A Perspective, 1999, Asia-Pacific Association of Agricultural Research Institutions. FAO Regional Office for Asia and the Pacific, Bangkok.
- Proceedings – Expert Consultation on Development of an Asia-Pacific Agricultural Research Information System, 6-7 November 2000, Chiang Rai, Thailand.
- Proceedings – The Sixth General Assembly of APAARI & Expert Consultation on Strategies for Implementing APAARI Vision 2025: Agricultural Research for Development in the Asia-Pacific Region, 8-10 November 2000, Chiang Rai, Thailand.
- National Agricultural Research Systems in the Asia-Pacific Region–A Perspective (Supplement) : Country Status Report–Australia.
- APAARI – A Decade of Progress, reprinted in 2001.
- Proceedings – Expert Consultation on Regional Priority Setting for Agricultural Research for Development in the Asia-Pacific Region and Sixth Executive Committee Meeting of APAARI, 12-14 November 2001, Bangkok, Thailand.

FUTURE CONFERENCES

Title : International Conference on Environmentally Sustainable Agriculture for Dry Areas for the 2nd Millennium
Venue : Shrijiazhuang, Hebei, China
Period : 15-19, September 2002
Contact : Ms Catherine Vachon, Lethbridge Research Centre, Agriculture and Agri-Food Canada, Lethbridge, Alberta, Canada T1J 4B1
E-mail : vachonc@em.agr.ca
Fax : 1-403-382-3156

Title : Eighth International Congress on People and Biodiversity
Venue : Addis Ababa, Ethiopia
Period : 16-20, September 2002
Contact : Dr Fassil Kaebebew, Local Organizing Secretary, P.O. Box: 30726 Addis Ababa, Ethiopia
E-mail : fassilkeb@hotmail.com or Bioresearch@telachom.net.et

Title : Bringing Back the Forests : Policies and Practices for Degraded Lands and Forests
Venue : Kuala Lumpur, Malaysia
Period : 7-10, October 2002
Contact : Mr Alias Abdul Jalil, APAFRI Secretariat
E-Mail : foreconf@apafri.upm.edu.my
Website : http://apafri.upm.edu.my/reconf/index/html

Title : 7th International Symposium on the Biosafety of Genetically Modified Organisms
Venue : Beijing, China
Period : 10-16, October 2002
Contact : Prof. Hongya Gu, College of Life Sciences, Peking University, Beijing 100871, China
E-mail : biosafe@pku.edu.cn
Fax : +86(10)62751841, 62751194

Title : 4th International Plant Tissue Culture Conference on Biotechnology for Plant Improvement
Venue : Dhaka, Bangladesh
Period : 1-3, November 2002
Contact : Organizing Secretary, 4th International Plant Tissue Culture Conference, Department of Botany, University of Dhaka, 1000 Bangladesh
E-mail : bapte@bd.drik.net

Title : International Conference on Vegetables : Vegetables for Sustainable Food and Nutritional Security in the New Millennium
Venue : Bangalore, India
Period : 11-14 November, 2002
Contact : Dr Prem Nath, Chairman, Organizing Committee, ICV, PNAS Foundation, Bangalore 560094, India
E-mail : pnasf@vsnl.net; info@pnasf.org
Fax : 91-80-3511555
Website : www.pnasf.org.news&events

Title : Second International Agronomy Congress on Balancing Food and Environment Security – A Continuing Challenge
Venue : Vigyan Bhawan, New Delhi
Period : 26-30 November, 2002
Contact : Dr RC Gautam, Secretary, Indian Society of Agronomy IARI, New Delhi 110 012
E-mail : rcg@iari.ernet.in

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