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CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE

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TAC Panel on Fisheries Research

DRAFT REPORT

(Agenda Item 3)

TAC SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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The Panel disussed the background papers and then followed the TAC guidelines and the questions in the Chairman's letter in reaching its conclusions. The Panel found that the information provided to it was adequate for its purpose and concluded that a further visit by a TAC panel to ICLARM would not be necessary.

This report follows the list of questions in the guidelines.

1. **What should be the future CGIAR activities if any, in the general area of fisheries?**

Between the extremes of capture and culture fisheries, from simple artisanal fisheries to intensive aquaculture, lies a continuum of fish production systems which can be inter-related, depending on the degree of control or management of the fish 1/ or production environment involved (see Annexes I and II).

All these systems pose a number of common scientific problems, e.g., need for knowledge of the population dynamics of early life stages or nutrition. At the same time it has to be recognized that the assimilation of new scientific knowledge is itself a gradual process dependent on the social and economic circumstances of the community to which it is available. Further, the application of scientific advances in fish production now require both an ability to reformulate strategic scientific questions and a multi-disciplinary approach that integrates the contributions of experts in areas such as genetics, nutrition and pathology.

In defining research priorities the following considerations are important:

(i) As the system of fish exploitation becomes more intense, strategic research in ecology, genetics, nutrition, pathology and reproductive biology becomes necessary.

The applications of knowledge derived from strategic biological research are likely to be of most importance in semi-intensive systems (Annex I). Of particular significance is the increased understanding of ways to improve pond productivity, the role of supplementary feeding and the integration of pond culture into existing farming systems, particularly in Asia.

1/ Fish: Generally include all aquatic organisms, whether plant or animal (finfish, shell, shrimp, molluscs, algae, and so on)

(ii) Research to analyze and understand the social and economic factors which condition the take-up (and take-off) of new technology are essential.

(iii) Open bodies of water offer potential for increased fish production through stock enhancement of selected species. To realize this potential substantial scientific investigations are necessary on production of fry, effective enhancement of population recruitment, proper use rights and accessibility of the exploited stocks. Work of this kind could be of great benefit to many small rural communities, and production in such open systems is non-demanding of artificial diets and may be environmentally sound.

(iv) Sustained exploitation of open (coastal and ocean) fisheries can only be attained if good basic information on stocks is available. Stock characterization is, however, poorly developed for many species and this problem needs to be addressed, particularly as in many cases, what was thought to be a simple stock is revealed as a complex of several or many stocks. Systematic study of stocks of important species using modern techniques is therefore needed. This also has obvious implications for conservation of germplasm.

(v) In all fisheries systems, optimization of management regimes requires a capacity to model, realistically, life histories, environments and production systems. Appropriate knowledge of these with respect to fish species of tropical and subtropical regions is very sparse, and research designed to develop capacity to carry out modelling is needed.

2.   To what extent do existing CGIAR Centres meet the demand for research in the general area of fisheries?

Existing CGIAR Centres do not meet any of the research needs in fisheries.

3.   To what extent, with respect to subject-matter coverage, do the activities of ICLARM (a) fill gaps in, (b) complement, or (c) duplicate current work supported by the CGIAR, or undertaken by other institutions?

Very little fisheries research is currently being conducted within the CGIAR system, although ICLARM has carried out a limited amount of cooperative research with IRRI on rice-cum-fish farming. There is some scope for cooperative research on small-scale mixed farming systems which include aquaculture at IITA and WARDA. Collaboration between ICLARM and ISNAR on fisheries research management has also been discussed.

ICLARM has been highly dependent on collaboration with a number of national programmes as a means of carrying out its research programmes, as it has few facilities of its own. It has also built strong ties with individual scientists through its own networks and support to the Asian Fisheries Society. With the exception of the Coastal Area Management Programme, ICLARM networks involve scientists rather than institutions.

ICLARM has also collaborated with other types of institutions, particularly the Asian Institute of Technology and the Collaborative Research Support Programmes (CRSPs) of USAID and BIFAD, the Fisheries Stock Assessment CRSP and the Pond Dynamics/Aquaculture CRSP. ICLARM cooperates in several programme areas with various regional organizations (SEAFDEC and NACA), and with FAO, mostly in the areas of dissemination of information. There has been considerable overlap between some information and training activities undertaken by ICLARM and those undertaken by regional organizations. The Panel would expect such overlaps to be minimized if, as it recommends ICLARM moves more upstream in research.

4.   What research needs in fisheries are not currently being met either by the CGIAR Centres or by ICLARM?

In fishery resource evaluation and coastal management, ICLARM activities concentrate largely on the refinement and application of existing approaches and models. ICLARM has not developed original programmes of a strategic nature aiming at developing methodological tools in response to newly emerging issues such as the modelling of coastal hydrodynamics, population dynamics of early life stages, etc. This was necessary because funding imperatives forced ICLARM's programmes more towards applied research in support of development programmes rather than on strategic research.

ICLARM's coastal area management work is largely centered around economic planning rather than research on modelling alternative coastal land/water uses.

Aquaculture research globally is more at the level of information collection and problem identification, though it is recognized as a major area for achieving sectoral goals; further little research of strategic nature has been done on aquaculture. Most of the research topics listed in Section 1 above, and the new areas identified in Annex III (in bold print) are not being tackled adequately by international fisheries research institutions.

5.   To what extent do the activities and modes of operation of ICLARM conform to those considered acceptable for CGIAR Centres?

From its beginning ICLARM was established along the lines of a CGIAR centre to conduct, stimulate and strengthen fisheries and aquaculture research in Asia and the Pacific Islands. More recently, it has extended its work to Africa (aquaculture) and Latin America (stock assessment/management). ICLARM's major role is to conduct and promote research. In 1990, research will comprise 50% of total operating expenditures, which is similar to the norm in the CGIAR. ICLARM's research is mostly applied in nature and is carried out in association with national programmes.

The Panel concluded that many of the activities of ICLARM conform to those considered acceptable for a CGIAR centre. ICLARM is a research institution, with a number of activities that relate to the TAC's list of international research and related needs. The ICLARM programme is made up of three major research programmes: Capture Fisheries

Management, Aquaculture, and Coastal Area Management. The Asian Fisheries Social Science Research Network is considered part of the research programme. Its mode of operation closely follows that of a CGIAR centre, especially in its Capture Fisheries Management, Aquaculture and Information programmes. The Coastal Area Management Programme may conform less to the CGIAR model, because in addition to applied research it involves considerable technical assistance and project management. However, the Coastal Area Management Programme does represent an international research need, "Land Use Management, Research to understand multiple and competing land use options for coastal areas". The Panel concluded research in this area is needed, but ICLARM's present involvement was less related to research than to technical assistance. In its work in Capture Fisheries Management and Aquaculture, the Centre operates through collaborative research, since the Centre has no research facilities of its own at headquarters or in its host country.

ICLARM has had a heavy involvement in developing national research capacity. To do this it has emphasized training, which is complemented and strengthened by a strong programme in documentation and information. The Centre has made considerable investments in developing and coordinating networks, most of which have information exchange as their major purpose. The Coastal Aquaculture Network is involved in both reserach consultation and collaborative research, while the Giant Clam Research Group is a collaborative research network. The ASEAN Coastal Resources Management Project acts mostly as a collaborative research and information exchange network. The ASEAN Fisheries Social Science Research Network is a research consultation network. Also, ICLARM has emphasized close working relationships with national programmes, through outposting of staff, training and networking.

The ICLARM programme is, by and large, international in scope and content, and reflects the interests and needs of some developing countries through the planning mechanisms of the networks it coordinates.

6.   To what extent does ICLARM conform to the preferred institutional nature of a CGIAR Centre with respect to mandate and governance?

The Panel concluded that both the mandate and the governance of ICLARM conform to that of the CGIAR Centres.

(a)   Mandate

ICLARM's mandate is defined in terms of the conduct and stimulation of research on fish and other aquatic organisms. It hence can be regarded primarily as a commodity research Centre, with the Aquaculture Programme being the major contributor here, along with the Capture Fisheries Programme.

Resource management and conservation also feature in the Centre's mandate, especially in its Capture Fisheries and Coastal Area Management Programmes.

The major, regional focus is Asia, with smaller programmes in Africa and Latin America. ICLARM has programmes across the aquaecological spectrum of marine, inland, coastal and land-based systems.

Its institutional strengthening activities embrace training, research and information networks.

(b)   Governance

ICLARM is a non-stock, non-profit philanthropic Philippine corporation which was granted tax-exemption status in the Philippines in 1977 through a Presidential Decree.

The Center is governed by a Board of Trustees serving in their individual capacities. The Board operates like the Board of a CGIAR Centre and sets the policies of the Centre. ICLARM has had a donor support group since 1986 that provides a forum for communication concerning the Centre's programmes and financial requirements.

7.   From consideration of the above issues, is there a case for considering admission of ICLARM into the CGIAR?

ICLARM, by virtue of its activities, mandate and governance does qualify in the view of the Panel for consideration for admission to the CGIAR.

Research activities in fisheries are not adequately represented in other international research centres. The continuum of fisheries systems requires more strategic research of an international character. ICLARM is already conducting research on most of the research needs identified in Annex I of "A Possible Expansion of the CGIAR - Part I. Interim Report".

In addition, there are a number of areas that need attention from ICLARM. Unmet or partially met needs include pond productivity and nutrient dynamics especially in semi-intensive systems, development of alternative feedstuffs (especially replacing use of fishmeal supplements), reduction of a disease transmission through seed distribution, understanding of gender issues in fisheries, and methodologies for participatory fishing production systems.

Some resources needed for strategic research and the enlarged research agenda mentioned above can be found by reducing some information and training activities that are also being supported by regional organizations.

In the light of the above, the Panel concluded that options 7 b, c, and d, are not appropriate to be pursued. It is unlikely that incorporation of ICLARM into an existing CGIAR centre, e.g. IRRI, would be beneficial to either party and might well be inhibiting. There is no obvious candidate non-associated centre with which ICLARM might be combined, and no unlisted option suggested itself to the Panel.

8.   What institutional options would be appropriate for incorporating into the CGIAR System those research activities in fisheries not currently covered either by the CGIAR or ICLARM, or by other institutions?

If ICLARM is brought into the CGIAR System, it could stimulate work in those areas of fisheries not covered in its current research

agenda or suggested as an international research need by the Panel in the answer to Question 7 above. These include: development of fish processing/preservation techniques, and understanding human health hazards in fishing systems. A topic of much wider scope that may have impact on fisheries, but that is beyond the comparative advantage of ICLARM, is the effect of environmental changes on fisheries.

ICLARM should develop a draft strategic plan and have it available for a comprehensive EPR/EMR. Also, to meet its goals, the Centre will need research facilities of its own at its headquarters rather than to continue to borrow facilities as at present. In the view of the Panel, it would also be necessary for ICLARM to set up a Scientific Programme Committee with a high proportion of active research workers.

Developing country capabilities in strategic research are inadequate. The gap is likely to be particularly detrimental in the future since new management needs and development opportunities have emerged as a result of resource scarcity in fisheries. Although these scientific issues are of global concern, their relative importance differs among geographical areas, depending on the present and potential significance of fishery systems there. Decisions regarding the inclusion of ICLARM in the CGIAR System should consider the global need to strengthen the strategic research capabilities of developing countries in fisheries. In that respect, the development of regional structures for cooperation in research, and new research in areas of strategic significance, require different institutional arrangements at national and regional levels.

ICLARM could assist or lead in regional or continental efforts to stimulate and conduct strategic research on priority matters, probably through a network mode of operation.

A CONVENIENT CLASSIFICATION OF FISHERIES SYSTEMS

USED BY THE TAC PANEL ON FISHERIES RESEARCH DURING ITS DELIBERATIONS

OPEN WATER FISHERIES

    1.   CAPTURE: No seeding, harvest only; no control 1/

        - inland
        - marine

    2.   CULTURE-BASED: Seeding; less control 1/

        - inland
        - marine

    3.   AQUACULTURE: Control 1/, from seed to harvest

        - extensive/semi-extensive (natural feed)

CLOSED FISHERIES

        - semi-intensive (natural feed and feed supplementation)
        - intensive (supplementary feeding only)

1/ Control - can involve aquatic environment, fish populations, nutrition, property rights, and management.

DEFINITIONS OF FISHERIES SYSTEMS

A.   In considering fish culture systems we may distinguish intensive and extensive systems. This terminology is, however, ambiguous because there are at least three ways of characterizing differences between the two. The first definition involves a relatively high level of human control of factors such as the aquatic environment (water quality, predation, environmental quality, diseases), fish species (reproduction, the gene pool), nutrition, property rights, and management (caging, feed systems, disease control, productivity), as characterizing an intensive system.

The second definition regards a high level of stocking density (irrespective of other factors) as defining an intensive system. The third definition regards a relatively high level of investment of capital and/or labour as characterizing an intensive system. Clearly, there is no necessary coincidence between any two of these three definitions. In this discussion we use, primarily, definition 1.

B.   A second common and important distinction is that between open and closed systems. Large water bodies ("open") are exploited typically by simple systems with low technological inputs, although some capture systems may involve large capital investments and in high technology machinery. Some open culture systems may, nevertheless, have a high stocking density (e.g., crustacean farms). Even when there is a high technological input (e.g., salmon cages) they are dependent upon the "natural" quality of the aquatic environment.

Smaller water bodies ("closed"), whether static or flow-through, lend themselves to the use of a wider range of controls (e.g., broodstock, nutrition). However, not all small water bodies are truly closed, and many systems in such waters typically display a low level of technological input.

Tentative List of International Research and Related Needs
(From Interim Report)

	ASIA	SSA	LA/C	WANA

I. RESOURCE CONSERVATION AND MANAGEMENT

1. Global environmental concerns
(research on selected aspects)

	ASIA	SSA	LA/C	WANA
– Effects of environmental changes on agriculture, FORESTRY AND FISHERIES	x	x	x	x
– Effects of the management of natural resources on the global environment	x	x	x	x

2. (Agro) – DELETE ECOLOGICAL CHARACTERIZATION

	ASIA	SSA	LA/C	WANA
– Methods for (agro) – DELETE ecological characterization and zoning in relation to existing farming systems, forestry, and, FISHERIES and potential land/WATER uses	x	x	x	x
– Methods for response farming (practicality of forecasting seasonal rainfall, especially in semi-arid areas)	x	x		x

3. Germplasm conservation

	ASIA	SSA	LA/C	WANA
– Plant, animal, and aquatic species of regional and global importance	x	x	x	x

4. Natural forest ecology and management

	ASIA	SSA	LA/C	WANA
– Improved understanding of climatological and biological role of tropical forest ecosystems	x	x	x	
– Development of management principles for sustained yields of wood and non-wood products in forests	x	x	x	x
– Application of remote sensing methods to improve quantification of land use change with special reference to deforestation	x	x	x	x

5. Natural fisheries ecology and management

	ASIA	SSA	LA/C	WANA
– Development and validation of models for management of capture-based fisheries	x	x	x	x
– APPLICATION OF REMOTE SENSING METHODS TO IMPROVE QUANTIFICATION OF FISHERIES STOCK	*	*	*	*

	ASIA	SSA	LA/C	WANA
6. Soils conservation and management				
− Development of techniques for increased production by small farmers in vertisol areas	x	x	x	x
− Development of appropriate tillage methods for soil, water and power conservation	x	x	x	x
− Understanding the long run nutrient economy of tropical soils under increasing cropping intensity	x	x	x	
− Better understanding of the chemistry and management of acid soils in the tropics	x	x	x	
− Research on the clearing and sustainable management of cleared forests and woodlands	x	x	x	
7. Water conservation and management				
− Development of principles and methods for sustainable management of water resources (including drainage)				
−− irrigated systems	x	x	x	x
−− rainfed systems	x	x	x	x
−− exploitation of groundwater resources	x	x	x	x
8. Land use management				
− Research to understand multiple and competing land use options for:				
−− watersheds	x	x	x	x
−− coastal areas	x		*	
−− rangelands		x		x
9. Development of production systems for sustainable resource management				
− Development of testing of cost-effective methods for assessing the contribution of trees and shrubs to production systems	x	x	x	x
− Development of management principles for agroforestry systems				
− Multiple systems for crops/livestock/trees	x	x	x	x
− Multiple systems for crops/livestock/fish	x	*		

	ASIA	SSA	LA/C	WANA

II. CROP PRODUCTIVITY RESEARCH

1. Germplasm enhancement, breeding and int. trials (including use of biotechnology)

	ASIA	SSA	LA/C	WANA
– Development of adaptation, tolerance and resistance to biotic and abiotic stresses for important crops	x	x	x	x
– Selection for yield potential	x	x	x	x
– Selection for quality:				
–– food	x	x	x	x
–– feed	x	x	x	x

2. Crop systems

	ASIA	SSA	LA/C	WANA
– Sequencing, mixing, intercropping principles	x	x	x	x
– Tillage, planting and harvesting systems	x	x		x

3. Plant protection

	ASIA	SSA	LA/C	WANA
– Components for integrated pest management for main crops				
–– Identification and evaluation of biological control agents	x	x	x	x
–– Other components for integrated pest management	x	x	x	x

4. Plant nutrition

	ASIA	SSA	LA/C	WANA
– Understanding interactions of nutrients/ microbiological processes for designing simple methods for improved nutrient use efficiency	x	x	x	x

5. Fertilizer production methods from indigenous materials, especially P

	ASIA	SSA	LA/C	WANA
	x	x	x	

6. Seed technology and production

	ASIA	SSA	LA/C	WANA
– Development of methods for smallholder seed production to enhance adoption of improved cultivars	x	x	x	

7. Machinery research and development

	ASIA	SSA	LA/C	WANA

III. LIVESTOCK PRODUCTIVITY RESEARCH

1. Germplasm enhancement and breeding

	ASIA	SSA	LA/C	WANA
- Development of breed improvement strategies appropriate for smallholder production systems				
-- Identification and multiplication of disease and pest resistant animals	x	x		
-- Introduction and evaluation of superior sheep and/or goat breeds	x	x		x
-- Evaluation of crossbreeding systems	x	x		x

2. Livestock systems

	ASIA	SSA	LA/C	WANA
- Herd and flock management under increasing pressures of land and forage resources	x	x		

3. Animal nutrition and feed

	ASIA	SSA	LA/C	WANA
- Improvement of the feed resource base				
-- fodder crops, pastures and shrubs	x	x	x	x
-- crop residues and by-products	x	x		x
- Strategic feed supplementation	x	x	x	x

4. Reproduction

	ASIA	SSA	LA/C	WANA
- Identification of critical constraints to improved reproduction	x	x		

5. Animal health; identified priorities, e.g.:

	ASIA	SSA	LA/C	WANA
- Tsetse-borne diseases		x		
- Tick-borne diseases	x	x	x	
- Reproduction diseases	x	x	x	x
- Endoparasites in ruminants	x	x	x	x

IV. FISH PRODUCTIVITY RESEARCH

1. Germplasm enhancement and breeding

	ASIA	SSA	LA/C	WANA
- (Selection of improved) - DELETE IMPROVING germplasm of key species	x			
- Maintenance of quality of stocks of key species	x	x	x	

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	ASIA	SSA	LA/C	WANA

2. Fish production systems

(– Culture-based fisheries for smallholders/
fishermen) TO BE DELETED — ASIA x, SSA x

AND REPLACED BY:

– POND PRODUCTIVITY AND NUTRIENT DYNAMICS,
ESPECIALLY IN SEMI-INTENSIVE SYSTEMS — ASIA *, SSA *

– CARRYING CAPACITY OF OPEN AQUATIC SYSTEMS — ASIA *, LA/C *

– RECRUITMENT ENHANCEMENT — ASIA *, SSA *, LA/C *, WANA *

3. Fish nutrition — ASIA x

– NUTRITIONAL REQUIREMENTS OF CULTURED
AQUATIC SPECIES — ASIA *, SSA *, LA/C *, WANA *

– NUTRITIONAL CONSTRAINTS IN EXTENSIVE AND
SEMI-INTENSIVE SYSTEMS — ASIA *, SSA *

– DEVELOPING ALTERNATIVE FEEDSTUFFS
— CRITICAL AMINO AND FATTY ACIDS — ASIA *, LA/C *, WANA *

4. Reproduction

– Methods for propagation of seed by natural
and artificial breeding — ASIA x, WANA x

– Reduction of disease transmission through
seed distribution — ASIA x

5. Pests and diseases

– Constraint analysis on pests and diseases — ASIA x, SSA x, LA/C x, WANA x

– Studies on control of viral disease in
aquatic species — ASIA x, SSA x, LA/C *, WANA x

6. AQUACULTURE ENGINEERING

– FISH FARM DESIGN — ASIA *, SSA *

– CAGE, PEN AND OTHER ENCLOSURES — ASIA *, SSA *

V. FORESTRY RESEARCH

**1. Germplasm enhancement, breeding and
biotechnology**

– Selection (including clonal propagation
and tissue culture where appropriate)
of selected multi-purpose species — ASIA x, SSA x, LA/C x, WANA x

	ASIA	SSA	LA/C	WANA
− Exploratory research on genetic resistance to biotic and abiotic stresses	x	x	x	
− Biological processing of wood wastes and non-wood products for economic use	x	x	x	

2. Forest systems and establishment methods

	ASIA	SSA	LA/C	WANA
− Development of data base	x	x	x	x
− Methods and principles of intensive biomass forestry, with emphasis on fuelwood and fodder	x	x	x	
− Afforestation techniques for wasteland reclamation	x	x	x	x

3. Tree nutrition

	ASIA	SSA	LA/C	WANA
− Understanding soil organic matter and soil microbiology/tree interactions in major agro-ecological zones, with emphasis on seedling survival, enhanced yield and improvement in nutrient use efficiency	x	x	x	x

VI. COMMODITY CONVERSION AND UTILIZATION RESEARCH

1. Crops

	ASIA	SSA	LA/C	WANA
− Post-harvest technology	x	x	x	

2. Livestock

3. Fish

	ASIA	SSA	LA/C	WANA
− Development of fish-processing/PRESERVATION techniques	x	x		

4. Forest products

	ASIA	SSA	LA/C	WANA
− Assessment studies on efficiency utilization of biomass	x	x	x	
− Utilization research for making better use of presently non-commercial timber species	x	x	x	

VII. RESEARCH ON HUMAN LINKAGES

1. Analysis of human nutrition

- Development of data base on food consumption patterns of the rural and urban poor and on

	ASIA	SSA	LA/C	WANA

the nutritional composition of foods (incl. micronutrients and antinutritional factors, potentially toxic), in order to identify nutritional risks

	x	x	x	x

- Development of reliable, cost-effective, rapid indicators of malnutrition for agricultural programme development and evaluation

	x	x	x	x

- Investigation of the effect of alternative production methods on the nutritional quality and safety of food

	x	x	x	x

2. Other linkages

- Understanding of general gender issues

	x	x	x	x

- Understanding of human disease hazards from:
  -- fish production systems
      (and fish products) - DELETE

	x	x	(x) DELETE	

  -- Irrigated agriculture

	x	x		*

  -- Crop, animal, water and pesticide management implications as they relate to human health (INCLUDING USE OF MANURES IN AQUATIC SYSTEMS)

	x	x	x	x

  --- AQUATIC ENVIRONMENTAL POLLUTANTS FROM NON-FARM SOURCES

	*		*	*

- SOCIO-CULTURAL ORGANIZATION AND FARMING SYSTEMS

	ASIA	SSA	LA/C	WANA
--- USE RIGHTS	*	*	*	*
--- HARMONIZATION OF USE OF SCARCE RESOURCES	*	*		
--- RISK MANAGEMENT STRATEGIES	*	*	*	
--- MECHANISMS AND INSTITUTIONS FOR COOPERATION AT COMMUNITY LEVEL	*	*	*	

VIII. SOCIO-ECONOMIC AND POLICY RESEARCH

1. Economic and social analysis at micro level

- Development and testing of cost-effective methodology for participatory production systems research

	x	x	x	x

- Modelling of technology and policy options for smallholder production systems

	x	x	x	x

2. Market analysis

- Aggregate commodity supply and demand trends

	x	x	x	x

	ASIA	SSA	LA/C	WANA
- Structure and functioning of poorly under-stood input and product markets, e.g.				
— fuelwood and substitutes	x	x	x	
— livestock products		x		x
— fish and fish products	x	x		
— fertilizers	x	x	x	

3. Policy analysis

	ASIA	SSA	LA/C	WANA
- Assessment of alternative development strategies and technology policies for poverty alleviation, INCLUDING INTER- AND INTRA-SECTORAL RELATIONS	x	x	x	x
- Particular areas identified for policy analysis				
— irrigation policy	x	x	x	x
— fisheries	x	x		
— food programmes	x	x	x	x
— common property	x	x		x
— labour markets	x	x	x	x
— equity concerns	x	x	x	x
- Assessment of underlying causes of ongoing environmental degradation processes and identification of policy options				
— deforestation causes and processes	x	x	x	
— reforestation incentives	x	x	x	x
— chemical pollution	x	x	x	x
— soil erosion	x	x	x	x
- Land AND WATER use management policies (e.g. water-sheds, coastal areas, rangelands, PROBLEM SOILS)	x	x	x	x

4. Research on research

	ASIA	SSA	LA/C	WANA
- Methods for ex-ante analysis of expected impact and for priority setting at the national and international level	x	x	x	x
- Ex-post impact assessment studies including development of methods	x	x	x	x

IX. INSTITUTION BUILDING AND RESEARCH RELATED ACTIVITIES

1. Training

	ASIA	SSA	LA/C	WANA
- Training of national staff on:				
— advanced research techniques	x	x	x	x
— field experimentation for junior professionals	x	x	x	
— system-based, on-farm research	x	x	x	x
— research management and priority setting	x	x	x	x

	ASIA	SSA	LA/C	WANA

2. <u>Conferences and seminars</u>

    – Specialized and network-orientated events   x   x   x   x

3. <u>Documentation and dissemination of information</u>

    – Specialized services   x   x   x   x

4. <u>Research on institutional systems; e.g.</u>

    – NARDS   x   x   x   x

    – Irrigation Systems   x   x   x   x

    – Forestry Systems   x   x   x

    – **FISHERY SYSTEMS**   *   *   *   *

5. <u>Strengthening national research systems</u>

    – Organization and management of research
       institutions   x   x   x   x

    – Linkages among research, development,
       policy makers, and public opinion   x   x   x   x

    – Research programme strategies   x   x   x   x

6. <u>Technical assistance</u>

7. <u>Networks</u>

    – Assist the establishment and administration
       of collaborative research and information
       networks   x   x   x   x