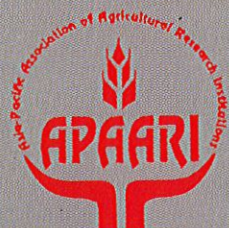
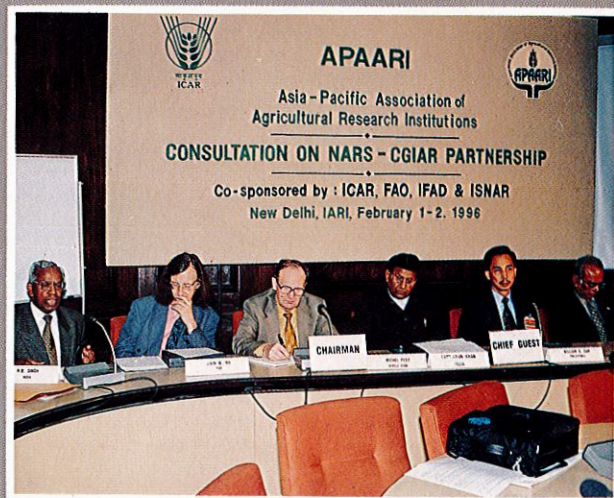


CONSULTATION ON NARS-CGIAR PARTNERSHIP

(CO-SPONSORED BY ICAR, FAO, IFAD AND ISNAR)

FEBRUARY 1-2, 1996, NEW DELHI, INDIA

PROCEEDINGS



ASIA-PACIFIC ASSOCIATION OF AGRICULTURAL RESEARCH INSTITUTIONS

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Asia-Pacific Association of Agricultural Research Institutions

(APAARI)

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I. OPENING OF THE CONSULTATION

The Consultation on NARS-CGIAR Partnership, co-sponsored by the Indian Council of Agricultural Research (ICAR), the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agriculture Development (IFAD) and the International Service for National Agricultural Research (ISNAR), was held at the Indian Agricultural Research Institute (IARI), New Delhi on February 1-2, 1996. It was organized under the auspices of the Asia-Pacific Association of Agricultural Research Institutions (APAARI). Heads of the National Agricultural Research Systems (NARS) of twelve countries, namely, Australia, Bangladesh, India, Iran, Malaysia, Nepal, Japan, Pakistan, The Philippines, Thailand, Western Samoa and Vietnam, the Director-Generals of four Consultative Group on International Agricultural Research (CGIAR) Centres, namely, ISNAR, CIMMYT, ICRISAT and IIMI, senior representatives of IRRI and IPGRI and high level officials of the World Bank, FAO and IFAD participated in the Consultation. From India, besides the Director-General, ICAR, Vice-Chancellors of three selected Universities and other senior officials participated. Some of the special invitees also attended. A list of the participants is given as Annexure-I.

The Agenda and the Programme of the Consultation, as adopted, is attached as Annexure-II.

Mr A.Z.M. Obaidullah Khan, Assistant Director-General of FAO and the Regional Representative for the Asia-Pacific Region, FAO, Bangkok chaired the Opening Session.

Dr R.S. Paroda, Executive Secretary of APAARI and Director-General of ICAR welcomed the participants. He expressed great satisfaction on the overwhelming response from the various partners and particularly appreciated the initiative and support of FAO, IFAD and ISNAR in organizing this meeting. Referring to the importance of appropriate research priorities, strategies and programmes at the regional, national and international levels, he emphasized the need to have an arrangement which will ensure efficient governance, implementation, monitoring and financing of priority research areas. He desired that regional collaboration among NARS should be strengthened by involving concerned CG Centres and the regional fora, such as APAARI. Dr Paroda asserted that appropriate support to APAARI would greatly help in developing NARS in the Asia-Pacific Region.

Mr Peter Rosenegger, FAO Representative in India, welcomed the participants on behalf of the FAO. He challenged the NARS leaders of the region and the international systems to ensure a sustained and comprehen-

sive food security as the region still has the highest concentration of malnourished people.

Dr Stein Bie, Director, Sustainable Development, FAO, expressed his appreciation over the Consultation's goal to help the CG system generally and TAC in particular to develop strategies that also reflect the priorities of the NARS in the region. He regretted that TAC could not be represented in the meeting but offered to explain the rationale of the TAC priorities and to carry back the recommendations of the Consultation to TAC for its consideration. He reiterated FAO's continued support to APAARI activities in the region.

Dr Bonte-Friedheim, Director-General of ISNAR, referred to on-going external changes and internal adjustments of the CG system and found the Consultation to be an important step in the process. Reiterating the objectives of the Consultation, he highlighted the following aspects :

- Improving NARS-NARS partnership, which is a major APAARI objective;
- Improving NARS-CG system partnership at various levels;
- Soliciting inputs from the region for consideration in the TAC global priority setting exercise for the CG system. He cautioned that any new or increased priorities must go hand-in-hand with the decrease in existing priorities as resources are shrinking; and
- Selecting nominees of the Regional Forum to represent the region at a global meeting of the CGIAR in May in Indonesia. In the context of ISNAR, he found the Consultation particularly important as it reflects the very mandate of ISNAR to strengthen the role of NARS as an active partner in international agricultural research.

Mr S. Mathur, Technical Advisor, Technical Advisory Division, IFAD, informed the participants regarding the initiative of the CGIAR Renewal Process. According to him the premise of the NARS initiative was that the CGIAR could not undertake a revitalization exercise in isolation from its partners along the technology continuum. In recounting the deliberations at the First Global NARS Consultation convened by IFAD in Rome in December 1994, he highlighted the need expressed by the participants to consolidate successful experiences in the promotion of institutional mechanisms and approaches at the levels of NARS-CGIAR interface, Inter-collaboration and Intra-NARS links. These include IARC-NARS partnership through networking, consortia and eco-regional models, as well as emerging new forms of partnership to take the lead in undertaking certain initiatives, based on their

comparative advantage. The need to forge upstream/downstream links through broader coalitions with NGOs, universities, regional centres, the private sector and farming communities, in the technology development process, was highlighted.

Referring to the purpose of the present APAARI meeting, he urged the participants to focus on strategic concerns such as rural poverty alleviation, through increased productivity and environmental sustainability in defining regional research priorities. He hoped that, in formulating the Outline Action Plan, the Consultation will focus on substantive issues of research priorities as well as in identifying ways of institutionalizing the process of systematic involvement of the regional NARS fora in the TAC priority setting exercise. This, he added, is to ensure sustainability of the process by which the CGIAR agenda would become more NARS-driven and more responsive to the opportunities and constraints of the farming community.

Dr Michel Petit, Director, Agricultural Research, the World Bank, briefly described the renewal process of the CGIAR. He emphasized on the major changes in science and strategies taking place in recent years such as the revolution in biotechnology, informatics, expansion of research agenda, and the increasing role of NARS in priority setting in international agricultural research and participation in global research activities. He found the Consultation very timely in view of the recent meetings in New Delhi, Lucerne and Washington, which called for the creation/strengthening of regional and global fora in evolving mechanisms for strengthening partnership role of various actors within the world agricultural research. Dr Petit emphasized that both the NARS and CG system should be strengthened synergistically and that appropriate mechanisms of governance, priority setting mechanisms and the increasing role of regional fora in this process should be established.

Mr A.Z.M. Obaidullah Khan, in his Address, called for a participatory approach at all levels to include men and women farmers, extension systems, research systems and international organizations. Commenting on the association between scientists and farmers, he said that the relationship is generally one-way rather than two-way as it ought to be. He found that NARS in general, especially in Africa, were involved in field trials with CG Centres without any participation in the research design. He expressed his concern that over the years, the informed knowledge systems of country schools and farmers' fields, have been disjointed from the formal cultivated thoughts of higher schools, like national or international research systems.

While appreciating the tremendous impact of Green Revolution in Asia, Mr Khan pointed out that the Green Revolution technologies altered the environment to fit the high-yielding genotypes and that the focus has been

on commodities rather than systems. He pointed out the following second generation problems which must be solved to achieve sustainable growth:

- Waterlogging and salinization.
- Soil erosion.
- Surface and ground water contamination from agricultural chemicals.
- Resistance of insects, weeds and pathogens due to present methods of control using pesticides.
- Plateauing of yields.
- The irreversible loss of land races and habitats.

The other disturbing trends, he identified includes centralism, homogenization, consequent disempowerment of resource-poor farmers and dismantling of both biodiversity and cultural diversity. He desired that special attention should be paid to avert poverty, especially in the stressed and diverse areas of rainfed agriculture which comprise about 65% of Asian farm land. The distinctive knowledge of women in seed selection, preservation and ecosystem management should be appropriately harnessed.

As regards management of national and international research, the establishment of decentralized research efforts is perhaps a pre-requisite for reconstructing research procedures and decision making protocol of public and private sector research agencies. This is to ensure that the farmers can truly participate at every stage of the research and development process. Scientific issues, relevant to the aspirations of resource-poor farmers and communities, which cannot be addressed at the farmers' field level can constitute research agenda for Central Research Stations. National Research Systems, including local experimental stations can thus become skilled in helping to set the agenda for strategic research by international centres. The products of global research are then mobilized, modified and incorporated into locally specific knowledge and circumstances through the interface of national systems. With the increasing demand for natural resource sustainability on national research systems and the CGIAR, paralleled by the scarcity of funds for research, a stock-taking of the roles and complementarities of local, national and global research is needed. He emphasized institutional complementarities and collaboration and hoped that research development needs should have a moral and ethical basis of sharing human and nature's resources.

II. NARS - CGIAR PARTNERSHIP

This first working session of the Consultation was Chaired by Dr C. Bonte-Friedheim, Director-General of ISNAR. The Keynote Paper entitled "APAARI's Vision towards NARS-CGIAR Partnership" (Annexure-III) was presented by Dr R.S. Paroda, in his capacity as Executive Secretary of APAARI.

According to Dr Paroda, the Asia-Pacific Region has 56% of the world population (3.1 billion) and 70% of its farm households. Despite the Region's rich diversity of plant, animal and fish species, and even with the "Green Revolution" success in the mid-sixties which resulted in the high growth rate of cereals—wheat (3%), rice (2.3%) and maize (4.1%), it still has a large concentration of poor people (300 million, of which 200 million are in South Asia). With a current growth rate of 1.8%, the Region's population is expected to increase by another billion and reach 4.1 billion by 2010.

After citing some sixteen major success stories in improved technologies, Dr Paroda noted that most of these had taken place independently, mainly through national efforts, and though relevant, had often not been taken advantage of by others in the Region. This highlighted the distinct advantages to be gained by mutual co-operation through APAARI.

In discussing the key challenges, he noted that food production must increase by 2.5% per year, yet projected growth rates are decreasing due to little potential for area increase and the slowing of yield growth rates. About 60% of the poor farmers live in areas with fragile eco-systems, often causing further land degradation in the battle to achieve food security. Despite the need for a more sustainable agriculture with greater attention to better natural resource management, the over-riding need is still to increase productivity and production. These are critical concerns in developing the global agricultural research agenda. To meet the challenges on the ecological, global, climatic, economic, equity, social justice, energy and employment fronts, new technologies are needed.

The Paper then developed a Perspective Plan for APAARI that embodies the vision for nursing the Asia-Pacific Region to sustained growth, citing the key issues to be addressed : food security, diversification, sustainable natural resource management, global competitiveness, equity and social justice.

On NARS-CGIAR Partnership, the Paper states the need for :

- a resource tracking strategy needs to examine the proportion of resources being allocated to different programme themes and agro-ecoregions;

- institutionalization of regional fora consultative mechanism so that it becomes self-sustaining;
- closer collaboration between other centres and ISNAR on NARS institutional strengthening activities with each centre developing a monitoring policy on this activity;
- increased recognition of experimenters in the generation and evaluation of production technology, as tried in an Indian Project on Institution-Village Linkage Programme (IVLP);
- broadening/strengthening of the NARS in each country, with APAARI acting as the catalyst; and
- expansion of the benefit of using consortia approach.

The scope for regionalization was then emphasized. Dr Paroda recommended the specialization of some institutes in different research areas to make better use of scarce resources and the benefits from networking, and to better sensitize policy-makers. The overall programme has to be both NARS- as well as TAC-driven, rather than donor-driven.

Priority setting and a number of action points were then discussed, stressing that strong regional fora and networks are not possible with weak NARS. While moving upstream, the CG system should not lose sight of resource-poor farmers and the needs of the developing NARS.

Dr Paroda presented a comprehensive review of the strengths and weaknesses of the international agricultural research system. He cited a number of critical research problems still to be addressed. He pointed out the low attention being given by the CG to the strengthening of the research management system in Asia, and the slow pace of devolution of training. Despite examples of good networks, like INGER and CLAN, the agenda for co-operative research remains mainly donor-driven and in keeping with CG priorities only. While the CG has only limited funds and that not all expectations of the NARS can be met, it seems clear that much more could have been achieved if better institutional mechanisms for regional collaboration and priority setting were in place.

Dr Paroda further elaborated on the strengths and weaknesses of NARS emphasizing the need for strengthening NARS-CG Partnership is to follow a more "participatory" approach, in which each major stakeholder plays an important role. In broadening their membership, many NARS had not been able to provide teeth to their councils, internal funding support remained a major weakness and effective mechanisms for regional co-operation to gain the strength from each others' efforts and technologies generated are still

lacking. The distinct role of regional fora like APAARI and CG Centres like ISNAR in addressing these issues is quite evident. Linkages with Extension staff and farmers remain far too weak and again "top-down" rather than participatory, leading to a complete gap or a long time lag between technology generation and its adoption in farmers' fields. Priority setting remains a key problem and co-ordination at the institute level makes it difficult to organize truly multi-disciplinary research programmes. Much work has to be done in tapping the advances available from biotechnology. Stronger links with agri-business, NGOs and the private sector had been knowledge-intensive, location-specific and relatively costly in application, such that technology transfer would require more knowledge and higher management skills. Integrated management of resources is vital, and achieving food security to address hunger and poverty is the highest priority. Augmenting production, productivity and profitability of foodgrains and other key commodities remain major priorities while we move towards a more holistic eco-regional approach to achieve the required sustainability. The latter must not have precedence over the former in our enthusiasm for reprioritization.

After reviewing the issues to be given attention in adopting the eco-regional approach, Dr Paroda highlighted the need for the NARS to have a more effective understanding of natural resource management research. He also stressed the importance of socio-economic and public policy research to understand farmer and community decision making processes regarding resource utilization, farmers' incentives and likely adoption of improved technologies. He agreed that the most important end-product of the eco-regional approach is to provide a framework for sustainability. He welcomed the matrix mode for management involving an inter-disciplinary approach using decentralized consortia and networking methodologies, however, he stated that in reorienting research priorities, greater NARS participation is needed to address location-specific problems.

In briefly reviewing the IPGRI 2020 vision, he stressed the reorientation that would be needed, placing at the top of the list of policy changes, the need to invest more on research and extension and to increase farmer feedback in technology generation and dissemination process. For this and other required policy reorientation, he commented that the role of regional fora, such as APAARI, could be critical in influencing the policy decision-makers.

In efforts to strengthen national economies, and to alleviate poverty by adding value or employment at the farm level, research on processing, product development and value addition should get more attention. Special arrangements are needed for non-CG mandated cash crops, drawing on the NARS' experience and that more of the developed countries with such commodities.

Finally, a series of points were proposed for strengthening NARS-CG Partnership as well as a specific action plan for the role of APAARI in the Region to be pursued with adequate support from donors and effective linkages with the CG system :

- i. Required technical and funding support for the regional co-ordination activities such as, TAMNET, CLAN, UTFANET, FLCGNET, INGER, ITFOHR and other similarly networks.
- ii. Devolution and organization of the regional trainings, meetings and workshops, including PGR activities.
- iii. Institution and support to the regional publications such as Newsletters, Technical Reports, Success Stories, Case Studies, etc. Also, support for the establishment of a regional information network.
- iv. Development of the consortia approach for basic and strategic research, on a pilot scale to begin with in some highly relevant and priority areas.
- v. Effective representation of APAARI as well as NARS in the priority setting as well as governance of the CG system.
- vi. Support for undertaking/initiating/instituting collaborative research in the region, in areas not being pursued so far by the CG system, through involvement of other donors.
- vii. Jointly with CGIAR and other donors, strengthening of selected NARS to address their national needs, regional priorities and goals; policy guidance and technical support to the less developed NARS in their institution-capacity-building programmes.

It was made clear that much more can be achieved by effective regional collaboration among the NARS themselves, and between NARS and the CG centres. APAARI has a key role to play in meeting this objective.

III. ECO-REGIONAL AND REGIONAL COLLABORATIVE APPROACHES – CENTRES' INITIATIVES

Dr J. Ryan of ICRISAT opened this Session with a presentation of the genesis of the eco-regional approach, devised to meet the goals of improved sustainability, poverty alleviation and environmental conservation. The 1990 TAC "Expansion Paper" introduced the concept of a regionally defined agro-ecological zone, which could be assisted by research conducted in a holistic, integrated fashion through a multi-disciplinary approach. This approach was designed to meet concerns of widespread land degradation and better co-ordinated IARC's priorities with those of the NARS, reducing duplication. Following the Mid-Term Meeting (MTM) in 1993 , a new Eco-Regional Paper (ERP) was produced by TAC that set out a new definition of and guidelines

for, eco-regional programmes, with the combined objectives of restoring and enhancing improved natural resource management, increasing production and productivity, while alleviating poverty. The CG panel chaired by Dr Ndiritu presented a review at the 1995 Nairobi MTM. From that meeting, twelve initiatives are currently underway, such as the African Highlands, Alternatives to Slash and Burn, and Desert Margin initiatives.

Dr T. Reeves of CIMMYT then gave his Centre's review of eco-regional partnerships stressing the goal of achieving sustainable agriculture, and meeting the needed 2.5% increase per year in cereal production. This would need not only yield increases, but also greater efficiency in achieving them, through more effective use of water, sunlight and fertilizers, combined with better pest, disease and drought resistance. The need is to build on past achievements, under which 80% of increased wheat production in Asia has been developed by NARS with CIMMYT collaboration. The new rice/wheat initiative needs an agenda that is driven by farmers' needs. Research must address concerns on disease resistance, while much has to be done on integrated pest and weed management. New advances in biotechnology, information, GIS systems and crop modelling have to be harnessed; and the priorities for improved sustainability will only be achieved through improved co-operation, collaboration and integration. APAARI provides a key forum to further these objectives; there is a need to broaden membership by involving the universities, the private sector, NGOs and farmers' associations. CIMMYT remains both responsive and very willing to strengthen the partnership with NARS to achieve these goals.

Dr D. Seckler of IIMI welcomed the strengthening of APAARI and stressed the need for regular collaboration for it to operate effectively. IIMI was operating as a "virtual" institution that relies on its partners to carry out much of its work. It does this by using many methods to forge closer integration with NARS partners, by using one year seconded senior associates and part-time associates from NARS, together with country officers and by making full use of advances in electronic networking. He cited as an example, "precision irrigation" to increase water-use efficiency. This involves small scale water harvesting and groundwater recharge – a utilization technology, combined with precise delivery of water to meet the critical growth stages of the crop in rainfed agricultural areas. IIMI would like to collaborate with NARS and other CG Centres in the whole range of technologies from crop modelling to water harvesting and advanced irrigation systems, such as pumps, pipes, sprinklers and drip irrigation systems. These are important areas for collaborative research. A pilot project on Water Management has started at Chandanagar in Bihar in collaboration with an NGO run by Dr Swaminathan.

IIMI is very enthusiastic about APAARI and other regional consortia of NARS. APAARI provides IIMI an opportunity to work closely with many more NARS than would otherwise be the case. IIMI hopes to provide effective communication, through the dissemination of its publications, computer programmes and e-mail interchange with the NARS. IIMI, likewise, looks forward to guidance for its programmes and collaborative research in the region from APAARI.

Dr Ramanatha Rao of IPGRI discussed the role played by their networks in assisting countries with plant genetic resource conservation. He cited as example, the European Programme on Plant Genetic Resources and the Coconut Genetic Resources Programme funded by the ADB. He commented on the establishment of regional gene banks, and the good collaboration with INIBAP on the forestry sector in bamboo and rattan. IPGRI is interested to improve regional collaboration by working through APAARI. He suggested that APAARI should set up a Committee/Group on Plant Genetic Resources that IPGRI would work with. In response to a question from the Chairman, he said that the global plan of action is now ready and would be discussed at the forthcoming PGR World Conference to be held in June.

The final presentation of this Session was given by Dr K. Fischer and Dr Mahbub Hossain of IRRI. IRRI celebrated its 30th Anniversary last year and had produced 8,000 alumni in that period. Through close collaboration with NARS, they had a good understanding of regional needs to set realistic priorities, research programmes were jointly planned and implemented through increasingly successful partnerships. Dr Hossain then gave an overview of IRRI's 1992 initiative to address eco-regional research.

IRRI has been using the Geographic Information System (GIS) to develop a socio-economic data-base by Agro-Ecological Zones (AEZ) for Asia using sub-national level statistics (States and Provinces) for large countries. The data are being used for :

- | |
|---|
| <ul style="list-style-type: none">(a) ex-ante assessment of technology needs for productivity enhancement and management of natural resources; and(b) analysis of the trend in land-use pattern for identification of opportunities for eco-regional approach. |
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The analysis of the data shows that the progress of productivity growth in foodgrain production has been faster in sub-humid and humid sub-tropics than in the semi-arid regions and in the humid and sub-humid tropics. The sub-tropical regions have been able to increase foodgrain yield to more than 5.0 tonnes/ha, and per capita rice production to more than 350 kg/annum.

The incidence of poverty and malnutrition is also the lowest in these regions. However, these regions are increasingly faced by the problem of sustaining farmers' incentives in production growth due to the rising cost of labour and of maintaining the quality of the natural resource-base due to intensive cultivation and heavy dependence on agro-chemicals. These regions should, therefore, be given high priority in their natural resource management research.

The tropical eco-regions have been struggling to ensure adequate growth in staple grains to meet the needs of the growing population. The average grain yield is less than 2.5 tonnes/ha and per capita grain availability is around 259 kg/annum. Poverty and malnutrition is extensive, particularly in the sub-humid tropics. The potential for increasing production is large, as indicated by the relatively low pressure of population on arable land and low levels of development of irrigation facilities. With the movement towards liberalization of agricultural trade following GATT Agreements, there will be pressure on these regions to produce exportable surpluses for the middle and high-income countries of Asia. These eco-regions should be given high priority in the productivity enhancement research.

Dr K. Fischer concluded by discussing IRRI's mid-term plans which have been reviewed with NARS leaders. Several initiatives in devolution had already taken place : much of the training had been devolved to Thailand, India, the The Philippines and China; the flood-prone eco-system research to India and Thailand; and agricultural engineering research to India. Their two year joint work plan has been making considerable use of the strong NARS. At the policy level, Dr Fischer counts on the APAARI to assist with framing an overview council – the Council for Collaborative Rice Research in Asia (CORRA).

In the ensuing discussion, a number of points were raised. Dr V.L. Chopra of India enquired on the mechanisms and criteria used for identifying eco-regional research initiatives in the first place. Dr M.S.U. Chowdhury of Bangladesh welcomed Dr Paroda's paper, but asked what were the differences between partnership and leadership, convening centres and host centres and how regional eco-regions tie in with natural eco-regions. Dr Zafar Altaf of Pakistan queried that despite the excellence of work done in India, poverty alleviation remains a major problem. He then asked how we can couple increases in productivity with poverty alleviation. Dr Clements of ACIAR highlighted the problems raised by the other three speakers and commented that while there is much interaction between NARS and the CG Centres on the eco-regional programmes at the local level, the decision on ER selection had been made without much NARS input. Dr Paroda of India commented that APAARI can only effectively develop regional priorities, when each

NARS has set its own priorities, after which common priorities can be defined and then compared with those of the TAC. He also cited problems India had on lentils that ICARDA could not help out without more donor support. He also asked why ILRI was working mainly on Africa, despite livestock being so important in Asia. He also wanted CG Centres to continue laying greater emphasis to PGR activities, information dissemination and agricultural human resource development activities and more research support in biotechnology, hybrid research and commodities, such as soybean and vegetables.

Dr C. Bonte-Friedheim, in summing up, cited a number of issues that had emerged from the discussions :

- There is a need for priority setting, but this has to start at the national level. In aggregating priorities, we have to look at each country's resources.
- Basically, CG Centres have the same financial resources with little prospect of additional funding, hence, if we do more on one priority, we have to decide where to do less elsewhere.
- It has to be remembered that IARC's work is on international public good and cannot work on a "good" that concerns only one nation; but a much excellent regional collaboration or collaboration with advanced institutes in the developing countries takes place outside the CG (especially, of course on non-CG mandated crops).
- Almost all the IARCs have programmes in Asia.
- There appears to remain key questions on the eco-regional approach. The NARS and IARCs together with the TAC and the donors have to work more on this issue.

IV. STRENGTHENING AND SUSTAINING REGIONAL NARS ASSOCIATIONS, NETWORKS AND PROGRAMMES

This session was chaired by Dr Paroda. The first speaker was Dr Stein W. Bie of FAO, who discussed the background of FAO-sponsored Regional Associations and Regional Representatives. With regard to regional representatives, it has to be remembered that these are chosen at FAO convened Regional Ministerial Conferences every two years. The regions elect them from a short list, provided by member countries. However, when selected, these regional representatives rarely get funding support from the member countries to enable them to be operationally effective in representing the views of regional colleagues. The system has justifiably been criticised but no

better method has yet been provided. FAO is, however, very willing to listen to other alternative suggestions, and would like to have a recommendation from APAARI.

FAO has been very pleased to facilitate the work of regional fora if and when requested, as it has been doing, but the fora should always be fully controlled by their members. It also very much welcomes the strengthening of the regional fora, and encourages each one to develop a model that suits it best; there is no need for standardization, when both needs and cultures are so diverse.

Dr Abrol of ICRISAT then commented on the Rice-Wheat Consortium for the Indo-Gangetic Plain which is an eco-regional approach in cropping system mode. It has been going on for 15 months and is a collaborative programme involving four NARS – Pakistan, India, Nepal and Bangladesh; four IARCs – ICRISAT, IRRI, CIMMYT and IIMI; and three others – ACIAR, IBSRAM and Cornell University. The key goal is the enhanced productivity and sustainability of the major cropping system. It lies in a very productive region, which was a key area in the Green Revolution, and remains important though facing declining productivity that needs to be reutilized. The partners have a common goal, and can achieve more together by complimenting their varying strengths and weaknesses in a cost-effective manner. It has a Regional Steering Committee to oversee its operation, and a Facilitating Unit to provide support services. It is considered to be a very good model for replication elsewhere and it has achieved much through its judicious use of diagnostic workshops, multi-disciplinary teams, improved linkages, training of NARS staff and better sensitizing the IARCs.

Dr Nene of ICRISAT then described the CLAN. This Cereals and Legumes Asia Network was established in 1992 to serve as a research and technology exchange network for all the ICRISAT mandated crops: sorghum, millet, chickpea, pigeonpea and groundnut. The specific objectives are to strengthen linkages and enhance exchange of germplasm, breeding material, information and technology options among members. Also it:

- facilitates collaborative research among members to address and solve high priority production constraints giving attention to poverty and equity issues as per needs and priorities of member countries;
- assists in improving the research and extension capability of member countries through human resource development;
- enhances co-ordination of regional research on sorghum, pearl-millet, chickpea, pigeon pea and groundnut; and

- contributes to the development of stable and sustainable production systems through a responsive research capability in member countries.

The network operates through Memoranda of Understanding (MoUs) between ICRISAT and member countries, and is founded on the strong links between their respective scientists. In each country a senior scientist is appointed as Country Co-ordinator. Network activities include germplasm and information exchange, training and collaborative research based on working groups and special projects. Collaboration with ICARDA is being built on lentils, and most funding comes from the member countries, with some support from ICRISAT, ACIAR, ADB, FAO and the Peanut CRSP. ICRISAT presently hosts the network, but seeks APAARI's assistance to make it a fully NARS-driven network.

Dr N.N. Singh of India then described the TAMNET Network, which is a NARS-driven initiative on maize, bringing together several NARS, FAO and CIMMYT. The network was set-up in 1993, and grew out of the former Asian Maize Network of FAO in Thailand. It harnesses the advances with maize hybrids from China, Thailand and Vietnam and is combating both biotic and abiotic stress factors on the research side and the gap between technology generation and adoption on the dissemination side. Its objectives are sharing information and co-ordinating release of germplasm, and it has its own newsletter. It is now drawing support from the private sector and moving into post-harvest technologies to add value and increase incomes at the farm level. While some finance, administrative support and training are given by FAO and CIMMYT, the aim is for the NARS to run the network by itself completely.

The final paper of this Session was given by Dr Fischer on IRRI's concept for a Council for Collaborative Rice Research in Asia (CORRA). The rationale for this is based on the fact that 90% of the world's rice is grown and consumed in Asia, and yields have to be increased to combat both population growth and land degradation. IRRI and the NARS are already effectively collaborating with two consortia on Lowland and Upland Rice, and several networks, including INGER, IPMNET, CREMNET, ARBN and SARP; there are steering committees for each of these. To enhance the effectiveness of the various collaborative mechanisms being employed in meeting the challenges of the global rice research system, CORRA has been proposed. The Council's specific objectives are :

- To promote more effective collaborative rice research in the Asian region, and guide formulation and sharing of responsibility in its implementation.

- To guide and promote strong partnership between NARS, IRRI, and other IARCs and among NARS, to strengthen established mechanisms, such as research consortia and networks; to promote new initiatives, as appropriate; and to seek donors' support for the collaborative activities.
- To harmonize NARS view and provide feedback to IRRI in particular, and to the CGIAR in general, on agricultural research needs of the Asian region.
- To develop concepts for an eco-regional approach to research in rice and rice-based farming systems relevant to the Asian region.
- To facilitate linkages with advanced institutions conducting relevant research.

It is proposed that the Council, consisting of senior officials of selected NARS in Asia and the IRRI Director-General, should meet once annually for a two-day period. The role of the council vis-a-vis the IRRI Board of Trustees is spelt out in the proposal. APAARI is asked to comment on the proposal at its meeting on February 3, 1996, as IRRI wants to make a decision on setting up the Council before they commence their new Six-Year Plan in March 1996.

Dr Dar of The Philippines asked if all the Centres agree with IRRI in having such a Council. Dr Reeves of CIMMYT said it depends on the intensity of the activity and whether another such layer is needed. It seemed evident that in IRRI's case, the concept of a Council is a useful suggestion, and it was endorsed by several speakers. However, Dr Bonte-Friedheim cautioned that all 16 IARCs could not have Councils that placed a two-day demand each year on Research Directors. APAARI members, however, endorsed the idea of forming the Council by IRRI.

In his concluding remarks, Dr Paroda emphasized the importance of regional networks involving NARS and CG Centres, where APAARI could be actively involved. These networks should be sustainable and not donor-driven; CG Centres and APAARI should play a catalytic role by providing need-based support and facilitation role. TAMNET is a good example involving NARS, FAO, CIMMYT and APAARI. Also, the initiative of IRRI to establish a Council is a good mechanism by which effective participation/involvement of NARS leaders in Centres' priority setting process could be ensured. CLAN could be integrated with FLCGNET and the involvement of ICARDA for support to lentil would be a welcome step. APAARI and CG Centres should work more closely in future to strengthen these networks to address various needs of NARS in the Asia-Pacific region. For Pacific nations, a clear need

for the Roots and Tuber Crops Network is evident and could be considered as NARS priority by CG Centres.

V. CGIAR - TAC PRIORITY SETTING – NARS VISION

Dr William D. Dar, Executive Director, PCARRD, The Philippines and Chairman of APAARI, chaired this Session. Dr Stein Bie of FAO and Dr R.B. Singh of India served as Facilitators. The various NARS leaders made topical interventions/presentations.

Dr Singh introduced the NARS vision on priority setting and mentioned that the NARS generally set their priorities at five levels, namely, national level, the concerned Ministry level, the level of the Apex Body of the NARS, the national agricultural research institution level and the programme level. Referring to the congruence between the priority setting mechanisms in the CG system and in the NARS, he emphasized that the NARS and the CG system should be in a position to interact at all the levels. He also referred to the congruence between the concerns of the CGIAR and NARS, such as poverty alleviation, environmental protection, sustainability, productivity and food security. Dr Singh suggested that the importance of the various elements and considerations will vary from country to country and from eco-region to eco-region. Therefore, while the NARS should be strengthened to be able to identify their topical priorities, appropriate mechanisms should exist at regional and international levels to identify the commonalities of problems and opportunities for setting the regional/international research agenda.

Dr Singh mentioned that APAARI for agriculture and other such regional associations for forestry, fisheries and livestock exist in the region and should provide the necessary fora for linking NARS with the CG system. He gave a few examples of NARS-led priorities which have now been accepted in the CG programme (rice-wheat system, hybrid rice, single cross maize hybrids) and also suggested new priorities such as soybean, vegetables, prevention of post-harvest losses, biotechnology and human resource development to find place in the CG agenda. Dr Singh also asked questions which needed to be answered while preparing the Action Plan for strengthening NARS/CGIAR Partnership. These were :

- whose research priorities ?
- how to develop research priorities ?
- who are the main actors : NARS, CG, International Organizations or Donors ?
- how to organize research and HRD ?
- how to devolve?, how to sustain APAARI and Regional Networks?, and
- how to finance?

From the presentations by the participating NARS leaders, as members of APAARI and based on the detailed discussions, the following recommendations and suggestions which should receive greater attention while preparing the Action Plan for NARS-CGIAR Partnership emerged:

- Considering that the largest number of poor and malnourished people are concentrated in the Asia-Pacific Region, specially in South Asia, where there is a decline in the arable land availability, and the increasing problems of environmental degradation, this region must be given highest priority by the CG system in view of its concern for poverty, food and environment.
- In most of the countries, production, productivity and profitability would be the highest consideration, though other aspects such as, environmental protection and sustainability should not be disregarded. In fact, there is a need to have an appropriate balance between the productivity and sustainability.
- The priority setting process by the TAC needs to be improved further with greater transparency. The active involvement of the NARS directly or through regional forum in TAC priority setting process is envisioned. The NARS should also be properly represented in the TAC and other technical committees of the IARCs, and in other important decision making bodies of the CGIAR and its Centres.
- It also has to be recognized that NARS priorities are set in a wider context than that of the CG, and hence the overall NARS priorities should be considered while setting the CG agenda.
- Keeping in mind the plurality of the constitution of NARS in different countries, there is a need to clearly define NARS and its comparative advantages vis-a-vis the CG system for both priority setting and joint research activities in a partnership mode.
- Greater attention was needed to strengthen the NARS in their research management capability, specially in monitoring and evaluation. ISNAR's more effective role in this regard in the Asia-Pacific Region cannot be over-emphasized.
- Greater attention by the CG Centres is needed in newly emerging areas such as biotechnology, crop modelling, environmental science, GIS research, IPM, etc. The CGIAR Centres should concentrate on public goods and knowledge in advancing areas and share them with NARS.

- The CG system should give greater attention to the information management and sharing with NARS and must consider the need for further strengthening this work on genetic resources and training programmes.
- Greater emphasis in future be given to macro-economic and policy related issues in priority setting.
- The NARS as well as the IARCs must aim for greater efficiency in their R&D activities through effective partnership and complementary role.
- The countries in the region vary considerably in terms of their size, human resources, level of research and development, etc. Specific needs of the different groups of countries will have to be kept in mind while setting the priorities. For instance, the Pacific Island countries have distinctively different commodities, human and natural resources; they require specific attention to address their problems and capture uncommon capabilities for taro and other root and tuber crops; banana and coconut need to be particularly strengthened in these countries. Similarly, distinct need for research support in soybean, vegetable crops, cotton, animal science, fishery and agro-forestry is acutely being felt.
- Bilateral co-operation based on complementarity and comparative advantage should be promoted for addressing specific problems of concerned countries. Due recognition by CG Centres for NARS contribution in terms of institutional and human resources, besides local funding support, is necessary for effective and sustainable partnership in the future.

VI. APAARI'S RECOMMENDATIONS ON INTERACTIONS BETWEEN THE NARS AND THE CGIAR AND ON IARC PRIORITIES IN THE ASIA-PACIFIC REGION

The Consultation concluded with the adoption of the following recommendations by APAARI in the Plenary Session chaired by Dr Michel Petit and Capt. Ayub Khan, Minister of State for Agriculture, Government of India as the Chief Guest:

1. APAARI believes that the NARS should make a greater input to CGIAR priority-setting, and that APAARI can provide a suitable forum at which member countries in the Asia-Pacific region can develop a shared view on regional priorities for consideration by the CGIAR. Currently, APAARI

is largely a forum of public institutions (NARIs), whereas there are opportunities to expand its membership to NGOs, universities and private sector institutions, as well as other fora covering forestry and fishery sectors. It is a well established and financially secure association of 18 member countries, with membership expanding steadily.

2. An excellent APAARI Vision Statement, prepared by the APAARI Secretariat, which was later adopted by the Executive Committee, reflects the overall views of the Association. This document, together with information from other APAARI-approved studies, formed the background for the discussions at the APAARI meeting on February 1-3, 1996.
3. APAARI endorses three major objectives of the CGIAR for agricultural research within the Asia-Pacific region:

- | |
|---|
| <ul style="list-style-type: none">● Alleviating poverty.● Enhancing food security.● Sustaining the resource base. |
|---|

APAARI recognized the imperative to alleviate poverty and enhance food security by maintaining the rate of improvement in sustainable agricultural production within the region.

4. APAARI believes that the capacity to alleviate poverty and enhance food security through research is greater in the Asia-Pacific region than in other parts of the developing world, because of the considerable strength of the NARS (including research agencies and NGOs). APAARI also notes the potential for significant spillover benefits from research in the Asia-Pacific region to other regions. APAARI argues, therefore, that the Asia-Pacific region may deserve a greater share of CGIAR resources.
5. In considering priorities, APAARI has found it helpful to categorize activities as follows:

- | |
|--|
| <ul style="list-style-type: none">● Tasks of importance to all (or nearly all) APAARI members.● Tasks of importance to some but not all APAARI members.● Special tasks of importance for only one or a few APAARI members. |
|--|

6. APAARI recognizes the need for stability in research priorities, particularly those common to all member countries and those relating to

staple food crops. Frequent changes in research priority setting process by the TAC is viewed with some concern and APAARI would, therefore, prefer gradual evolutionary process involving proper consultation mechanism with NARS and their Regional Fora.

- Research on agro-biodiversity and on the conservation, enhancement, distribution and use of genetic resources is of central importance to all the member countries. The CGIAR System is well-placed to strengthen research capabilities on these issues at both the national and regional levels and funding support to these activities should be enhanced and made sustainable in future.
- APAARI has already recognized the importance of network programmes in the region, as per its Perspective Plan, and reaffirmed the establishment of relevant networks on a sustainable basis in partnership with CGIAR and other donors. These networks have distinct advantage of sharing information, experiences, materials and technologies for greater benefit to participating countries. APAARI endorses that such networks be prioritized in consultation with NARS and strategies be devised jointly by APAARI and CGIAR for required technical and funding support on a sustainable basis.
- The IARCs can play a major role in promoting and facilitating the information flow among and within the NARS and the IARCs. The NARS have access to valuable ethnic knowledge which could be shared, particularly if better mechanisms for information flow could be developed. Information networks will, obviously, play increasingly important roles in the planning and execution of research, and in the dissemination of results. APAARI will encourage the acquisition and use of such information systems. While the organization of telecommunication structures is beyond the scope of APAARI, the methodologies and organization of information exchange fall within APAARI's mandate, and are seen to be high priority tasks. CGIAR experience is highly relevant, and in particular, ISNAR could play a supportive role by making its information resources available to APAARI and its member countries.
- Biotechnology will clearly play an important role in the agricultural research in the future, and the NARS currently are not all well-placed to benefit from the advances that are often made in the commercial or university sectors. CGIAR Centres need to move forward in this regard to meet the expectations of the NARS by expanding this area of research, and several issues relating to

intellectual property rights need to be resolved.

- APAARI recognizes the need for a continued emphasis on human resource development in the region and the specific contribution that could be made by the IARCs, particularly in relation to training in areas of high technology.

APAARI urges the TAC to continue giving high priority to this specific need. Human resources from the developed countries within and outside the region and from strong NARS could be utilized to achieve this goal.

7. APAARI believes that well-focussed research on some of the important commodities/species of the region such as soybean, vegetable crops, cotton and animal/fish research would benefit farmers in the Asian region and would promote all the major CGIAR objectives, provided that suitable technologies are made available by the CGIAR.
8. APAARI also believes that research on root and tuber crops, especially for the Pacific countries require strong support from the CG Centres, including institutional and research management support from ISNAR.
9. Similarly, a research effort on under-utilized fruit trees from the region might be considered. The region is rich in such indigenous trees, and there would be significant spillover benefits to other regions, as well as for nutritional security, conservation of these resources and the generation of employment and income of the poor farmers.
10. APAARI recognizes the importance of eco-regional and system-wise research initiatives, each of which may be relevant to some, but not all the member countries. We note the portfolio of such existing and planned initiatives, and emphasizes the key role of the NARS in their development and effective implementation. In recognizing the need for greater involvement of the NARS in identifying and prioritizing such initiatives both individually and collectively through regional fora such as APAARI, we also note the difficulty that NARS from small island countries have in providing required input to this process. We also note the need for greater involvement of social scientists in identifying and implementing such eco-regional initiatives.
11. Eco-regional and system-wide initiatives impose significant cost burdens on the NARS, because scarce national research resources must be allocated to such initiatives, if they are to be effective. There is an opportunity cost associated with them, if resources are diverted from other activities. APAARI notes that such opportunity costs will be minimized as the NARS becomes more actively involved in identifying and

prioritizing these initiatives. This is so because the initiatives will then be more closely aligned to the priorities of the NARS. Hence, efforts are needed jointly by the NARS and CGIAR to put consultative mechanisms for priority setting in place by the effective involvement of regional forum such as APAARI. The Rice-Wheat Initiative provides a good model for the development of an eco-regional initiative in line with national research priorities. Similar initiatives could be developed for other similarly placed eco-regional priorities in the region. Such initiatives might address, for example, resource degradation in intensively cropped areas, or issues relating to root and tuber crops, or soybean based or cotton-based cropping systems. Research on cotton falls outside the scope of the CGIAR, yet cotton is a component of farming systems in which CGIAR mandate crops are utilized. Closer co-operation in a strong regional thrust involving APAARI and the CGIAR might yield valuable advances in applications of biotechnology or Integrated Pest Management.

12. APAARI recognizes the need for continued improvement in the framework and criteria for allocating resources to research priorities, both by the CGIAR and by the NARS. APAARI notes the need for enhanced determination of national research priorities by the NARS and the need to translate these into the regional priorities. The appropriate methodologies could accelerate and facilitate these processes, where ISNAR could play an important role in partnership with APAARI.
13. APAARI also appreciates the support to its activities by CGIAR, FAO, World Bank and IFAD and reaffirms the need for similar continued support from these organizations and other donors, including ACIAR in the region, for sustained priority setting mechanism and needed collaboration for the regional programmes.

**ASIA-PACIFIC ASSOCIATION OF AGRICULTURAL RESEARCH
INSTITUTIONS (APAARI)**

**CONSULTATION ON NARS-CGIAR PARTNERSHIP
(CO-SPONSORED BY ICAR, FAO, IFAD & ISNAR)**

February 1-2, 1996 at IARI Library Conference Hall
New Delhi 110 012, India

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PROGRAMME

February 1, 1996 (Thursday)

Inaugural Session

- Chairman** : **A.Z.M. Obaidullah Khan**
Assistant Director-General, FAO-RAPA
- 0900-1000 **Welcome** : R.S. Paroda, APAARI/ICAR
Peter Rosenegger, FAO
Representative
- Statements** : Stein Bie, FAO
C. Bonte-Friedheim, ISNAR
S. Mathur, IFAD
- Renewal of the
CGIAR and Asian
Agriculture** : A Message by Chairman, CGIAR -
presented by Michel Petit
- Chairman's Remarks** : A.Z.M. Obaidullah Khan
- Vote of Thanks** : R.B. Singh, IARI
- 1000-1030 **Coffee/Tea Break**

**SESSION - I
NARS - CGIAR PARTNERSHIP**

- 1030-1300 **Chairman : C. Bonte-Friedheim**
Director-General, ISNAR
- 1030-1100 **APAARI's Vision towards NARS-CGIAR
Partnership** : R.S. Paroda, APAARI/ICAR

**Eco-Regional and Regional Collaborative Approaches
- Centres' Initiatives**

- 1100-1120 Dr James G. Ryan, ICRISAT
1120-1140 T. Reeves, CIMMYT
1140-1210 Ken Fischer, IRRI
M. Hossain, IRRI
1210-1230 David Seckler, IIMI
1230-1245 Ramanatha Rao, IPGRI
1245-1300 Discussion
1300-1400 **Lunch at IARI, New Delhi**

**SESSION - II
STRENGTHENING AND SUSTAINING OF REGIONAL NARS
ASSOCIATIONS/NETWORKS AND PROGRAMMES**

Chairman : R.S. Paroda
Director-General, ICAR
India

- 1400-1415 FAO Sponsored Regional Associations and Regional Representation Stein W. Bie, FAO
1415-1430 Rice-Wheat - a Case Study I.P. Abrol, ICRISAT
1430-1445 CLAN - a CG Network Y.L. Nene, ICRISAT
1445-1500 TAMNET - a NARS driven initiative N.N. Singh, India
1500-1515 A Concept for the Collaborative Rice Research in Asia (CORRA) Kenneth Fischer, IRRI
1515-1530 Discussion
1530-1600 **Coffee/Tea Break**

**SESSION - III
CGIAR-TAC PRIORITY SETTING: NARS VISION**

Chairman : William D. Dar
Executive Director, PCARRD
The Philippines

Facilitator : R.B. Singh
Director, IARI, India

- 1600-1620 TAC and NARS led CG Priorities: R.B. Singh
1620-1800 Asian NARS Views on the Priorities
- A Round Table Discussion for views of the NARS leaders.
1930 Dinner Hosted by FAO Representative in India & Bhutan (Hotel Meridien)

February 2, 1996 (Friday)

**SESSION - IV
WORKING GROUPS**

0900-1300 **Working Group A**

Action Plan for Strengthening NARS-CGIAR
Partnership with Focus on Regional Collaboration

Chairman : Robert John Clements

Director, ACIAR
Australia

Working Group B

Mechanisms for Strengthening and Sustaining of
Regional Associations and Networks

Chairman : Stein W. Bie

Director (Sustainable Agric. Div.), FAO

1030-1100 **Coffee/Tea Break**

1300-1400 **Lunch**

1400-1530 Joint Discussion between Group A and Group B

February 2, 1996 (Friday)

PLENARY SESSION

1600-1730

Chief Guest : Capt. Ayub Khan

Minister of State for Agriculture, India

Chairman : Michel Petit

Director (Agricultural Research), World Bank

* Presentation of the Report of the Technical Sessions

* Presentation of the Recommendations of Working
Groups A and B

* Address by Chief Guest : Hon'ble Capt. Ayub Khan

* Chairman's Remarks : Michel Petit

* Vote of Thanks : S. Mathur

1930

**Dinner Hosted by Minister of State for Agriculture,
India (Hotel Ashoka)**

**THE APAARI VISION TOWARDS
NARS-CGIAR PARTNERSHIP¹**

R.S. Paroda
*Executive Secretary, APAARI
Secretary (DARE) & DG, ICAR
Ministry of Agriculture
Government of India
New Delhi*

¹Paper presented for the IFAD initiative on building NARS-CGIAR partnership in APAARI meeting held on February 1-2, 1996 at New Delhi, India

- I. The Regional Scenario
- II. Significant Technological Developments
- III. Future Challenges
- IV. Eco-Regional Approach – A New Paradigm
- V. IFPRI Vision 2020 – Key Policy Issues
- VI. Agricultural Research Systems
 - i) International Agricultural Research System
 - ii) National Agricultural Research System
- VII. APAARI in Perspective
- VIII. NARS-CGIAR Partnership – The Need
- IX. Scope for Regionalization
- X. Priority Setting and Action Points
- XI. Conclusion

I. THE REGIONAL SCENARIO

In Asia and the Pacific, 56% of the world's population (3.1 billion) and 70% of the world's farming households live on less than 30% of the global agricultural land. The region presently consists of 30 countries, of which Japan, Australia, New Zealand, Singapore and South Korea are being considered as developed, whereas majority of others are still in the category of developing countries.

2. The region possesses a rich diversity of several useful species of plants, animals and fish. Two of the world's four cradles of agriculture are also from this region. Large variability exists for important crops such as rice, soybean, pigeonpea, cotton, sugarcane, jute, maize, egg plant, citrus, banana, and a number of coarse cereals, pseudo-cereals, *Vigna* species, a number of spices and medicinal and aromatic plants. Similarly, best breeds of cattle, buffalo, sheep, goat and a variety of fish species have originated and evolved in the Asia-Pacific region.
3. About 75% of the cropped area in the region is rainfed and situations of drought and floods are the common features. This region has almost 50% of the developing world's irrigation potential. Also this region receives maximum of precipitation compared to the rest of the world.
4. "Green Revolution" was witnessed in Asia during the mid-sixties – thanks to the resilience and creativity of the farmers supported appropriately by the cutting edge of science. Over the last three decades, the region has decisively shed the stigma of "basket case" status.
5. Agriculturally, this region is the most vibrant as it has witnessed higher growth rates for foodgrains such as wheat (3%), rice (2.3%) and maize (4.1%) compared to other regions of the world. Also spectacular growth rates have been noticed for the crops such as cotton, sugarcane, soybean, rapeseed-mustard, oilpalm, potato, fruits, etc. About 77% of the world's aquaculture products come from this region.
6. In spite of such successes, the region is having a large concentration of impoverished people (around 300 million), of which almost 200 million are in South Asia alone. Present population growth rate is about 1.8% and the region's population is expected to reach 4.1 billion by the year 2010. Also eight of the world's 15 megacities are located in the region, where maximum of urban poverty is concentrated.

II. SIGNIFICANT TECHNOLOGICAL DEVELOPMENTS

7. In the field of agricultural research, the region has made a number of significant technological developments, specially in the past three decades, both through individual national efforts and also through required collaboration with the International Agricultural Research Centres (IARCs), under the aegis of the Consultative Group on International Agricultural Research (CGIAR).
8. One of the most spectacular achievements of the region had been both in wheat and rice, mainly in South Asia, as a result of large scale adoption of dwarf wheat and rice varieties evolved initially at CIMMYT and IRRI, respectively. Contributions from National Agricultural Research Systems (NARS) had also been equally praiseworthy in refining and adopting the new technologies, needing higher production inputs. Since then, impressive growth rates for both the crops have been registered implying thereby the inbuilt resilience of the national agricultural research systems.
9. Simultaneously, NARS individually came out with a number of improved technologies that enabled them to accelerate their agricultural growth. Some of the success stories in the region are: (i) hybrid rice in China covering almost 18 million ha (54%) of area under rice and contributing around 65% of total rice production; (ii) oilpalm research in Malaysia giving around 6 tonnes/ha of oil yield based on genetically improved materials, thus becoming number one in palm oil production and export in the world; (iii) single cross hybrids in maize in China giving on an average 5.0 tonnes/ha. of yield at the national level and accounting for almost 80% coverage under improved hybrids; (iv) hybrid cotton covering an area of 2.7 million ha (36.0% of total) in India, thus making export of long staple cotton possible while also resulting in self-sufficiency; (v) high-yielding, short-duration and disease-resistant hybrids of sorghum and pearl millet and also of castor and pigeonpea in India; (vi) evolving of most productive rice-wheat system in China, India, Pakistan, Bangladesh and Nepal, covering an area of 22.5 million ha; (vii) evolving of baby corn hybrids and varieties in Thailand resulting in higher production and export; (viii) success of transplanted maize immediately after rice in north Vietnam; (ix) integrated pest management strategy in Indonesia leading to 50% reduction in pesticides and 15% increase in yield; (x) production and export of tissue cultured orchids on a large scale in Thailand and Singapore; (xi) promoting a number of high-yielding vegetable hybrids (especially cabbage) in South Korea; (xii) production of Tilapia fish in The Philippines and China; (xiii) dairy technology in India resulting in 64

million tonnes of milk, next only to the USA, largely based on improved management of local cattle and buffalo breeds and also through cross-breeding programme; (xiv) soybean production technology in China, Thailand, South Korea and in last one decade in India where area has increased to about 4.0 million ha with annual increase of about 50,000 ha; (xv) increased production of cotton in Pakistan through improved varieties possessing genes for salt tolerance and earliness; and (xvi) evolving of true potato seed (TPS) technology and its adoption in India, etc.

10. As is apparent, these developments have taken place independently to a greater extent, mainly on account of national efforts, priorities and support. Many of these have great relevance for others in the region. Somehow, logical benefits have not reached others for either want of information or for want of effective collaborative mechanism. It is, however, evident that through mutual co-operation, much significant advancements could be made in the field of agriculture in the Asia-Pacific region.

III. FUTURE CHALLENGES

11. The world average of agricultural growth rate during 1980–91 was 2.6%. The estimated population of 5.35 billion in 1991, with life expectancy of 66 years, is believed to bring resources under further pressure for food, as the projections of world population stand at 6.17 and 8.35 billion by 2000 and 2025 AD, respectively.
12. Presently, 800 million people, i.e. every fifth person in the developing world and 15% of the total world population are insecure on food front. The insecurity has declined from 950 million in 1970 to 250 million primarily due to 50% reduction in the number of food insecure people in East Asia. Even the optimistic projections for 2020 AD indicate that about 100 million pre-school children would be protein-energy malnourished. More than half of the world's protein-energy malnutrition problem is in South Asia where 46% children are estimated to remain malnourished by 2020 AD despite increase in production, growth in income and reduction in population growth rate.
13. Income levels and rates of growth vary considerably across developing countries. In 1982, per caput income in Low-Income Developing Countries was 18% of those in middle-income developing countries and 3% of those in developed countries. In 1992, it dropped to 16% and 2% respectively, reflecting an increase in inequality. The widening gap between rich and poor is further illustrated by a dramatic decrease in the share of global incomes for the poorest 20% of the world's population, from 2.5% in 1960 to 1.3% in 1990.

14. The world production of cereals, which is a staple food, has shown a compound growth rate of 3.9% during 1966-90. Although, developed economies produced bulk of the world cereals, their share decreased from 54% in 1966 to 46% in 1990. However, Asia's share in production of cereals increased from 33% in 1966 to 41% in 1990. By this time, about 136 million ha of land was under irrigation which accounted for 78% of the total irrigated area in all developing countries of the world.
15. Rice, which is one of the important food crops in the region, is cultivated in 148 million ha which is over 10% of the earth's arable land. Globally the average rice yield has increased by 72% and production has doubled since 1966. Improved rice varieties are now grown in 70% rice land in Asia, and 37% in Latin America and the Caribbean countries. Asia cultivates 90% of the world's rice, and shares 92% of the production of 520 million tonnes of unmilled rough rice. Globally, rice consuming population is growing at the rate of 2% per annum. In Asia, where rice is a staple food, population is expected to increase by 18% during the nineties and by 58% over the next 30 Years. The world projection indicates the need of rice of about 760 million tonnes in 2025 AD, i.e. 70% more than what is consumed today. Incidentally, poverty and rice cultivation are somehow positively correlated in South Asia, where poverty is extensive and the rice demand is expected to be doubled in the next 40 years. Hopefully, this trend would get reversed in the future.
16. Projected growth rates for foodgrains production in the region are less than those recorded during the 1980s. This is mainly due to little increase in the area planted and a reduced growth rate in the yields. The advances of the "Green Revolution", so pronounced during the past, have also slowed. There is also a growing concern for the food security, which has three main aspects: the supply of food, the stability of supplies, and the access of people to the food. The supply of food largely depends on the prospects of domestic production and the volume of imports, taking into account the economic constraints prevailing in a country.
17. The countries of the South Asia are among the poorest and the most populous in the world. Roughly, one billion people in the region rely on locally produced rice and wheat for most of their daily calories. Food production must increase in the region by at least 2.5% each year to meet the demand of the growing population at the rate of 1.8% and also in view of its rising income and with a view to overcome the problem of undernutrition.

18. Assistance to production will be needed to improve the yields of food crops, while maintaining or improving the ecological balance, rehabilitation of degraded soils, and strengthening the inadequate agricultural infrastructure. The majority of poor farmers in Asia (60%) live in areas representing fragile eco-systems. Poverty and environmental degradation often interact in a manner that causes a downward spiral of greater poverty and food insecurity leading to further environmental damage. Unfortunately, at abject levels of poverty, often people are compelled to destroy resources for their survival.
19. According to the International Food Policy Research Institute (IFPRI), Asia including China would be needing additional 185 million tonnes of rice and 76 million tonnes of wheat per annum. Also this region is expected to import about 44.4 million tonnes of wheat and 3.5 million tonnes of rice by 2000 AD, which would be about 11.5 million tonnes higher than the present import figures. It is, however, argued that these estimates are based on the presumption that dependence on foodgrains would continue at the same level, as at present. On the contrary, significant shifts in food habits are taking place due to increased production and availability of fruits, vegetables, milk, egg, meat, fish, etc. Hence, these projections would obviously require a more rationale view by the concerned NARS in the region to evolve appropriate strategies.
20. Due to the expected shortfall in global production of wheat in 2000 AD, prices would probably rise, imports would fall by over 5 million tonnes and, all other things being equal, total cereal consumption would fall by about 0.2%. The fall in wheat consumption would be greater, i.e. about 0.9%. A bumper global level of grain production in 2000 AD would have little impact on the developing countries. That is because lower prices would lead to much of the surplus being used for animal feed in the developed countries. Substantial growth in the demand for meat and fats and oils is expected to occur in Asia, compared to other regions of the world. There should be more growth in the demand for pulses and milk, relatively slow growth for cereals and a decline in per capita demand for roots and tubers.
21. An FAO study indicates that the trade in agricultural products would increase if there was 1.0% higher growth in incomes in the developing countries, their cereal consumption would increase by 20 million tonnes with net imports rising by 8 million tonnes in 2000 AD. Raising food production output in the developing countries is, therefore, a key priority which must be addressed appropriately. This key issue should somehow not be lost sight of in our present concern and over-enthusiasm for sustainable agriculture.

22. The unprecedented increase in agricultural production during the past 25 years or so was coupled with important policy planning and research and technology development transformations. Towards the year 2000 AD and beyond, agricultural development in the region would be guided not only by the compulsion of improving food and nutritional security, but also by the concerns for environmental protection, sustainability and profitability. Following the GATT Agreement and the liberalization process, globalization of markets would call for competitiveness and efficiency of our agricultural production systems. Therefore, in the coming years, agriculture will face challenging situations on the ecological, global, climatic, economic, equity, social justice, energy and employment fronts.
23. Due to climatic changes, the production systems are getting more vulnerable on sustainable development front. Accordingly, recently concluded Climate Summit felt the need for of adoption of a protocol for limiting greenhouse gases on a stipulated time scale.
24. In Asia, over 90% of the water resources extracted go to agriculture as compared to 20% in more developed economies. With improved market integration and rapid urbanization and income growth, intensive cereal crop production is likely to give way to a diversified production system with increasing emphasis on vegetables, fruits, flowers and livestock. With the development of economies, value of commerce in agriculture would be appreciated and farmer's decision on land use choice would be increasingly based on comparative advantages rather than on the subsistence needs of the farm household. Sustaining productivity gains in the post-green revolution period would call for more efficient use of inputs, viz. fertilizer, water, pesticides, weedicides, labour, etc. Technologies for enhancing input efficiencies would generally be knowledge-intensive, location-specific and relatively costly in their application and management. The technology transfer would be far more knowledge demanding and higher skill of management would be essential. Instead of straight forward seed-fertilizer-irrigation technological capsules, system performance would require greater amount of farmers' time and specialized kind of training for monitoring crop nutrient status, pest pressure and water use and management. The kind of technologies which would be required would also be far more challenging for the scientific communities.
25. For an effective management of the changed scenario, integrated management of resources is considered vital. Development of sustainable and diversified system which are problem-oriented and demand-driven, will require situation-based matrix approach of integrated research and development and involvement of all reasonable players as partners to offer

practical solutions. The essence of co-operation should be removal of apprehensions and better appreciation of problems on the basis of SWOT analysis (realization of strength, weaknesses, opportunities and threats) leading to problem appreciation and formulation of commensurate programmes which are believed to benefit one and all.

26. Accordingly, there is general appreciation of the fact that agriculture would continue to be the most predominant sector in the economy of several nations of the region in the decades to come. In order to ensure potential-based and technology-oriented growth in agriculture, far more investments on research and development efforts would be imperative. In the last 2–3 decades, a majority of nations in the region have reorganized and strengthened their NARS to address issues of improved food security, sustainable agriculture and rural development, conservation of biodiversity, agricultural human resource development (AHRD) and globalization of agriculture as a consequence of post-GATT agreement.
27. Among the priority areas, food security for removal of hunger and poverty is the first and the foremost. The NARS should address also the concerns for environmental as well as conservation of resources and the globalization. Obviously, augmenting production, productivity and profitability of foodgrains, and other important commodities of the region, should continue to remain major priorities, while we move towards eco-regional approach to achieve the required sustainability. As stated earlier, the latter must not have precedence over the former in our over enthusiasm for reprioritization.
28. The development of agriculture in a given environment entails a skillful application of human resource and capital in the manipulation and management of the basic production assets: land, water, biodiversity, climate and sunshine. The output of human labour itself is amplified by engineering technologies starting from small tools to animal traction and leading all the way to automated heavy machinery. The manipulation of biodiversity starting with the domestication of plants and animals, to the selection of superior genotypes on to cross-breeding for incorporation of alien genes and finally to the application of the most sophisticated biotechnological and genetic engineering techniques have all but one common purpose i.e. to enhance the factor productivity of land, labour, water, time, etc.
29. Production assets in agriculture are neither evenly distributed geographically nor accessible equally to all the members in a given society. Further, the variation in human skills is confounded by the access to resources and the efficiency in utilization; and a cumulative effect of this makes for a wide disparity in human skills among societies and within members

of a society. Variation in human skills is directly reflected in variation in economic condition; affluence to abject poverty. Deprivation takes a heavy toll both on productivity and entrepreneurship of the poor.

30. The human supporting capacity of many fragile ecosystems has long been exceeded even as the rural poor are being progressively marginalized and being displaced from the more favourable environments. The solution to this problem does not automatically emerge from further improvement in efficiency of the production systems and from improvements in factor productivity. On the other hand, radical solutions may be needed; and these can emerge only from a better understanding of the dimensions of rural poverty and by a drastic reorientation of strategies. Hence, future challenges are numerous and concerted efforts are needed to address some of the priority areas by various NARS in a coherent manner.

IV. ECO-REGIONAL APPROACH - A NEW PARADIGM

31. In the developing countries, measures to alleviate rural poverty have failed to receive adequate attention. As a consequence, the problem has become pervasive, multi-faceted, deep-rooted and complex even in the post-Green Revolution era. It is reflected in the condition of landless labour in the favourable areas that benefitted from the Green Revolution. It has become wide spread in the arable farming regions of the semi-arid tropics exposed to the vicissitudes of scant and highly skewed rainfall and the parched soils in the flat lands, the erodable hill slopes in the mountainous regions and in the flood and inundation prone rainfed lowlands. The pastoralists with shrinking size of herds are being progressively sedentarized; the fishermen who earn more income from clearing the mangrove vegetation and selling it as fuelwood than from catching fish; and the peasantry for whom a greater part of their low income comes from off-farm rather than on-farm activities, reflect the severity of the problem. Interventions to alleviate rural poverty of this dimension and diversity must rely on developing and transferring sustainable production technologies that preferentially benefit the resource-poor farmers; on conserving and where possible, even elevating the resource base of farming in fragile ecologies—from humid to arid; and on deglamourizing the suicidal migration trend towards urban areas, which converts the lower scale and less efficient producers of agricultural commodities into consumers of the very commodities which get progressively scarce.
32. In this scenario, eco-regional planning will have to aim at enhancing agricultural productivity and production on a sustainable basis to meet

the ever-growing needs of the farm family and the livestock for food, feed, fodder, fuel, fibre, etc. This would imply an upscaling of research activities within the eco-regions and dovetailing research and development priorities between and within the eco-regions. This would call for an effective collaborative mechanism, i.e. responsibility for a higher level of integration in research and development efforts. Thus, a lucid distinction of collaborative mechanism and a clear distinction between priority setting at the eco-regional level and its effective execution at the local levels would be essential.

33. For addressing the issue of eco-regional research and development, following issues would need pin-pointed attention: (i) identify research issues common to different eco-regions; (ii) prioritize these issues for further R&D to plan sustainable agricultural strategies and develop technologies; (iii) develop the mechanisms for a collaborative programme on the prioritized issues which will involve NARS, IARCs, FAO, UNDP, Donors and NGOs; (iv) develop a methodology for synthesizing eco-regional research into application tools for specific geographic domains within the eco-region; and (v) develop and implement a system for monitoring of improvements in the eco-region according to predetermined sustainability criteria. Obviously, these would call for an ex-ante analysis of eco-regional issues and knowledge gaps and strengthening of collaborative mechanisms, specification of R&D priorities and development of an Eco-regional Action Plan to respond to eco-regional issues, participatory approach and implementation of action plan to meet research priorities, synthesis of R&D results, and creation of a supportive policy environment, and development and implementation of monitoring mechanisms to bring much needed improvement and mid-course corrections.
34. In the eco-regional approach to research and management of natural resources, a balance between development and utilization of biodiversity would be important. The research should aim at improving the productivity of scarce resources while protecting the quality of soil and water and at the same time safeguarding biodiversity for posterity. On the management issue, following points would need attention.

- Research on conservation and management of eco-systems that include multi-crop and multi-economic farming systems in programme mode.
- Accelerated research on the management of production systems.
- Socio-economic and public policy research to understand farmer and community decision-making process regarding the utilization

of resources and factors affecting farmers' incentives and adoption of improved technologies.

- Development of capacity of NARS for more effective understanding of natural resource management research.

35. The most important end-product of an eco-regional approach may be to provide a framework for sustainability. Incorporation of social and economic components would ensure success of the eco-regional approach. It is also recognized that training on various facts of multi-disciplinary approach in a programme mode would be extremely important for the success of the contemplated efforts.
36. As a revised strategy of CG, presently most of the Centres have re-prioritized their on-going programmes to address the issue of eco-regional sustainability. In the process, a matrix mode of management involving inter-disciplinary approach has been adopted using decentralized or Consortia or network approach. This reorientation in research priorities now requires greater NARS participation to address site-specific problems. The success of this new paradigm would, however, depend on the extent of devolution of Centres' activities and also on the effective partnership role of NARS in assuming greater responsibilities.

V. IFPRI VISION 2020 - KEY POLICY ISSUES

37. In one of the thematic papers presented for the Vision 2020 World Conference on Food, Agriculture and the Environment held at International Food Policy Research Institute, Washington, DC during June, 1995, the following reorientation concerning some key policies were suggested:

- Invest more in research and extension and increase farmer input and feedback into technology generation and the dissemination process.
- Shift fertilizer policy from an emphasis on increasing the level of use to improving efficiency of nutrient balance and timing and placement of fertilizer.
- Shift crop protection policy from application of chemical pesticides to use of integrated pest management.
- Shift emphasis in irrigation policy from investment in new systems to improvement of water-use efficiency and productivity in existing systems.

- Adopt appropriate economic incentives through price policies that keep domestic prices in line with long-term world price trends.
- Reform trade and macro-economic policy regimes that penalize agriculture to stimulate production by improving short-term input-use-efficiency and encourage long-term investment and technological change in the agriculture sector.

38. As is evident, the above contemplated view lay heavily on the improvement in efficiency and incentive-driven production and trade. In addition, resource and situation-based harmonization on a changing time scale, increase in fertilizer use, creation of facilities for efficient water use, pricing policies keeping in view the need of equity and social justice, would be highly rewarding in the Asia-Pacific region. For required policy reorientation, role of the Regional Fora such as APAARI could be critical, since it could effectively catalyze the decision makers and also those responsible for policy decisions.

VI. AGRICULTURAL RESEARCH SYSTEMS

39. Three major systems of agricultural research are existing presently. These are: (i) international, (ii) regional, and (iii) national. Of these, the international and the national systems have emerged to be reasonably stronger than the regional system and the linkages between National and International systems have helped significantly in improving the production of food for hungry and poor people in the developing countries.

i. International Agricultural Research System

40. The CGIAR has established 16 IARCs for conducting research in the developing countries aiming at enhanced production to ensure food security and to promote sustainable agricultural development. The CGIAR has vested its Technical Advisory Committee (TAC) with the responsibility to ensure that the progress of the Centres are of high quality and relevance. These Centres have proved to be highly successful in meeting the challenge and have enabled a number of the developing nations to improve their food production, technological skills, human resource and the existing infrastructures. Among major successes, role of CIMMYT and IRRI towards 'Green Revolution' in South Asia is internationally well recognized.

41. These Centres have evolved over the last four decades as institutions of high quality research, source of germplasm enhancement and conservation, information exchange, network of regional/international testing,

and also Centres for human resource development. Among these, the International Service for National Agricultural Research (ISNAR) is the only one that focusses especially on institutional development within national agricultural research systems, although some other Centres such as IRRI have also helped national research centres in building their rice research capabilities.

42. Initially, in early 1960s, the CG centres had focussed only on research relating to crop/commodities of different regions that could help increasing their production, thereby ensuring food security and removal to a certain extent of both hunger and poverty. Subsequently, there have been many changes in their number, level and pattern of funding and the mandate was enlarged to also improve production of livestock, fish and forest resources. Obviously, a gradual shift took place from commodity to eco-regional focus, thus adding 'sustainable agriculture' besides 'food security' as an additional objective. Such a shift also necessitated a shift in their style of research management, using 'matrix-mode', involving both the inter-disciplinary and inter-institutional linkages, as well as devolution of the centres activities at the regional and national levels by involving concerned NARS as effective partners. Further shifts are contemplated in their priorities as TAC proposes to include new paradigms such as environmental security and poverty alleviation.
43. **Obvious Strengths:** The system has demonstrated its importance and has emerged as a well recognized international institution of relevance to the needs of a number of developing NARS. The visible indicators have proved its utility and the relevance for productivity, profitability and sustainability of agriculture globally. A number of high-yielding varieties and hybrids of mandate crops have been evolved, tested and made available to NARS. Conservation and characterization of genetic resources have received required attention. Information management and dissemination had been quite effective. Human resource of the developing NARS has been built to meet specific national needs and the support to selected NARS has been provided for their institutional development and research. These achievements have given the CG system the required respect and recognition among the world community today.
44. **Inherent Weaknesses:** It is often felt that in view of either limited resources or in view of TAC priorities in the past, many IARCs have not been able to address some of the critical areas of research which could have otherwise helped its NARS partners much more. Examples of this kind could be cited as: effective support to the National Gene Banks in building their capabilities to conserve existing genetic resources, limited use of germplasm for its characterization and genetic enhancement,

research on early duration composites and single cross hybrids of maize, drought tolerant and early duration hybrids of pearl millet, varieties and hybrids of sorghum suitable for *rabi* (winter) season, research on sustainability of productive systems such as rice-wheat, required thrust on rainfed upland, as well as lowland rice and also on hybrid rice, support for temperate pastures in the Himalayan region, research on livestock i.e. Asia, where maximum of excellent livestock breeds otherwise exist, support for aquaculture including conservation of fish genetic resources, agro-forestry research representing varying agro-ecological conditions, and research on other important crops/commodities having greater relevance for sustainable agriculture such as soybean, mungbean, vegetable crops, etc.

45. It is argued that so far there exists no proper yield trial for hybrid rice and also for single cross maize hybrids. There is less sharing of germplasm of root and tuber crops, such as potato, sweet potato, taro, yam and cassava. Research on taro wilt, a major problem for the Pacific, is still not addressed. Also the National Systems are getting relatively less attention for their strengthening and research management in the Asia-Pacific region, mainly on account of ISNAR's major focus on African countries. Even mandate for research on vegetable crops has not yet been agreed to by the CG system in spite of China and India in the region being the largest vegetable producers in the world besides the importance of vegetables in the region for "household nutrition security". Research on hybrid wheat is so far limited and the work on biotechnology and genetic engineering for both biotic and abiotic stresses and quality improvement in mandate crops is presently at the 'take off' stage only. Devolution of training programmes at the regional level involving capable NARS is still to take a concrete shape and consortia approach for sharing resources and responsibilities, involving concerned NARS as partners, is yet to be given proper shape and importance. Formal work plans, based on mutual needs, are often not operative and the agenda for co-operative research are mainly donor-driven and in keeping with CG priorities only. Often the CGIAR-NARS participation is bilateral and required emphasis on network/regional collaboration is lacking, except for recently initiated consortium approach at some selected centres. Best examples of such networks are INGER by IRRI and CLAN by ICRISAT, but there are not enough such networks.
46. It is well understood that these International Centres have their physical and financial constraints too and, therefore, all expectations of NARS cannot be met fully from them. At the same time, it is evident that much more could have been achieved had there been appropriate appreciation

and donor support for these regional priorities and specific needs of some of the NARS, provided institutional mechanisms for regional collaboration and priority setting had been in existence in the past in this region.

ii. National Agricultural Research System

47. Considerable variation exists among NARS in the Asia-Pacific region. Also different kinds of models exist relating to research co-ordination mechanisms. While some NARS have emerged very strong, some are still in their loose formation. Not only NARS, but individual components of NARS also have varied strengths and weaknesses. To identify which areas need most strengthening, and what inputs are required to achieve specified objectives, descriptions of the characteristics of strengths and indicators of weaknesses for each of the key factors are essential. ISNAR has addressed to these issues in detail. The identification and prioritization of potentials/constraints in agricultural production/productivity should lead to the formulation of national research programmes. The crucial issues in this step relate to the amount, quality and timely availability of the necessary human, material and financial resources for research. Finally, the logical concluding step in the process is the monitoring and evaluation of the effort. The assessment of performance of the national research system *per se* in relation to the quantity and quality of products it generated as per its plan of action and the evaluation of impact of its research productions on the national agricultural output, would be important. The implementation of the various steps in the process should follow a "participatory" approach in which major stakeholders play an appropriate role. This calls for linkages with various actors, both from within (internal) and outside (external).
48. While this analysis of ISNAR is helpful in assessing strengths and weaknesses of various factors in the components of the NARS, it must be kept in mind that the breakdown of components relates chiefly to the classical structure of public institutions. A more current analysis would also take into account the broader definition of NARS by incorporating universities, private sector research entities, and institutions dealing with natural resource management. In this endeavour, ISNAR's experience in diagnostic studies in over 50 NARS may provide an excellent basis for analysis. It is now increasingly recognized that the institutional development of research systems is a difficult and complex process which requires more research. Some of the current problems of developing countries are partly the result of misguided interventions in the past.
49. **Obvious strengths:** Some NARS have become highly effective in

meeting the national research needs and required co-ordination of agricultural systems operating in the country. Required support for important commodity research has been provided and also educational programmes to meet human resource needs have been strengthened. Some NARS have also assumed the role of funding agencies for agricultural research and education and have set the national research priorities and agenda with concrete action plans. In the process, they have assumed the role of autonomous status for research and education co-ordination and funding, whereas some NARS play an effective advisory role. In others, either Government system has operated or NARI system has played required role to address the national priorities. To most NARS, reasonable funding support had been forthcoming from their respective Governments, whereas donor support including support by CG centres in many cases had also been instrumental to some extent for prioritization and conduct of agricultural research. Majority of NARS have succeeded in addressing their research agenda quite effectively in the past, culminating in increased agricultural production and improved institutional development. It is even argued that had there not been sufficient NARS support, Green Revolution would not have been possible in the region. A vast network of research institutions and agricultural universities has been created by many NARS to meet their national as well as in some cases the regional needs.

50. **Inherent weaknesses:** Some of the NARS do not have the required organizational structure and funding mechanism. It is sad to note that some of the countries have not even a strong National Agricultural Research Institute and/or an Agricultural University for conducting research and imparting required training and education. It is also realized that while some of the Agricultural Research Councils have emerged as autonomous organizations with required authority and linkage mechanisms with other institutions in the country, yet a number of the NARS have not been able to provide required teeth to its councils so far. In some of the countries these councils have only the advisory role. It is also noticed that in some cases, council has its own role to play at the Federal level, whereas State institutions are having their own independence. It is also noticed that in some countries, these councils are not linked with the Ministry of Agriculture and hence, do not have required effective linkages either with the Department of Agriculture or the Agricultural Research Institutions. Some NARS are still working for the support that is needed from the Government to have some effective role for research co-ordination and conduct. It is, therefore, felt that support for agricultural research and education by respective Governments would have to be further augmented in order to make their NARS more effective and meaningful.

51. It is a general impression that many of the NARS have not been able to address their research priorities in a holistic manner either for want of well-set priorities or due to non-availability of resources. Regional imbalances are existing and also variations for research support to various commodities vary. It is also realized that thrust on eco-regional research is relatively less and work in some specialized areas, such as biotechnology for crop improvement and research on environmental as well as natural resource conservation and information management, etc. are not fully addressed due to lack of required infrastructure as well as human resource. Funding support to various NARS in the Asia-Pacific region varies between 0.2% and almost 1% of their agricultural GDP. Whereas, NARS in the developed countries have around 1% – 2% funding support. Hence, appropriate funding support is one of the major weaknesses of NARS in the Region. Also, political and policy support for strengthening the NARS in various countries are lacking for required growth of these institutions. Similarly, the effective mechanism for regional co-operation in order to gain strength from each other's efforts and technologies generated in other countries are lacking. Thus, distinct role of regional fora like APAARI and CG Centre like ISNAR in addressing these issues is quite evident.
52. As far as co-operation with CG Centres is concerned, some of the NARS have done exceedingly well, whereas others could not reap the benefits to the desired level for want of requisite support for agricultural research in their own country. Co-operation also varies in the sense that some NARS have taken even regional responsibilities and are working as effective partners for research collaborations in several areas of mutual interest. Whereas, in some NARS, still CG centres are working to improve their national capabilities for research as well as human resource development.
53. As the respective components of the NARS have become stronger, the Centres have moved 'upstream' in their research. There has been a gradual shift away from more general production courses to specialized individual training. Much of the former type of training is now conducted in and by the NARS, or by the regional collaborative networks. To help in this endeavour, many of the Centres are now engaged in 'training of trainers'.
54. Human Resource Development, particularly in the frontier areas of technology, is considered crucial to meet the changing research and educational needs. In the frontier areas of technology generation, a blend of new and experienced scientists would be required. In this endeavour, training and/or visits within the region and outside would be essential.

This would call for adequate resources to ensure that such activities are undertaken depending on the need. Provision of sabbatical leave or additional slots for visiting scientists would be crucial to ensure that scientists avail of the facility to have more innovative thinking in order to meet the emerging needs. Similarly, redeployment/readjustment and transfer of scientists and officials would call for an effective policy to meet the research and developmental requirements. Training for work conversions would be very crucial for redeployment of surplus staff.

55. Transfer of farm worthy technologies is vital for harnessing the fruits of research. In this endeavour, agriculture system has to reorient itself so that site-specific technologies which are demand-driven and oriented towards problem solving are developed, assessed, refined and transferred through innovative methods that help the system to respond quickly to the ever changing and diverse needs of different agro-eco-regions. This would increasingly become more important concern of planners and researchers. Special emphasis will have to be laid on the extension needs of hilly, tribal and rainfed areas. Capitalization of the level of technology in hand, realization of the need for refinement, transfer of farm worthy technologies with associated impact analysis would be the key to success.
56. The research service in most countries is not equipped to reach the large number of farmers as the transfer of technology is often the mandate of the development departments. The research system, however, has a major responsibility to develop institutional links with the extension service for a two-way flow of information. This is often described as the front-line extension service. Required efforts in this regard to build much needed linkages are often far from satisfactory leading to a gap between technology and its adoption at farmers' fields.
57. The research priorities must be translated into relevant research programmes whose implementation would determine whether the country would be having the right kind of technology for increasing agricultural production. The process of programme formulation is a highly interactive process involving both a top-down and bottom-up approach. Basically, the programmes must be formulated by the scientists at the experiment stations but they must receive clear messages about the national and regional priorities and about the problems to be solved. Such priority setting mechanisms are often non-existent in the region.
58. Correction and improved planning of research programmes is necessary if the different projects on completion are to yield useful results. The senior managers must put in place a good system of monitoring and evaluation of research for this purpose. Further, large countries with a multiplicity of re-

search institutions must co-ordinate their work in order to be cost-effective. Ideally, a large country will have a limited number of national institutions which do the more advanced basic and strategic research and need-based regional stations in different parts of the country, which would be mainly involved in applied and adaptive research, working in close collaboration with the extension service and the farmers.

59. Problems arise, however, when it comes to setting of priorities in a systematic manner. Few formal methods are needed so that the allocation of resources for research on different commodities and on natural resource management are defended on rational grounds with greater transparency. For the South Asian countries with enormous resources of manpower in such areas as social and management sciences, in addition to their large pool of agricultural scientists, it should not be difficult to employ a formal framework such as a weighted objective scoring method or a cost-benefit analysis approach. In the absence of this, the net result would be that their limited sources would not always be put to the best use.
60. As regards programme formulation, it would be true to say that scientists, in general, are able to address through their research some of the most pressing problems of agricultural production in respective countries. They are not free to pursue their own academic agenda. The focus on well defined development objective is particularly great in the case of the nationally co-ordinated programmes. All-India crop co-ordinated programmes are perhaps the most successful examples of this kind. Closely related to the issue of programme formulation and implementation is the important function of monitoring and evaluation. This is perhaps the weakest link in the management of agricultural research systems in the region. It is true that formal reporting mechanisms do exist whereby scientists are required to report periodically on the progress made by them but the same is far from the desired goal.
61. As regards co-ordination at the level of the individual institutes, much remains to be done to bring scientists from different disciplines together. In the research institutes and even at smaller stations, a departmental structure exists based on different disciplines. It becomes difficult, therefore, to organize truly multi-disciplinary research programmes. The linkages are often informal with the concerned scientists meeting together and discussing their respective projects. The need obviously is for an institutional mechanism to establish inter-disciplinary groups to address pressing problems in a programme mode.
62. The greatest promise of biotechnology is for the resource poor farmers as it should help to substitute the present high cost non-renewable

resources of energy on the farm with inputs of a renewable kind, such as the biologically fixed nitrogen. The genetic transformation technology promises to introduce genes from bacteria into crop plants to make them pest resistant. In short, there are many contributions which biotechnology can make and which could be taken advantage of. Examples of these simple biotechnologies with immediate pay-offs include micro-propagation of horticultural and plantation crops through tissue culture, production of disease-free clones of root and tuber crops, and improvement of animal nutrition through bioconversion of straw and crop residues. With the kind of institutional framework, it would not be possible to take advantage of these developments in biotechnology. Biotechnology laboratories for the more advanced work involving recombinant DNA techniques would be required so that a large number of young scientists could be trained in these modern methods and frontier areas to develop cutting edge technologies.

63. Finally, the agricultural research institutions will be called upon to develop closer links with agri-business and with the private sector in general. The history of agricultural development in the industrialized countries shows that as the government-funded systems have evolved and matured, and subsequently they have transferred many of their responsibilities for research and research-related services to the private sector.
64. On a changing time scale, the system will have to be dynamic to exploit opportunities by using natural endowments on a sustainable basis. The conceptual model of deriving the best out of the vast resources, viz. scientific, technical, ecological and environmental, will have to be judiciously used and managed in a way that these are in harmony with the environment and useful to the society.
65. The NARS in Asia and the Pacific region would be required to assess the ground realities for better functioning on a 'Switch On' mechanism to respond to the changing needs. The planning, monitoring and co-ordination will have to be appreciably consolidated to operate programmes individually and collectively.

VII. APAARI IN PERSPECTIVE

66. It is increasingly being recognized that national agricultural research systems are not able to address new emerging challenges all by themselves with the resources placed at their command. The countries in the regions have also gradually realized the need for developing linkages between NARS and with the CGIAR Centres to cross fertilize their experiences for deriving benefits from the strengths of one another.

67. Considering research co-ordination among institutions, it is felt that the same has not been developed so strongly in the Asia-Pacific region, though a number of international and regional institutions such as IRRI and ICLARM and IBSRAM (The Philippines), ICRISAT (India), AVRDC (Taiwan), AIT (Thailand) and ICIMOD(Nepal) are located in the region. There are also some regional associations or co-ordination bodies, such as Asia-pacific Association of Agricultural Research Institutions (APAARI) and South-East Asian Regional Centre for Agriculture (SEARCA), both located in Thailand. Whereas, APAARI is an Association formed by the Apex research and co-ordination organizations of more than 19 countries in the region, SEARCA is presently working as a Centre supported by South-East Asian countries for co-ordination of information and conduct of regional training programmes and seminars in areas of mutual interest.
68. The genesis of APAARI lies in the 17th FAO Regional Conference held in Islamabad, Pakistan in 1984 which recommended that an Asia-Pacific Association of Agricultural Research Institutions be established. Further to this, recommendation was for FAO to sponsor the association to strengthen the national agricultural research capabilities of the region and to enable the sharing of experiences among its partners. In pursuance of this recommendation, the FAO Regional Office for Asia and the Pacific (RAPA) organized an experts consultation in October 1985, which was attend by senior officials of several countries in the region. The consultation strongly recommended the establishment of the Association. In December 1990, the constitution of APAARI was adopted by the General Assembly in its second meeting held at the FAO Regional Office for Asia and the Pacific, Bangkok, Thailand.
69. Subsequently, APAARI held Second General Assembly in Malaysia in December 1992 and the Third General Assembly meeting was organized at PCAARD, The Philippines in November 1994. Since its establishment, APAARI has slowly emerged as an institution that fosters closer linkages among Apex agricultural research management organizations in the region. As per the Mission Statement, APAARI will promote the development of National Agricultural Research Systems (NARS) in the Asia-Pacific region through intra-regional and inter-institutional collaboration. Its objectives are to:

- promote the exchange of scientific and technical know-how and information in agriculture;
- encourage the establishment of appropriate co-operative research and training programmes in accordance with identified regional, bilateral or national needs and priorities;

- assist in strengthening of research organizational and management capability of member institutions; and
- strengthen cross-linkages between national, regional and international research centres and organizations, including universities, through involvement in jointly-planned research and training programmes.

APAARI envisages to attain these objectives through an effective system of planning, co-ordination, strengthening of linkages and networks and establishing a dynamic system for information exchange and dissemination. In pursuance of the above objectives, the Association may undertake one or more of the following activities:

- convene General Assembly to discuss the Association's administration, general programme, policies and priorities;
- organize working groups, meetings and seminars to discuss specific problems or sponsor technical studies, training courses and workshops;
- collect, collate and disseminate research information;
- maintain links with agencies, institutions, or organizations and other entities undertaking similar activities within and outside the Region; and
- promote collaborative research among member institutions.

In addressing these activities, APAARI in collaboration with CG Centres and the NARS has already initiated a number of activities in the region and proposes to strengthen required linkages in future.

70. In 1994, APAARI considering the important features of the Asia-Pacific Region moved towards the 21st century through its Perspective Plan which embodies the vision for nursing the Asia-Pacific Region to a sustained growth. The perspective plan spells out the guidelines for intensifying co-operation among member countries in the areas of science and technology, human resource development, technology transfer, information networking, policy advocacy, and enhancing visibility. According to the perspective plan, it is expected that there will be:

- high level of co-operation among Institutes and Divisions that is synergistic and self-sustaining with active participation of the industry and private sector;

- a regional network of information;
- an enhanced state of policy advocacy;
- a comprehensive cross-linkage among agencies through joint programmes; and
- human resource development and resource generation.

71. This would obviously address the following pressing issues of considerable relevance to the region:

- Food security.
- Diversification.
- Sustainable natural resources management.
- Global competitiveness.
- Equity and social justice.

VIII. NARS-CGIAR PARTNERSHIP – THE NEED

72. Each NARS has specific programmes under different themes . However in some cases they fall short of their assigned mandates. There is an urgent need to strengthen linkage between NARS that have common research programmes. Similarly, there is need for collaborative working of man-power with available resources which can be shared.
73. A resource-tracking strategy to examine proportion of research resources being allocated to different programme themes and agro-eco-regions need to be evolved. This will facilitate in reallocation of resources according to importance of problems in a rational way. Similarly, a balance between the co-ordinated programmes and the different eco-regional needs would be required. Resource tracking and the institutional congruence will help the Apex organizations to determine modifications required in the co-ordinated project design and functions. Both the contractual and collaborative research programme strategies involving developed SAUs will prove useful in developing cutting edge technologies, while the developing SAUs may need further active technical assistance and infrastructural support. Institutes should identify their weaknesses and strengths in different areas so that synergistic linkages could be developed. The strength of the CG centres and the bilateral programmes need to be properly understood and harnessed for the mutual benefits. Human resource development needs in emerging areas of cutting science

is being felt by most of the NARS in the region.

74. The process of regional fora consultative mechanisms needs to be institutionalized in the medium term so that it becomes self-sustaining. Member's contributions are already a feature of most existing fora and it is intended that they will become self-supporting in the medium- to long-term. A key aspect of the CGIAR renewal process is that it envisages a greater role of NARS as full partners. The NARS be seen for playing an important role in both priority setting and implementation of the CGIAR research agenda in future. Fortunately, institutions such as APAARI are emerging in the region to address these issues.
75. The emergence of regional groupings of NARS is seen as a potentially positive development that can help facilitate and channelize the Centres' efforts in institution strengthening. The CGIAR needs to explore how it can assist in the strengthening of such regional groupings to make them truly effective and functional.
76. There appears to be a need for closer collaboration between the Centres and the ISNAR, in NARS institution-strengthening activities. It is quite encouraging that CG Centres as ICRISAT, IRRI and CIMMYT are playing an increasingly important role for the research on hybrid technology far more than before. Such clear policies by other CG Centres as well as National Governments in the developing countries, till they adopt Plant Breeder's Rights, would encourage both the public and private R&D organizations to intensify their efforts on hybrid technology generation and its dissemination. Even thereafter, it could be on mutually agreed terms and functional arrangements in order to ensure complementarity.
77. Each Centre should develop a monitoring policy regarding the effects of its overall activities on the institutional development of research capabilities. The CGIAR should be seen as a relatively small, but key component of the global research system, and must expand its linkages with other institutions involved. Its ability to forge such linkages, as well as linkages with and among NARS, will be facilitated by the dynamic developments such as institutionalization of regional fora and the development of information and communication facilities.
78. The question that arises, however, is what is to be the role of the new CGIAR in this strengthening endeavour and how same would be addressed. Views on this subject are divided, some see this as an important function for the CGIAR while others suggest this responsibility should be assumed by other organizations. It is pointed out that in order to increase work on natural resources and social science there may be a proportionate

decline in expenditure on capacity building. It is further asserted that strong national research systems are essential for the CGIAR to move upstream and tackle more strategic problems. A question obviously arises as to "Who is going to build that research capacity?". The major questions that TAC is raising and which need clarification are:

- What are the Centres doing and how is it done?
- Are there better ways of doing it and what are the options available?

79. Farmers themselves have been increasingly recognized as experimenters in the generation and evaluation of production technology. This has been accompanied by a growing trend towards farmer participation in the research planning and execution process. In many NARS, input of the farmers in the planning process is rather limited. India has already recognized this fact and a project on Institution-Village Linkage Programme (IVLP) for integration of different elements of technologies on the farmers' fields has recently been initiated.
80. It, therefore, appears more appropriate for the CGIAR to conceptualize the NARS as a system comprising all entities in the country responsible for organizing, co-ordinating, conducting and executing research that contributes directly to the development of agriculture. In such a national system, the various entities responsible for research operate at different levels and fulfil different functions. Involving key partners in Consortia mode would enable CG Centres respond to various demands more effectively while ensuring wider participation. APAARI should act as a catalyst in achieving this objective.
81. The challenge for the renewed CGIAR presently is to see how this relatively small amount can be used to its maximum effect for reducing poverty and protecting the environment while ensuring both the productivity and sustainability. The partnerships developed between individual Centre programmes and the respective programmes in NARS represent another coalition of those who have been trained at the Centres and continue their relationships through follow-up activities and collaborative research. As Centres have moved into more strategic research, "upstream", coalitions are also being developed between them and advanced institutions in developed countries in areas of highly specialized research. These coalitions can serve as an important bridge to bring benefits of new knowledge and methods to bear on the research problems being addressed by the NARS.

82. In a recent publication, ISNAR suggested a “multiframe” approach consisting of three Perspectives: Structural, Human Resource, and Political. Many bilateral and multilateral development organizations: national (NGOs) and international (World Bank, FAO, UNDP, CIDA, ODA, USAID, EEC, the Ford and Rockefeller Foundations) have provided assistance in institutional development, especially in the areas of infrastructure and human-resource development. In order to carry this further, the broad subject of “strengthening” needs to be clarified and de-aggregated keeping in present status and future needs of NARS.
83. IFPRI, like the other Centres, is involved in collaborative research with NARS, training, workshops, and information services, that have an institution strengthening role. However, these efforts are not enough and more devolution is needed. In this respect, what has been said with respect to the other Centres above, applies. More important, however, is the need to co-operate in few areas in which there is overlap in the policy and public management area. Since IFPRI deals largely with the national food policies, and ISNAR with the agricultural research policies, both could jointly make much better impact. Unfortunately, inter-Centre linkages have not become stronger especially to address the regional needs of NARS.
84. There are many good examples of Centres collaborating in institution strengthening activities, particularly in joint programmes carried out in regional settings. But this needs further improvement. The co-ordinating mechanisms being developed by the emerging regional groups of NARS, referred above, offer a good avenue for such co-operation to avoid duplication and share facilities.
85. Countries of the Asia-Pacific region have developed very close collaborative relations with the International Agricultural Research Centres like CIMMYT and IRRI. Green Revolution, for instance, is an outcome of CG-NARS linkage. However, it is felt that only those countries have been able to take advantage of the technologies developed by these international centres which have strong research programmes of their own in the area of adaptive and applied research. Future progress in agriculture would demand effective strengthening of NARS.
86. The NARS of Bangladesh, India, Nepal and Pakistan, and CG Centres such as IRRI, CIMMYT and ICRISAT are collaborating to improve rice-wheat system’s productivity and sustainability in South Asia on the basis of a system-wise-system approach. The Rice-Wheat Collaboration links different NARS institutes in the Gangetic eco-region in a consortium mode. The collaboration of this kind, involving support from CG donors

and also NARS, must be replicated in other priority areas, where regional fora could also be involved to play a catalytic role. Recent initiative by the World Bank to facilitate this programme is a welcome development, which could be replicated for other priority programmes in the region.

87. The collaboration addresses, through multi-disciplinary cross-commodity teams, and in an eco-regional setting, the interactions between rice and wheat and among the physical, biological, and socio-economic factors influencing the system. It also quantifies sustainability through on-farm monitoring of total factor productivity and features a rapid exchange of information and technologies among the NARS scientists through frequent specialist meetings and travelling workshops. The role of international centres and other specialized institutions is most important in collaboration on strategic research for the system. In the process, all stand to gain.
88. Bilateral donor countries now face problems of scarce financial resources and of increasing pressure for more transparency and a more efficient use of public funds. In such circumstances, it is obvious that donors' concerns at times are broader than the CGIAR agenda. As such, NARS-CGIAR partnership would be more effective in the interests of donors who see their own NARS more directly involved in the international agricultural research agenda. This needs to be considered and a pragmatic view taken in the beginning itself.
89. An International Consultation on the NARS Vision of International Agricultural Research was first convened by APAARI at PACCARD, The Philippines in November, 1994 when a draft Resolution on the subject was proposed and all related issues were discussed in detail keeping in view the regional priorities. Later, another Consultation on the subject was convened by IFAD in Rome in December 1994. Following this, a ministerial level meeting was convened by the co-sponsors of the CGIAR in Lucerne in February 1995. It called for the strengthening of the process for systematizing participation by Regional and National Agricultural Research Systems of developing countries in setting and implementing the CGIAR/IARCs agenda. Within this framework, at the initiative of IFAD a consultation meeting was then held in Nairobi, Kenya in May 1995 when a basic framework for 'Action Plan' was attempted. Subsequently, the ICW 1995 meeting held in November 1995 in Washington, DC, discussed this issue in detail and considered the proposed action plan to be drawn in detail by involving regional fora in different parts of the world. ICW stressed to review the key issues associated with strengthening of NARS-CGIAR partnerships, in priority setting and conducting research, improving collaboration, institution building, and human re-

source development. Accordingly, APAARI has taken the initiative to have this meeting organized. On similar lines, a regional workshop for developing agriculture of Caribbean states was organized on 9-11, January, 1996 where following two basic questions were discussed:

- How should the regional fora be strengthened to make the NARS-CGIAR partnership more effective and constructive?
- How should the needs of the NARS, that are so variable and different, be better addressed through the CGIAR system and in the NARS regional fora?

IX. SCOPE FOR REGIONALIZATION

90. Recently, the issue of regionalization has received special attention from the donors, policy-makers and the research managers. Several initiatives are underway to explore the possibilities that regional agricultural research approaches or entities, such as networks, institutes, or associations, may provide for more effective and efficient agricultural research cutting across boundaries of different kinds. In the renewed efforts, difficult financial situation of both donors and recipient countries are to be realized. With severe budget reductions, donors see regionalization as a way of increasing the impact of their support by sharing benefits amongst large number of national programmes at reduced cost and placing the biodiversity issues in the driving seat. There is a growing acceptance that regional fora are appropriate mechanisms to improve the necessary linkages between national and international research and to bring NARS priorities onto the international research agenda. Furthermore, regional fora will increase the visibility of research and enhance the linkages with policy-makers at the national and regional levels. Concerns about environmental degradation and sustainable agriculture have recently led to a number of eco-regional research initiatives, which by their very nature often cross national boundaries. Similarly, research in certain fields, e.g. biotechnology, seed technology, processing, value addition etc. are expensive, long-term and complex for an individual country to engage on its own. This relates to a general trend of internationalization, globalization and the emergence of new political units or trading blocs at the regional level; technical bodies tend to follow such new structures. Also there is an increased awareness that the new information technologies, which are rapidly becoming available at falling cost, provide radically new opportunities for regional information sharing and collaboration.
91. Depending on what, when, how and the level of operation, regionalization

could have differential meaning for different users. However, following could be the common points for all the reasonable players if they consider themselves as partners:

- A natural resource base and common problems related to it: Soils, water, biodiversity, agroclimatology and farming systems.
- Problems in crop and livestock management and technology, e.g. pest and pathogen which cut across political boundaries.
- Common issues such as food security, poverty alleviation, and sustainable agricultural development calling for joint action plans.
- A common culture or background for regional research groupings and networks.

92. Regionalization can take many different shapes depending on the intensity of co-operation, scope of the collaborative effort and the operational processes involved. Regionalization can result in structured networks for information exchange among individual scientists who focus on a certain problem/commodity/discipline into networks sponsored by an international agricultural research organization or donor aiming to transfer new production technology to a number of countries. Regionalization may also have association(s) of research institutes that aim at identifying and confronting common problems in a region, possibly involving the specialization of some institutes on certain research areas. Finally, it may lead to actual transfer of research activities/technologies from a national to a higher-level (regional) research institute/system/organization.
93. The scope and intensity could be the most important criteria to distinguish different forms of regional research initiatives. It can have information sharing on R&D, co-ordination on technology use and transfer, collaboration on different elements of research on complementary basis to be holistic and the integration on research front. Such an arrangement can address single as well as multiple issues. It would, therefore, be important to find out what is the most appropriate form of co-operation to achieve certain objectives. If a goal can be obtained through informal networking, it should not be the subject of more fully integrated systems.
94. If the right balance between national and regional research could be had, it may result in gains from more effective research and greater savings by addressing efficiency issues (reduced costs). Two factors explain why this would be the case: first, countries are unlikely to give up research on commodities that they consider of crucial importance for food security, even though logic would dictate that research could more effectively

be done regionally, and secondly, the cost reductions obtained from economies of scale may be offset by increased transaction costs and, in many cases, diseconomies of scale.

95. Regionalization would avoid some duplication of research efforts. Collaboration could exploit complementarities in research capacity, enhance the chances of success, and sharply reduce costs. To rationalize such research programmes within a region would require some integrating mechanisms through which comparative advantages are examined and assurances are given that research results will be made accessible to all the partners. This rationalization will inevitably involve some degree of specialization of institutions. It will also mean that individual countries will take the lead in some specific areas while other countries, as participants, will be content with borrowing from them in these fields. While doing so, scarce resources could be better utilized and quality control mechanism could be strengthened and working conditions improved.
96. The difficult financial situation of NARS is well known to all. Salaries in NARS are generally poor and incentive and reward systems are lacking hence there is little scope for striving for excellence in the highly competitive environment. Performance assessment mechanisms generally fail since they are not linked in a positive way to a reward system that would support higher levels of performance. Regional research organizations, if given adequate protection against undue political influence, could develop as credible bodies offering more attractive work conditions than NARS currently can afford, especially in the small and mid-sized NARS that may not be viable as independent institutions in the fast changing global environment.
97. While the expected benefits of regionalization appear to be reasonably clear, there is much less clarity about the direct and indirect costs related to different types of regional initiatives. These costs may be unknown, underestimated, or ignored. As a matter of principle, the benefits of more efficient and effective research through regionalization should outweigh the transaction costs of adding additional institutional layers. The transaction costs are particularly high for the more intensive forms of collaboration and should be carefully considered. Costs related to regionalization may increase substantially if there is resistance to regional initiatives. There may be policy-makers to resist collaboration in export commodities that they believe are vital for the national economy. Political problems may create a situation where countries feel they cannot trust other countries in the region.
98. Regionalized research collaboration will often require priority setting at

the regional levels and if this occurs without appropriate representation of policy-makers and users, the relevance of programmes may become highly questionable. At the very least, the participation of those groups will be made more difficult. In several networks, there is no government representation, nor is there any lobby-type group to push end-user's interests. This implies that national policies, priorities, and actors should play an important role in the regional priority setting.

99. In commodity research, an important issue is the trade regime. In general, the scope for collaboration is greater under an import regime, in particular situations of problematic food security, than under an export regime where developing countries are competing directly in the world market. Yet, options for collaboration sometimes exist even in an export situation. One example is the response to pest/disease problems affecting an entire region; another example is the common interest of a whole region to strengthen its market position in relation to other parts of the world. In adaptive research that deals with highly localized problems, the main option for regional collaboration lies in the development of tools, e.g., for on-farm research. Another area for regional co-operation would consist of more advanced research in high technology involving high-cost and well-trained manpower. Except for the largest NARS, this type of research cannot be undertaken effectively at the national level. Hence, regionalization for selected activities would be of considerable advantage to all concerned.
100. In the on-going phase of renewal of CGIAR, consortium approach and integrated mode of operation, eco-regional approach on system's productivity and profitability on a long-term sustainable basis, devolution with all regional and national players as partners, representation of NARS on its board and institutes to ensure relevant priority setting and transparency in its governance and involvement of the developing countries as donors in order to develop a sense of belonging would be desirable. Further, the programme of CG system should be both TAC as well as NARS-driven rather than donor driven. In this context, APAARI finds an increasing role to serve the needs of member NARS in the Asia-Pacific region.

X. PRIORITY SETTING AND ACTION POINTS

101. It is realized that chronic hunger and poverty continue to persist in the region and with the projected rates of population growth, current trends in agricultural production would not be sufficient to meet adequately the requirements of consumption, food and nutritional security, enhanced

income, fulfillment of socio-economic needs, bridging of equity gaps, providing social justice, arresting migration towards urban areas where poverty concentration is being felt, addressing gender issues, providing adequate job opportunities etc. To achieve these objectives, the efforts would further put pressure on already diminishing biodiversity, deteriorating climate, increasing biotic pressure, shrinking and deteriorating natural resources and limiting heavy investments particularly on issues related with long-term sustainable development.

102. Under the given circumstances, a well thought of research and development programme in a matrix mode with streamlined priorities, appropriate strategies and consciously thought of approaches would be absolutely essential. Thus, the contemplated sustainability would hinge on enhanced productivity, profitability, equity, protection of environment and natural production base, efficiency, effectiveness, competitiveness and market oriented and demand-driven production to consumption system. This would require synergies of action, reaction and interaction so that the desired results are in tune with the comprehensive policies, priorities, and resource allocation/deployment at the national, regional and international level.
103. Based on the local, regional and global needs of food and nutritional security and economic accessibility, integrated application of the principles of adequacy, job opportunity, gender equity, market accessibility, national and regional sensitivity, eco-regional productivity, environmental plasticity/elasticity would call for a well thought of strategy in space and time on a changing time scale so that need and client-oriented basic, strategic, applied and adaptive research for ultimate technology generation, assessment, refinement, transfer and adoption is harmonized with least scope for deviation from the ultimate goal. This could be achieved if the linkages established at various levels are focussed, transparent, manageable, dynamic and relevant.
104. Asia-Pacific is a vast region with a varied range of agro-climatic conditions which provide a congenial environment for success of an equally diverse range of agricultural activities, be it crops, livestock or fisheries. There is a need to synergise our strength of natural resources and human capital. In order to harness the advantages of the resources on a sustainable basis, it is essential that we prioritize our research agenda in the right perspective. Depending on the priority needs of the institutions and nations in the region, a few relevant issues (Tables 1 and 2) could be picked up for collaborative research networking, aiming at technology generation, information sharing and dissemination, human resource development, etc.

105. With reorientation in vision, national, regional and CG system's agenda will have to be readjusted with appropriate financial arrangements, governance, implementation and monitoring mechanisms. For each of the mission so identified, the underlying principle that the strength of participating NARS would determine the success of the programme will have to be kept in view. A strong regional fora and networks cannot be thought of with weak NARS. Similarly, with eco-regional orientation, regional fora and regional networks would determine the regional strength and relevance of CGIAR in future. Hence, partnership and the catalytic role of CGIAR for strengthening regional fora assumes far more importance than ever before. In fact, essence of co-operation with removal of apprehensions would be mutually beneficial for all the reasonable players as partners. Thus, effectiveness of CGIAR in future would depend on simultaneous growth of the regional fora and the NARS as partners.
106. In future, the developing nations will have to invest more in meeting largely their own needs of food, feed, fuel and fibre etc. This would call for moving towards "Supergreen Revolution" by making grey areas green. For required complementarity, the CG system will have to provide more of basic and strategic research support for developing cutting edge technologies relevant to such areas. In doing so, difference between 'partnership' and 'ownership' will have to be recognized and it should not be judged merely on the basis of monetary contributions. On the contrary, the contributions of NARS in kind and human resource is key to the success of the partnership so envisaged. For system's productivity and sustainability, *ad-hoc* planning process would not serve the purpose in future. Mechanisms for effective devolution would form the very basis of co-operation for achieving the desired goal. For the proposed devolution process, regional fora such as APAARI could serve as a bridge between NARS and the CG system.
107. While moving 'up-stream', CG system should not lose sight of the resource poor farmers and the NARS where networking arrangements could be of considerable assistance and help. In this endeavour, required support to the centres of excellence and the establishment of networks would be the priority areas in future, where sharing by all concerned will be the cardinal principle. In doing so, it must be realized that problem oriented commodity centres and resource centres in research are not mutually exclusive. The commodity research must centre around appropriate resources and resources are to be effectively managed for enhancing the farm productivity. Cutting across the crops and the commodities to enhance competitiveness and market access, researches on

processing, product development, value addition, etc., should also receive much needed CG support in the future.

108. In order to ensure effective support for information flow and its management, NARS should involve relevant private sector, NGOs and the Farmers' Co-operatives for its policy formulation and programme setting. Special attention for systems sustainability be paid on natural resource management, IPM, IPNS, integrated soil and water management etc. Since, poorly endowed areas such as drylands, waterlogged, salt affected, etc., had received limited attention in the past, the technology development and transfer needs of such areas must be addressed on priority basis which CG Centres have started addressing lately. In the same vein, the role of women in agriculture with their effective participation in decision making process in NARS, Regional Fora and the CG system, through their greater representation, will have to be ensured. Thus, some of the important areas for partnership in the initial phase could be:

- Strengthening/initiating networking programmes on existing and some more crops and commodities with required CG funding for at least the co-ordination/facilitation arrangements and critical support on training, visit, workshops and consultancy.
- Germplasm conservation and enhancement programmes on the regional basis, with active involvement of CG institutions and their genetic resource centres.
- Required CG support for model/pilot eco-regional research programmes in a Consortium mode, which could be initiated in the poor endowments to begin with.
- Development of the regional information management system having CG Net/Internet linkages.
- Agricultural human resource development in the emerging and developing cutting edge technologies through regional training and workshops involving capable NARS as partners.
- The support to the centres of excellence around the competent NARS institutions/scientists with the CG support in the frontier areas of science and technology in order to address the most pressing problems of the region.
- Support for specific case analysis for the required priority setting, policy formulation, technology integration, programme implementation, monitoring and management.

- Pest and pathogen management, and the guidance on exchange and quarantine regulations with the support of international expertise and experience.
- System's oriented research programme support where isolated crop/commodity institutions/projects are ill-equipped for a holistic approach.
- Support for socio-economic, market, trade and policy research in order to build the required national/regional capabilities.
- Involvement of the selected NARS institutions with the CG Centres as partners for developing regional research management capabilities. Also required help and guidance to NARS in drawing funding support from donors.

109. To ensure more effective service and partnership role of APAARI in the region, following action plan is proposed to be pursued with adequate support of donors and especially through effective linkages with the CGIAR system:

- Required technical and funding support for the regional co-ordination activities such as, TAMNET, CLAN, UTFANET, FLCG NET, INGER, ITFOHR and other likely networks.
- Devolution and organization of the regional trainings, meetings and workshops including PGR activities.
- Institution and support to the regional publications such as News letters, Technical Reports, Success Stories, Case Studies, etc. Also support for the establishment of a regional information network.
- Development of consortia approach for the basic and strategic research, on a pilot scale to begin with in some highly relevant and priority areas.
- Effective representation of APAARI as well as NARS in the priority setting as well as governance of the CG System.
- Support for undertaking/initiating/instituting collaborative research in the region, not being pursued so far by the CG system, through involvement of other donors.
- Initiating activities for the effective involvement of private sector, NGOs, farmers' cooperatives, etc., in supporting the NARS agenda.

- Jointly with CGIAR and other donors, strengthening of selected NARS to address their national needs and also the regional priorities and goals. Also the policy guidance and technical support to the less developed NARS in their institution capacity building programmes.

XI. CONCLUSION

The Asia-Pacific region is presently most dynamic agriculturally. It has witnessed remarkable successes in the recent past. For these successes, credit goes to the NARS as well as to the CG Centres for generating and making available the improved technologies.

Considering future challenges and priorities, it is felt that much can yet be achieved through regional collaboration among NARS, which needs to be strengthened by involving CG Centres concerned and the regional fora such as APAARI. Effective partnership among these would help in the prioritization of research needs at the regional level and initiation of appropriate activities for required benefits to all concerned.

APAARI, as a regional forum, is also expected to foster closer linkages among NARS as well as between NARS and CG Centres. Being a new paradigm of NARS-CGIAR partnership, required strengthening and support to the regional fora such as APAARI would greatly help the developing NARS in the Asia-Pacific region. This obviously is an experiment worth trying for the larger benefit to all concerned.

Table 1. Priorities in the Asia-Pacific Region for Agricultural Research and Development

Activities	Priority Level	
	Current	Needed
I. Crops		
i. Cereals	H	H
ii. Coarse Cereals	M	H
iii. Pulses	L	H
iv. Oilseeds	M	H
II. Horticulture		
i. Fruits	M	H
ii. Vegetables	M	H
iii. Flowers	L	M
iv. Roots & Tuber	L	M
III. Livestock		
i. Small ruminant	L	M
ii. Cattle	M	H
iii. Poultry	M	H
iv. Piggery	L	M
IV. Fisheries	L	H
V. Resource Management & Conservation		
i. Soil	M	H
ii. Water	M	H
iii. Environmental Concerns	L	M
iv. Land-Use Planning	L	H
VI. Land-Use Systems		
i. Range and Marginal Lands	L	M
ii. Agro-forestry	M	H
iii. Degraded & Waste Lands	L	M
VII. Biodiversity Conservation	L	H
VIII. Biotechnology	L	H
IX. Institutional Building & Human Resource Development	M	H
X. Socio-Economics, Public Policy, Market Research, Management Research	L	M
XI. Germplasm Enhancement	L	H
XII. Processing, Product Development and Value Addition	L	M
Priorities: H = High; M = Medium; L = Low		

Table 2. Agro Ecological - Commodity Research Approach

Agro-ecological Production Regimes	Crops/Commodities									
	Rice	Wheat	Coarse cereals	Fruits	Vegetables	Spices/plantation crops	Agro-forestry	Live-stock	Aqua-culture	
									<i>I</i>	<i>M</i>
Irrigated	H	H	L	M	H	L	L	H	L	
Rainfed	H	M	H	H	L	M	H	H	L	
Deserts			H	M	L	L	M	H		
Sub-humid (1,000-1,500mm)	H	H	M	H	M	L	H	M	M	
Humid (> 1,500mm)	H	L	L	L	M	H	H	L	H	
Coastal Hills	H		L	L	L	M	L	L	H	H
	M	M	M	H	H	L	M	H	L	

Note : *I* = Inland; *M* = Marine
 Priorities : H = High; M = Medium; L = Low

