



REPORTS OF THE THIRD MEETING AND THE FIRST GENERAL ASSEMBLY OF THE ASIA-PACIFIC ASSOCIATION OF AGRICULTURAL RESEARCH INSTITUTIONS

Bangkok, 11-14 December 1990



**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
REGIONAL OFFICE FOR ASIA AND THE PACIFIC
BANGKOK, THAILAND
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PART II

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PART I

**REPORT OF THE
THIRD MEETING OF THE
ASIA-PACIFIC ASSOCIATION OF AGRICULTURAL RESEARCH INSTITUTIONS
(APAARI)**

I. INTRODUCTION

Attendance

1. The Third Meeting to finalize the establishment and to prepare the programme of work and budget of the Asia-Pacific Association of Agricultural Research Institutions (APAARI) was held at the FAO Regional Office for Asia and the Pacific (RAPA), Bangkok, Thailand, from 11 to 14 December 1990. Eighteen experts from 15 countries participated in the Meeting. The List of Participants is attached as Appendix I.

Introductory Remarks

2. Dr. R.B. Singh, Regional Plant Production and Protection Officer, FAO RAPA, Secretary of the Meeting, welcomed the participants on behalf of the Secretariat. He referred to the high level of participation as well as to the diversity among the countries of the Region represented at the Meeting and hoped that the deliberations would lead to crystallization of programme of work and activities of the Association.

3. Dr. B. Muller-Haye, Chief, Research Development Centre, Research and Technology Development Division (AGRR), FAO Headquarters, Rome, Italy conveyed the greetings and best wishes of Dr. M.S. Zehni, Director of the Research and Technology Development Division. He assured the participants that their deliberations will be closely monitored and that their recommendations would be followed up as much as possible. Introducing FAO's research development activities, he mentioned that the activities included specific discipline-oriented research projects, reviews and analyses of country research programmes/infrastructures, institution-building, and advice on research policies and strategies. In promoting inter-country research cooperation, FAO encourages and in some cases provides logistic and technical support for regional or sub-regional agricultural research associations, such as APAARI, said the AGRR Chief. In concluding, he expressed his hope that participants would have fruitful discussions and would carry APAARI another step forward.

Opening Statement

4. Mr. H. Tsuchiya, Officer-in-Charge and Deputy Regional Representative, FAO RAPA, welcomed the participants on behalf of the Director General of FAO and on his own behalf. He expressed satisfaction that the Member Nations of the Region have maintained a persistent interest in the establishment of APAARI. He recalled that all the FAO Regional Conferences for Asia and the Pacific held since 1984 had strongly endorsed and recommended the establishment and operationalization of the Association under the auspices of FAO.

5. The Officer-in-Charge expressed satisfaction that FAO RAPA, in close cooperation with the FAO Headquarters (AGR), has strived hard to implement the recommendations of the Conferences.

6. The Region has certain unique features, Mr. Tsuchiya said. It has a monopoly or near-monopoly on certain crops and commodities: rice, coconut, jute, buffaloes and aquaculture, among others. The Region accounted for 56% of the world's population and 73% of the world's agricultural farming household, but only about 30% of the world's arable land. The pressure of agricultural population on agricultural land in

the Region was about seven times that of the rest of the world. Further, the land frontiers are almost closed in a majority of our countries and the per caput arable land is declining, he asserted.

7. Mr. Tsuchiya referred to the wide differences in the research and development capacity of the nations of the Region. Some have strong R&D programmes and may be in a position to share their experiences and expertise with other countries. But many Member Nations lagged behind in this field, observed Mr. Tsuchiya.

8. With the above backdrop, Mr. Tsuchiya emphasized the need for an early effective functioning of the Association of Agricultural Research Institutions to promote region-wise cooperation. Underscoring the importance of generation and wide adoption of new technologies for increased and sustained agricultural production in the Region, Mr. Tsuchiya urged the Meeting to finalize the programme of work of the Association with clearcut responsibility and accountability of the cooperating countries.

9. Mr. Tsuchiya also referred to the outstanding contribution of Dr. R.B. Singh in initiating and pursuing the establishment of APAARI, among his other eminent contributions at the Regional Office. He hoped that Dr. Singh's continuing support to APAARI would be available even after his transfer to the FAO Headquarters in the near future.

Election of Officers

10. The Meeting elected Dato Dr. Mohd. Yusof Hashim, Director General, Malaysian Agricultural Research and Development Institute (MARDI), Malaysia, as Chairman and Dr. Keith W. Steele, National Science Director, MAF Technology, Ministry of Agriculture and Fisheries, New Zealand, as Vice Chairman.

Adoption of Agenda

11. The Agenda as adopted by the Meeting is set out in Appendix II.

II. PROGRESS REPORT ON THE ESTABLISHMENT OF APAARI

12. Dr. R.B. Singh, Secretary of the Meeting, reviewed the past activities related to the establishment of APAARI. He mentioned that all the FAO Regional Conferences for Asia and the Pacific Region, held in 1984, 1986, 1988 and 1990, had strongly recommended the establishment and operationalization of APAARI. He recalled that the 1984 Conference had emphasized that the research priorities in the Region should be kept under continuing review, common research needs and prospects should be identified, research results and technologies of wider application should be recognized, and an effective regional association of agricultural research institutions to share the experiences and expertise and to upgrade the collective capability of the Region in agricultural R&D should be established under the sponsorship of FAO. This recommendation was endorsed by the subsequent regional conferences. Pursuant to the recommendations of the regional conferences as well as other concerned fora, FAO RAPA in close collaboration with FAO Headquarters (AGR) had organized expert consultations in 1985 and 1988 for establishment of the Association. These expert consultations had strongly endorsed the recommendations of the regional conferences and

prepared the Constitution of the Association as well as the modality of its operation. One of the important outcomes of the Consultation in 1985 was the FAO RAPA publication on agricultural research systems in the Asia-Pacific Region which was very well received throughout the Region and outside.

13. As per the recommendations of the expert consultations and according to the Constitution, FAO RAPA approached the Member Nations in the Region to allow their apex research institutions to become members of the Association. Dr. Singh revealed that all the countries appreciated and endorsed the move for the establishment of the Association, and 10 countries, namely, Bangladesh, China, Fiji, India, Malaysia, Pakistan, Philippines, Republic of Korea, Sri Lanka and Thailand had already become members of the Association and agreed to pay the membership fees.

14. He recalled the following recommendations of the 1988 Consultation "The Association may be deemed as established when a minimum of 10 institutions in the Region have agreed to become members of APAARI". Considering that 10 countries had already become members of APAARI, Dr. Singh expressed satisfaction that the Association should now be taken as established. He also mentioned of the positive response from Japan, Nepal and other countries, and urged that the remaining countries should soon become members of the Association.

15. Dr. Singh mentioned that several of the very successful research and development networks supported by UNDP, Trust Funds and other resources, die out after the external funding support is withdrawn. He suggested that the establishment of APAARI may provide a mechanism for sustaining such networks after the expiry of the external financial support. He also pointed out that APAARI will play yet another important role by providing a forum for the Region's representatives on the CGIAR to collect information regarding the current status of research and technology development in the Region as well as to keep APAARI informed of the developments at the CGIAR.

16. Referring to this Meeting, Dr. Singh emphasized that the programme of work and budget of APAARI should critically be examined and approved so that appropriate activities could be undertaken. He also desired that this meeting should elect the office bearers of the Association and streamline the modality of its functioning.

17. Dr. Singh mentioned that this Meeting, besides finalizing the programme of work and budget of the Association, should critically examine the following three secretariat documents, which along with the country papers, would constitute valuable publications for promoting regional cooperation:

- RAPA/APAARI/90/06 - Agricultural Research Systems in Asia and the Pacific Region,
- RAPA/APAARI/90/07 - Agricultural Research and Technology for Sustainable Agricultural Development, and
- RAPA/APAARI/90/08 - Agro-Climatic Zone Specific Research in State Agricultural Universities in India.

III. NATIONAL AGRICULTURAL RESEARCH SYSTEMS

18. Experts from 13 of the 15 countries present at the Meeting gave a comprehensive account of current status and future prospects of agricultural research and technology development in their respective countries. The detailed country reports along with the secretariat overview papers will be published separately as FAO publications. The salient features of agricultural research and technology development in individual countries are given below:

China

19. China's cultivated land area was 95.72 million ha, cropping area was 144 million ha, and area under forest was 124 million ha. The total grain output in 1990 reached 425 million tons, total meat output 27 million tons, and total output of aqua-products 13 million tons.

20. China's agricultural research system is a two-tier organization. The first tier comprises the research institutions directly under the federal Ministry of Agriculture and the second tier comprises the institutions sub-ordinated to each province. Agricultural universities and colleges administered by Ministry of Agriculture or provincial governments are also important parts of agricultural research. Some institutes of Chinese Academy of Sciences (CAS), Chinese Academy of Forest Sciences, and Academy of Water Resources are also doing agricultural research works. There are 58 national agricultural research institutions and centers sub-ordinated to the federal Ministry of Agriculture. The total yearly budget in 1988 for agricultural research institutions was Yuan 1.07 billions.

21. The hybrid rice research has yielded highly practical results. Hybrid rice in China now covers 15 million ha. China has also developed new hybrids of maize. Improved varieties of wheat, cotton, soybean, rapeseed and others are important developments. Research done was helpful in developing techniques for control of plant diseases and insect pests. Biological control was successful in China. Improvement of the low yielding lands and water saving irrigation were other important achievements. Lean-meat pigs and ducks and table chickens and fine wool sheep were developed. China had succeeded in the control of domestic animal and poultry diseases with the use of immunity principles. China has also made good progress in fishery sciences. In the past ten years, massive seed-breeding technique for prawn culture was developed and more than one billion prawn fries were released to natural sea area annually. In recent years, noticeable achievements have also been made in forestry science and technology, although research priorities in China were grain, animal husbandry and fishery and the gains in these fields were more widely felt. Breeding improved varieties of grain crops especially paddy rice, wheat, corn, soybean, rapeseed, and cotton, as reflected in the National Five-Year Plans, is high priority.

22. The progress in technology development had great influence on the country's agricultural production. It is estimated that 30%-40% of the extra yield in Chinese agricultural production may be attributed to the progress of scientific technology. For instance, ever since hybrid rice was commercialized in China, about 93 million ha with an extra yield of 70 billion kg were exploited.

23. China with only 7% the world's arable land feeds 22% of the world's population and keeps its soil fairly fertile. It is indispensable for the country to follow the fundamental principles of land utilization and fertilization, and integration of agriculture, forestry, and animal husbandry for improving sustained agricultural production. Traditional agriculture in China for thousands years has been based on organic farming, with priority on the combination of farming and feeding the land by rotation of graminaceous and legume crops, and resorting to green manuring for restoring soil fertility.

24. There were 1,099 agricultural research and development institutions, with a staff of 125,000 among which there were 35,954 scientists and engineers. In the Chinese Academy of Agricultural Sciences (CAAS), a science and technology documentation and information system has been established. In addition, information institutes have been founded at 27 provincial academies of agricultural sciences.

25. The number of countries, both developed and developing, having co-operative relation in agriculture with China had increased from over 50 in 1978 to over 100 in 1990. China has had cooperative relations and receives support from FAO, UNDP, World Bank, WFP, IFAD and others and the country had formal cooperative agreements with 10 international centres. In China, there is a fairly comprehensive extension system of agricultural technology and an effective linkage of extension with research.

Fiji

26. The Republic of Fiji comprises of about 330 islands with a land area of about 18,300 sq.km. It has an estimated population of around 740,000. The two largest islands, Viti Levu (10,000 sq.km) and Vanua Levu (5,520 sq.km) account for about 87% of the total land area and contain 90% of the population.

27. In Fiji, the primary production sector (agriculture, forestry and fisheries) is one of the strategic sectors of the economy. It provides one of the best avenues for the generation of employment and incomes.

28. Upto 1970 the primary production sector contributed significantly to the national GDP, being 44.2% in 1950, 47.5% in 1957, 33.6% in 1965 and 29.1% in 1970. The share of the primary sector has fallen sharply from 29.1% in 1970 to 22.1% in 1975. Between 1980-87, the share of the primary sectors remained between 18.4% to 22.2% with the average contribution to the GDP of 20.3% for the same period. In 1988, the agricultural sector accounted for 24% of the GDP, 80% of the total domestic export earnings and 42% of the total employment. Between 1980 and 1988, the contributions of the various components to the agricultural GDP were as follows: sugarcane (42%), subsistence (28.9%), other crops (14.7%), livestock (4.3%), fisheries (6.1%) and forests (4%).

29. The principal agricultural research organizations in the country are: (a) Research Division of Ministry of Primary Industries which is responsible for research on all crops other than sugarcane; these being rice, tree crops (coconut, cocoa), root crops (taro, ginger, yams, cassava, kava), vegetables, fruits and pulses, and crop diversification; (b) Research Section of Animal Health and Production Division of the Ministry of Primary Industries responsible for research activities in

beef, dairy, pigs, goats and sheep production; (c) Research Section of the Fisheries Division of the Ministry of Primary Industries; (d) Administration and Support Services Section of the Ministry of Forests responsible for silviculture research and timber utilization research and promotion; and (e) Research Centre of Fiji Sugar Corporation responsible for research on sugarcane.

30. The present percentage budgetary distribution in the Ministry of Primary Industries for research as compared to that for extension is as follows:

	RESEARCH	EXTENSION
Crops	30.0	70.0
Livestock	42.5	57.5
Fisheries	11.0	90.0
Forests	6.5	93.5
AVERAGE	20.7	79.3

31. In the Research Division of the Ministry of Primary Industries the prioritization of research projects within the major crop programmes is based upon guidelines contained in the Agricultural Research Plan document evolved in 1985.

32. The major formal interaction between research and extension occurs in two joint meetings that take place in June and December every year. These meetings provide a forum for discussion of the research findings as linked to crop development. There are also informal interactions between research and extension constantly throughout the year.

33. Presently, there is no formal system of assessment of the impact of agricultural research activities on agricultural production, environment and sustainability of agricultural development. However, the major impact of agricultural research on agricultural production has been in the area of providing of higher yielding crop varieties and their improved methods of cultivation e.g. rice, root crops, vegetables, pulses and sugarcane.

34. Presently, the Research Division has 22 professional officers, 66 technical officers, and 17 supporting staff. In comparison, the Extension Division has a total of 215 professional and technical staff.

35. The major constraints in agricultural research activities are (i) inadequate operational funds, (ii) lack of suitably qualified staff and (iii) inadequate support services.

36. The Research Division of the Ministry of Primary Industries has one central library containing about 500 books and 30 journals. It also produces an annual research report and two issues of Fiji Agricultural Journal.

37. Presently, the major international assistance to agricultural research in the country comes from (a) Japanese International Cooperation Agency (US\$ 0.75 million annually for rice); (b) European Economic Community (EEC) (US\$ 0.65 million annually for coconuts); (c) Australia and New Zealand Governments (US\$ 0.40 million annually for the Soil Classification and Evaluation Project; and (d) Australian Council

of International Agricultural Research (ACIAR) (Kava disease research). There is also a proposal for FAO funding of the fruits and nuts research to the tune of US\$ 0.40 million annually, starting 1991.

38. Presently the agricultural research system in the country needs to be greatly strengthened in terms of staffing, operational expenses, support services, and research/extension linkage. This is to ensure that future agricultural development in the country is not only research based but also research backed.

India

39. Agriculture in India accounts for 40% of the GNP and 26% of the total exports of the country. Around 70% of the population of about 800 million depend on agriculture for their livelihood. In the Indian context, agriculture includes crop production, horticulture, livestock production, veterinary sciences, fisheries, agricultural engineering, forestry and rural home science. The total geographical area of India is about 328.8 million ha and only 21.9% of the land mass is under forest at present. Out of the gross cropped area of about 180 million ha with 35 million ha under double crops, 64 million ha are under irrigation.

40. Rice is the most important food crop occupying 42 m.ha, followed by wheat (24 m.ha), pulses (24 m.ha), oilseeds (19 m.ha), sorghum (16 m.ha), millets (16 m.ha), cotton (8 m.ha), maize (6m.ha), and sugarcane (3 m.ha), which are the principal crops of the country. India has also vast potential fishing resources comprising 2.02 million sq.km EEZ, 7517 km of coastline.

41. The land ownership varies from state ownership, feudal landlords, tenants and peasant farmers. The agro-climatic settings are equally diverse. While the southern half is within the tropics, the northern half is in the sub-tropical warm temperate zone. Nearly 70% of the agriculture is rainfed and is subject to the monsoonal aberrations like drought and flood. The Planning Commission has grouped the 126 agro-climatic ecological zones into 15 regions based on physical conditions, topography of soil, geological formation, rainfall, cropping pattern, development of irrigation and mineral resources for each district of the country.

42. The present agricultural research system in India comprise the networks of Indian Council of Agricultural Research (ICAR) institutes and the state agricultural universities (SAUs). There are 46 central institutes including four deemed universities, 20 national research centres, nine Project Directorates and 71 All-India Coordinated Research Projects. The 26 SAUs are spread over the country. The total scientific manpower is approximately 27,000 and the supporting staff number around 100,000. Many other ministries like Science and Technology, Environment and Forest, Department of Biotechnology, Ministry of Water Resources, and Ministry of Human Resources Development, etc. are also interacting in the agricultural research activities.

43. During the Seventh Five-Year Plan, the total outlay for agricultural research and education in the country as a whole was Rs. 7,040 millions out of which ICAR's share was Rs. 4,381 millions which is around 62% of the total amount spent on research and education (US\$ 1 =

Rs. 18). During the Eighth Five-Year Plan (1990-95), an outlay of Rs. 15,940 millions has been proposed. The following figures (in million) will indicate the sector-wise allocation during the two plan periods:

	<u>Seventh Plan</u>	<u>Eighth Plan Proposed</u>
RESEARCH		
Crop Science	923.9	2700
Soil and Agronomy	568.3	1850
Animal Sciences	490.7	1850
Horticulture	280.5	1000
Fisheries	171.4	550
Agricultural Engineering	147.6	600
Agri Economics & Statistics	29.2	90
AGRICULTURAL EDUCATION	775.6	2200
EXTENSION EDUCATION	379.8	1600
ICAR HQS INCLUDING DARE	16.2	500
FOREIGN AIDED PROJECTS	598.2	3000
INCLUDING WORLD BANK PROJECT		
I.E. NARP II AND NSP		
TOTAL	4381.4 =====	15940 =====

44. The planning process for agricultural research and education in India is very comprehensive. It begins with the formulation of Steering Group of Agriculture and allied sectors by the Planning Commission. The Group identifies a specific working group on agricultural research and education consisting of Vice-Chancellors, Directors of ICAR institutes and eminent scientists. This group further constitutes sub-groups for different sectoral programmes to undertake comprehensive reviews and make recommendations to the Working Group. This process ensures termination of outlived plan schemes, reorganization of the existing schemes/mandate and identification of thrust areas for further research programmes and their projected outlay.

45. Since independence, the research on crop improvement has made a dent on the varietal scenario. As many as a 122 high-yielding, disease-resistant wheat varieties, and 258 varieties of rice have been released. Self-sufficiency in many crops like sugarcane, cotton, wheat, rice, tobacco, jute, etc. has been the hallmark of the continuing research efforts. In the horticultural crops, a large number of varieties have been developed including 119 varieties of vegetable crops, 27 varieties of potato, 25 of fruits, 18 in tropical tuber crops, 10 in coconut, 23 in cashewnut, 5 in pepper, and 11 in medicinal and aromatic plants. In animal sciences, major breakthroughs are the technologies for producing high-yielding and adapted breeds through cross-breeding with exotic dairy breeds; control and eradication of livestock and poultry diseases. Notable improvements have been made in the agronomic practices for rainfed agriculture in terms of selection of suitable varieties and crops, increasing cropping intensity, *in situ* soil moisture conservation, weed control and fertilizer application. In the fisheries sector, the average yield from the ponds has been enhanced from 50 kg/ha/year to 1,650 kg/ha/year. A large number of commercially important fresh-water fish species have been brought under aquaculture practices. The productivity of brackish water prawn culture systems has been

enhanced to 2,000 kg/ha/year. A hatchery technology has been developed for the production of seeds of white prawn and tiger prawn which would yield about 1,000 kg/ha/year.

46. In the Indian agricultural setting, cereals (rice, wheat) continue to receive the highest research priority. However, some increased importance has now been given to oilseeds, pulses and coarse grains followed by soil and water conservation, optimum input use, rainfed agriculture and agricultural engineering. Horticulture including plantation crops, animal husbandry, fisheries and agro-forestry have received relatively lower priority and budgetary allocations than the contribution of these sectors to the gross national product and to rural employment and distributive justice.

47. Technology generation is not an end in itself. Its success lies in the proper dissemination. The main responsibility of extension work in India rests with the Agriculture Departments of the State governments. The ICAR performs the extension education function and deals with the first-line extension projects and activities aimed at demonstrating the latest technological advances made by the scientists to the farmers, extension workers, training of extension functionaries and farmers, evolving suitable extension approaches, etc. ICAR has sponsored four first-line technology transfer projects - National Demonstration (ND), Operation Research Project (ORPs), Krishi Vigyan Kendras (KVKs)/Trainers' Training Centres (TTCs) and Lab-to-Land Programme. Every year, around 4,800 national demonstrations are organized on farmers' fields. Through the 150 ORPs, the proven technology in a particular subject is disseminated among farmers covering the whole village or a cluster of villages. Through the 109 KVKs, which are the vocational training centres, the practising farmers, farm women, young farmers, and school dropouts are trained on the principle of "learning by doing" and "teaching by doing". Through 104 Lab-to-Land Centres, over 20,000 farm families comprising small and marginal farmers and landless agricultural labourers, mostly from backward classes have been adopted for introduction of low-cost and no-cost agricultural and allied technologies.

48. To keep pace with the technological advances abroad, and to fill the gap, India has entered into a number of bilateral, multilateral collaborative programmes with around 40 countries including United Kingdom, France, U.S.A. and USSR. India has been a donor member of CGIAR and CABI. There are programmes with IRRI, ICRISAT, CIAT, CIMMYT, CIP, WARDA, IBPGR, ICARDA, IFPRI, ICRAF and ACIAR. A number of foreign aided projects with the assistance of IDRC, UNDP (FAO), USAID, USDA are in operation. Through the international collaboration, India has been able to exchange scientists, germplasm and also scientific information of mutual interest. The country has been taking active part in the South Asian Association for Regional Cooperation (SAARC). Till recently the Director General of ICAR was the Chairman of its Technical Committee on Agriculture.

49. The following priorities and thrust areas in agricultural research and education have been identified which are based on the present need to make agriculture knowledge-intensive using frontier technologies to accelerate R&D output in critical areas, developing appropriate rural technologies for farm women, research in agricultural economics and policy planning and creating genetic enhancement and technology blending centres:

- Conservation and planned exploitation of germplasm resources
- Enhancing productivity through evolution of new high yielding hybrids/varieties/breeds/strains with tolerance to biotic and abiotic stresses
- Development of integrated pest management practices to optimize plant protection
- Breeder seed production
- Research on export oriented commodities
- Diversification of agriculture with emphasis on agro-forestry, livestock and fisheries
- Development and refinement of dry farming technology
- Improving nutrient management system
- Inventory of natural resources
- Energy management in agriculture
- Post-harvest technology and engineering with emphasis on on-farm storage
- Fostering excellence in research and educational programmes
- Transfer of technology and improving information communication systems
- Human resource development

50. The World Bank has recently made a study of the status of the agricultural research in India. Specific recommendations on the research policy and strategy, research organization and management have been made in the report. The implications of some of these recommendations are being further studied while a few others have been accepted.

Indonesia

51. Indonesia is the largest archipelago in the world with total land area around 200 million ha. The 1980 population census estimated that Indonesia's total population would reach 183 millions in 1990. Agriculture accounted for 23% of GDP in 1987 (at current market prices). During the period 1983-87 the real agricultural GDP increased on an average by 3.6% per year.

52. The agricultural sector is the main source of income generation in the rural areas. Future growth in the agricultural sector is needed to stimulate increases in employment, incomes and the welfare of the rural people and to assure equitable distribution of the benefits of development. Future growth is also required in order to meet domestic demand and to increase foreign exchange earnings. Greater efficiency, productivity and sound use of natural resources are required to support sustainable agricultural sector growth.

53. In Indonesia, most of the agricultural research is carried out in the public sector. Private sector also conducts various research programmes to support its commercial activities. Some private firms

have requested public research institutions to do certain research activities to support their needs. In the public sector, agricultural research is carried out by various institutions. The Agency for Agricultural Research and Development (AARD) is the primary organization for agricultural research in Indonesia. The research activities conducted by AARD are focussed primarily on applied aspects to support achievement of the agricultural development objectives.

54. The research to generate the desired agricultural technologies was oriented to (i) promote regional development by determining the commodities which have a comparative advantage in the region, (ii) develop agricultural production systems according to the agro-climatic settings, (iii) create clear quality standards for seeds/varieties and products, (iv) support the move to create more capital intensive production systems, (v) enhance the necessary shift from traditional to commercial agricultural production system through increased efficiency, and (vi) assist in reducing seasonality in supply of agricultural raw materials for industrial purposes.

55. Research was expected to enhance the interdependence between agriculture and industry at various levels: pre-harvest, post-harvest and product processing, and to support diversification of the diet and broadening of the product base to provide employment, to meet domestic demand and to expand export potential. Priority will be given to research on products with high elastic demand.

56. Research conducted by AARD has had a very positive impact on agricultural development in Indonesia. It has significantly increased the productivity of food, estate/industrial crops, livestock, and fisheries over the last 15 years. Indonesia reached rice self-sufficiency in 1984 as a result of AARD research and complementary government support, such as extension, credit, provision of inputs, irrigation, marketing programmes, pricing policies, etc. The increased productivity had enhanced income and welfare of the people.

Iran

57. During the past decade, agriculture was the only sector whose contribution to the GNP had increased, from 14% to 16%.

58. Agricultural land area is about 18.3 million ha, of which 8 million ha are irrigated and the rest 10 million ha under rainfed. More than 5 million ha of the irrigated area was devoted to annual field crops, 1.1 million ha to perennials (orchards) and 2.2 million ha was under fallow. Of the 10 million ha of rainfed area, 6.4 million ha was occupied by annual crops and 3.6 million ha was left fallow. Cereal crops occupied more than 80% of the annual irrigated area and more than 95% of the rainfed area. The livestock population was 107 million animal units (sheep is considered one animal unit). Area covered by forest was about 12.4 million ha, of which 1.3 million ha was in the northern region and the remaining 11.1 million ha in the west to southwest ranges.

59. There are 2.474 million farm units throughout the country with a total of 12.7 million ha under cultivation. Farming systems prevalent in Iran include: peasant farming, commune (mosha'a) farming, rural co-operative farming, farm corporation, agro-industries and agro-business farming systems.

60. Over 95% of the agricultural research is carried out by the Agricultural and Natural Resources Research Organization (ANRRO) affiliated to the Ministry of Agriculture. The remaining 5% is conducted through other scientific and educational units such as universities.

61. At present, ANRRO consists of the organization headquarters and eight main independent institutes, some with a previous record of half a century research activities, 26 regional research centres and more than 80 experimental stations.

62. Budgetary allocation for agricultural research is made on the basis of research objectives and policies which are influenced by the country's long-term agricultural development programme. The funds allocated separately for agricultural research and extension in 1989 and 1990 are summarized below:

Approved Funds (Rials* 1000)

Year	Research	Extension
1989	9,450,000	2,160,000
1990	19,519,000	5,880,000

*Rials 110 = US\$ 1

The numbers of research and extension scientists/officials were 1,194 and 1,275, respectively, in 1990.

63. Having eight specialized research institutes, the ANRRO performs extensive research activities in various disciplines related to a wide range of agricultural and natural resources issues. In the current year (1990) 1,500 research projects are being implemented.

64. In the prioritization process the problems and topics of each region are referred to the relevant research council through farmers, extension agents and concerned officials. Such a problem is investigated in the relevant institutes and transmitted to the Technical Council for rechecking. It is finally submitted to the research co-ordinating commission in ANRRO.

65. ANRRO has fulfilled several of its important objectives, such as in increasing unit level of agricultural produce, in providing suitable environment for proper development, and in providing an improved overall living condition to the people.

66. Important technological developments include the production of human and livestock vaccines, improved seeds of several crops, including monogerm and polygerm sugarbeet. In the recent years, high yielding and disease resistant varieties of wheat (7), barley (4) and rice (5) were introduced.

67. The Agricultural Scientific Information and Documentation Centre (ASIDC) is a national centre for providing agricultural information (as a central library) and services all institutes and 26 research centres and also universities and private agricultural research institutes and consultants.

68. There is an active cooperation between ANRRO and FAO and as a member of CGIAR, the country has good linkage with the International Agricultural Research Centers, such as IRRI, ICARDA, CIAT, CIP, CIMMYT, and ICRISAT.

Malaysia

69. In spite of the declining trend in its contribution to the GDP, the agricultural sector would continue to be among the leading contributors to the country's economic growth. Currently it accounted for 22% of the GDP, 32% of employment and 31% in share of export earnings. For the next decade the emphasis will be towards diversification and broadening of its agricultural base from that of rubber, oil palm, cocoa, pepper, to include fruits, vegetables, flowers, livestock, fish and food products for export.

70. The R&D programmes and activities coordinated by the National Council of Scientific Research and Development (NCSRD) would be undertaken by some 20 research organizations, government departments and universities. The major ones being MARDI, PORIM, RRIM, FRIM, UPM, and VRIM. In the Fifth Malaysia Plan Period (1986-90) about M\$ 200 millions was allocated to agricultural research. In the Sixth Malaysia Plan (1991-95) about M\$ 274 millions has been allocated.

71. The research priority areas have been determined to include:

- a) **Production Research**
 - Maximizing land/water use
 - Increasing quality and productivity
 - Sustainable development of forest and aquatic resources
- b) **Post-Harvest Research**
 - Improving harvesting technology
 - Processing and product development
 - Quality control and standards
- c) **Basic and Supportive Research**
 - Exploitation of new/untapped resources
 - Biotechnology
 - Engineering, water management
 - Economics and marketing
 - Technology assessment and transfer
- d) **Agricultural Development and Environmental Research**
 - Input studies on development projects
 - Management of wastes and residues
 - Environmental changes
 - Commercialization of R&D results

72. Extension activities and programmes would continue to be undertaken by a number of departments and agencies in the Ministry of Agriculture, Ministry of Primary Industries, and Ministry of National and Rural Development. Through these extension activities and programmes considerable impacts have been made in the development of the agricultural sector. High yielding clones/varieties, improved husbandry techniques, pest and disease management, post-harvest handling/processing, and farm mechanization have to a large extent been adopted by farmers and plantations alike.

73. To further augment and sustain agricultural development and maintain environmental equilibrium, efforts of R&D are geared towards (a) the development of crops suitable to the various agro-ecological zones, (b) the development of technologies to reduce dependence on chemicals, to recycle agricultural wastes, water, and judicious management of natural resources, and (c) the development of commercially viable agricultural enterprises, based on R&D results.

74. Research manpower development would continue to be given priority in order to meet the R&D needs. While there are 1,162 scientists currently involved in agricultural research, only 366 have their doctorate degrees. More qualified scientists are needed particularly in the new emerging fields of biotechnology, sustainable agriculture and environmental pollution.

75. Most R&D institutions are well-stocked with books, journals and other publications. They, on their own also produce journals, bulletins, leaflets and the like to disseminate their research findings to various clients and target groups.

76. Most R&D institutions and departments have also established linkages and research collaborations with international research centres and foundations. Research grants, expertise and training are sought from these centres and foundations. In addition, some R&D institutions have also undertaken collaborative programmes with some universities and institutions in a number of countries on a bilateral basis.

77. In spite of the complexity of the R&D system in the country, it had so far served the nation well. The future development of the country, especially towards commercialization and corporate farming, sustainable agricultural development, and safer environment for future generations, poses greater challenges to R&D efforts and activities. A more efficient system must be established to ensure better coordination of R&D efforts, in terms of funding, manpower development, development of research infrastructure, technology transfer mechanism and commercialization of resultant technologies.

New Zealand

78. Agriculture is New Zealand's largest industry and New Zealand's largest foreign exchange earner. In 1990, agriculture, including horticulture, contributed 8.2% of GDP while forestry and fishing contributed 1.4% and 0.3%, respectively. The total value of New Zealand's exports in 1990 was NZ\$ 14,591 million f.o.b. Agriculture, forestry and fishing contributed 59%, 9% and 5%, respectively.

79. New Zealand's total land area used for farming is 14.19 million ha. There are 82,687 farm holdings.

80. The New Zealand forestry industry is predominantly based on 1.2 million ha of plantation forests consisting mainly of introduced conifers. Indigenous forests cover 6.2 million ha. Production from native forests is restricted.

81. New Zealand's 200 mile Exclusive Economic Zone, with an area of about 1.2 million square nautical miles is one of the world's largest. Over 1,100 species of marine fish are known in New Zealand's waters, of which about 100 are commercially significant.

82. Research and development (R&D) activity in New Zealand is characterized by a high proportion of investment by Government (0.58% of GDP), low proportion of investment by industry (0.27% of GDP), and a high proportion of R&D being undertaken in Government institutions.

83. The key components of science policy in New Zealand are:

- Minister of Research, Science and Technology responsible for research, science and technology policy within Government.
- Cabinet Committee for Education, Research and Technology responsible for establishing priorities for funding; recommending to Cabinet the overall level of Government funding for science; and ensuring efficient and effective use of science resources.
- Ministry of Research, Science and Technology responsible for providing Government with advice on development and implementation of Government science policy; identifying national priorities and recommending levels for funding. The conduct of science audit and opportunity reviews; management of government-to-government research, science and technology agreements; and facilitation and promotion of public awareness of science, and science education.
- Foundation for Research, Science and Technology, established as a Corporate Body under the Foundation Act, responsible for providing independent policy advice to Government; allocation of contestable funds to science providers; and the development of links between research and business.

84. Research Organizations: There are five main types of research organizations involved in agricultural, forestry and fisheries R&D. These are Government departments (Ministry of Agriculture and Fisheries, Department of Scientific and Industrial Research, Ministry of Forestry); Universities (Massey University, Lincoln University); Research Associations (Dairy Research Institute, Leather and Shoe Research Association, Meat Industry Research Institute, Wool Research Organizations); Independent Research Institutes and Private Companies.

85. A major restructuring of Government research organization in New Zealand is in progress. On 1 July 1992 the Ministry of Agriculture and Fisheries' Agricultural Research and Consultancy Division (MAF Technology), DSIR, FRI and the Meteorological Service will be disestablished with the establishment of a number of Crown Owned Research Institutes as companies under the Companies Act 1955. Each Institute will have its own Board of Directors with two share-holding Government Ministers. The number and size of institutes is yet to be determined.

86. Science priorities and funding levels for Crown research are defined by outputs. Government expenditure for 1990-91 is: Agriculture NZ\$ 75.8 millions; Horticulture NZ\$ 30.9 millions; Forestry NZ\$ 11.3 millions; Fisheries NZ\$ 17.8 millions; Agricultural Processing Industries NZ\$ 17.3 millions; and Wood and Paper Processing NZ\$ 7.0 millions.

87. In 1990 a Commodity Levy Act was introduced allowing marketing boards to levy their suppliers for research purpose. These boards invest around NZ\$ 61 millions annually in R&D.

88. Agricultural extension has undergone major changes since 1985. Government does not at present financially support extension activities. Technology development and transfer occurs primarily through interaction between research institutes and the private sector.

89. There are 1,131 scientists and 1,415 technicians involved in agricultural, forestry and fisheries research in New Zealand.

90. Priority in agricultural research is placed on: sustainability, food safety and health, biotechnology, animal health and welfare, environmental change, new products, adding value to existing primary products, increased efficiency of primary production and increased efficiency of downstream industries. Anticipated changes in research expenditure relating to agriculture include a move towards more market responsive research; a general shift from agricultural research to other sectors of the economy; a shift from on-farm to off-farm or downstream industries and a strengthening of generic research.

91. Priorities of fisheries marine research are the conservation and management of fisheries, management of aquaculture, and the realization of opportunities in fishing or aquaculture. Freshwater fisheries research is focussed on the impacts of developmental projects and environmental modification, particularly in relation to water abstraction, hydro-electric development, mining and forestry. Aquaculture, and the enhancement of the recreational salmon fishery, have received considerable attention and this is expected to extend to other species.

92. Forestry research activities include forest health, ecology, management, and wood technology.

93. A set of research goals for New Zealand has been developed using inputs from a general public opinion survey; a detailed survey of expert opinion covering a wide spectrum of groups and organizations representing industry, professional bodies, academics, scientists, welfare organizations, environmental groups, trade unions and local and national government; and analysis of survey results in the light of other reports and recommendations which have dealt with socio-economic development issues.

Papua New Guinea

94. Agriculture is the most important economic sector in Papua New Guinea today and will remain so for many years. Its relative importance is reflected in its provision of livelihood for about 85% of the economically active population, and employment for 25% of the work force in the formal sector. Agriculture also contributes an average of 35% of the value of exports and 40% of the gross domestic product.

95. The agricultural sector can be divided into three sub-sectors:

- a purely subsistence group, 8.5%

- a semi-subsistence or semi-commercial group which constitutes about 87% of the sector; it covers predominantly village smallholdings of less than a hectare in size,
- a purely commercial group, 4.5%, consisting of plantations and joint venture nucleus estates including blockholders.

96. Papua New Guinea has a land area of about 460,000 sq.m, but because of poor soil and topography only 30% of the total land area is suitable for agricultural development. The total population is approximately 3.5 millions, 80% of which live in the rural areas.

97. The agricultural research in Papua New Guinea is carried out by three types of organizations:

- National Department of Agriculture and Livestock (DAL); operating eight research stations for food and minor crops, and livestock research
- Commodity Board Research Institutes responsible for coffee, cocoa, coconut, sugarcane, and oil palm research
- The Universities doing basic as well as applied research in food crops and livestock.

98. Funding for agricultural research in DAL has declined by about 50% since 1985; the allocation in 1990 was K 4.1 million. In contrast, the budget for development/extension has increased by 150% since 1985.

99. The research institutes are funded through a cess payment which depends on the crop and the volume exported. The institutes are also supported by government grants, through the DAL budget.

100. Current research is aimed at improving productivity of the major staple food crops and livestock, and the five major export commodities; coffee, cocoa, copra, oil palm and sugar. The need to diversify the export base has led to cash-crop diversification programmes, involving fruits and nuts, and spice and essential oils. Agro-forestry has recently been included to achieve sustainable agro-systems.

101. Presently, due to the fragmented nature of the NARS, there is no proper mechanism established for priority setting of research at the national level. Hence, the types of organizations involved in research have developed their own programme, not all of which adhere to the national objectives as outlined in the White Paper on Agriculture.

102. A method of impact assessment has been developed to forecast the expected economic returns of export crop research, as well as in assisting policy makers in defining research priorities. This method is being refined for annual crops.

103. Presently, the most important sub-sector is the smallholder agriculture. Hence, any efforts towards achieving sustainable agricultural systems in Papua New Guinea must focus the smallholder.

104. The establishment of a Farming Systems Research programme is not only an attempt to define the research needs of the smallholder sector, but also to develop activities, such as conservation farming and agro-forestry in attaining sustainability.

105. The two most acute problems faced by the Papua New Guinea NARS are:

- Inadequate funding of research programmes
- Lack of qualified scientific staff

106. Manpower development is considered the most pressing requirement to develop a strong research system. A long-term training programme is desirable to upgrade technical capabilities of national scientists in all disciplines of research. The research planning and management of the total operations of the NARS also need strengthening. A national coordinating agency for R&D is therefore a top priority for the future. As the extension research linkage is poor, efforts must be made to improve this link.

107. The main recommendations for improvement of the Papua New Guinea NARS are as follows:

- Conduct a review of the present situation and determine whether a Council or an Institute model is the ideal body to centrally coordinate and monitor all agricultural research in Papua New Guinea.
- That once this body is established, all research institutions are to come under its general umbrella.
- Improve extension - research linkage.
- Institute twinning arrangements with regional research organizations for possible collaborative programmes and long-term linkage.
- Seek a substantial funding for a five-year training programme for Papua New Guinea nationals, in post-graduate as well as other technical training. This assistance should also include support to the Papua New Guinea University of Technology in developing an in-country post-graduate training programme in agriculture.

Philippines

108. Agriculture remains a very important component of the Philippine economy. It provided employment to about 43% of total labour force and accounted for 27% of the total GNP.

109. Rice and corn together accounted for 55% of the total area harvested. Coconut accounted for 24%. Sugarcane production although remaining a major export crop suffered major setback in the world market thus total area harvested declined by 37% of the 1982 level.

110. Scientific and technological R&D activities in the Philippines are coordinated at the Department of Science and Technology (DOST). The Philippine Council for Agriculture, Forestry and Natural Resources

Research and Development (PCARRD) is one of the five sectoral councils under DOST which provides the leadership for planning agriculture and natural resource research and development activities in the country.

111. The National Agriculture and Resource Research and Development Network (NARRDN) consists of agencies involved in the generation, development, and verification of technologies for agriculture and natural resources.

112. There are at present four national multi-commodity research centres, seven national single-commodity research centres, 20 regional R&D centres, 66 cooperating stations and eight specialized agencies.

113. Government expenditures for R&D in agriculture and natural resources increased from Peso 111 millions in 1977 to Peso 445 millions in 1988.

114. Current research activities are guided by five major strategies identified to improve the farmers' well-being and help the country attain a Newly Industrialized Country (NIC) status by year 2000. These strategies are: (i) transfer and commercialization of technologies; (ii) upgrading of R&D institutional capability and management; (iii) conduct of R&D to generate income enhancing technologies; (iv) increasing R&D inputs in policy and decision making; and (v) increasing R&D investment.

115. To facilitate commercialization of agricultural technologies, PCARRD coordinated 34 action projects involving over 3,692 farmers from 122 barangays (counties) in 1989. These action projects aimed primarily at verifying and fine-tuning technologies at the farm level on a semi-commercial basis.

116. The project on Strengthening Regional Applied Communication aims to develop effective technology transfer strategies to complement the technology generation activities of the NARRDN.

117. Agricultural R&D priorities are identified by PCARRD in collaboration/consultation with Department of Agriculture (DA), Department of Environment and Natural Resources (DENR) and members of the NARRDN. These priorities are guided by the national development goals identified by National Economic and Development Agency (NEDA) and the sectoral goals specified by DA and DENR.

118. Studies have shown that rates of return to agricultural R&D investments in the country ranged from 27% to as much as 358%.

119. Technologies for sustained agricultural development are determined using the following criteria: general acceptability, economic profitability, social acceptability, environmental safety, and potential availability of appropriate support services to complement technology adoption.

120. Major constraints to agricultural R&D implementation include: (i) insufficient number of trained manpower, (ii) limited funds for R&D, and (iii) inefficient technology transfer and dissemination.

121. As of 1988, total available manpower was 3,177 of which 53% have MS degrees and 8% PhD degrees. As of 1989, a total of 979 degree scholarships have been granted by PCARRD. Of these 744 are for MS and 154 for PhD.

122. Agricultural research information and documentation is facilitated through: (i) Scientific literature Service (SLS) which implements the Research Information Storage and Retrieval System (RETRES); (ii) networking with CARIS; (iii) Research Management Information System (RMIS); and (iv) Agriculture and Resources Regional Technology Information System (ARRTIS).

123. International collaboration generally includes: (i) exchange of germplasm (ii) funds for R&D projects, (iii) manpower development and training, (iv) technical assistance, (v) provision of research facilities and equipment, (vi) verification and exchange of technologies, research findings, and methodologies.

124. Linkages with extension activities have been strengthened particularly with DA. Trainings, seminars, collaborative research activities, and production of research materials have been used to establish these linkages.

Republic of Korea

125. Traditionally, Republic of Korea was one of the agricultural countries of Asia. More than 60% of the Korean people depended on agriculture practice where rice is the dominant crop. Until the mid-1970s, Republic of Korea had faced a chronic shortage of rice and other foodgrains. Since the reorganization of the Rural Development Administration (RDA) in 1963, agricultural research for improving farming technology and varietal improvement of food crops was intensified. This resulted in the selection of the cultivar Tongil that had outyielded the best checks by about 30% and was widely grown in the 1970s. This stimulated research in other crops to increase their yields and the average yields of food crops increased steadily from the 1960s. During the last two decades, due to rapid national economic growth, the structure of Korean agricultural research and technology development had changed dramatically.

126. In Republic of Korea, as well as in other countries, agricultural research is closely related with the nation's science and technology policy and the global agricultural situations. Republic of Korea's agricultural policies have greatly influenced agricultural research goals and research priorities. RDA is in-charge of agricultural research together with rural extension in its organizational and operational structure. Agricultural research is undertaken by the scientists in the 14 research institutes and experiment stations, the Research Bureau of nine provincial RDA and the professors in the colleges of agriculture, who are members of the Institutional Co-operation Committees and the Technical Cooperation Committees. These Committees are the main bodies for research cooperation under the Ministry of Education and the Ministry of Agriculture and Forestry and Fisheries.

127. The RDA's goal for rural development programme is to construct a prosperous rural community. Major emphasis in research has been focussed on steady increase of the important food crops production with

higher quality, expansion of the farmers' income resources and development of new technologies for sustainable agriculture with low input measures. While higher research priorities for the future are given to steady increase of agricultural productivity in relation with farmers' income generation, technology development, including biotechnology, for sustainable agriculture and sound agricultural environment are emphasized.

128. During the past 20 years, the RDA has greatly contributed to the development of agricultural technology. Furthermore, the research and extension service played a key role for the dissemination of farming technologies to the farmers. The agricultural research and extension activities have been integrated into one body, i.e. RDA, which provides excellent two-way channel between researchers and farmers. The agricultural technology dissemination with the feedback mechanism between the agricultural research and extension service is systematized in RDA, and the scientists are involved in the various aspects of extension activities. RDA is still facing many problems on its structure to evolve and adapt the rapid changes of the global agricultural situations. RDA, however, is planning to reorganize its structure with expansion of the number of scientists to cope with the problems in the coming years.

Thailand

129. In 1988, overall agricultural production increased over 1987 production 8.6%, while the 1987 production had declined by 2.7% from the 1986 level. Droughts and floods in many countries had resulted in a decline of world agricultural output and an increase in agricultural prices in the world market in the recent years. Agricultural prices in Thailand thus increased and stimulated farmers to expand their planted area.

130. Total agricultural land area in Thailand is 147,800,656 rais (1 ha = 6.25 rais), while the irrigated area is only 25,755,531 rais or 17.43% of the total, and forest land is 89,877,182 rais.

131. Public agricultural research in Thailand serves many purposes: increased efficiency of agricultural production, alleviation of poverty in the rural areas and national security. The research process can be separated into following phases: research planning; research implementation; and analysis and communication of results, conclusions and recommendations to researchers, extension staff, industry and farmers.

132. Research planning and management becomes a more critical factor for success in a large organization like Department of Agriculture (DOA) in Thailand. In order to improve the effectiveness of research planning and management, the need for an integrated hierarchy of research operations that were aligned with the department's organizational structure was emphasized.

133. Total national agricultural research budget of the Ministry of Agriculture and Cooperatives (MOAC) provided for the offices and departments of agriculture was Baht. 19,591,878,000 in 1989. The Department of Agriculture budget is divided into three major categories: crop research, disciplinary research and administration. National

agricultural research under the MOAC was divided into central and regional research institutes, technical divisions and experiment stations.

134. Impact of agricultural research on agricultural production was realized in increasing yield and quality by using good varieties and appropriate technology. Future emphasis should be placed on developing relatively lower cost technology and improved quality according to market needs.

135. Agricultural research and technology in relation to sustained agricultural development have been emphasized. Improved varieties of crops possessing pest resistance were most readily adopted by the farmers, thus contributed significantly to environmental protection and sustainable agricultural development.

136. The coordination of agricultural research and extension between DOA and DOAE is ensured through a committee at the central level and many sub-committees and working groups at the regional levels.

Vietnam

137. In the past ten years, agricultural production in Vietnam increased by 4.5% a year. Agricultural research and development had contributed significantly to this growth rate.

138. The agricultural research system is conducted by:

- fourteen central and regional research institutes,
- nine research centres and corporations catering to the needs of specific commodities, and
- six universities and two agricultural faculties.

139. The research and development works are coordinated by the Council of Agricultural Research and Development of the Ministry of Agriculture and Food Industries.

140. Main research achievements included:

- Crop varieties adapted to different ecosystems and for different cropping systems
- Varieties and technologies for plantation crops
- Agro-forestry models
- Technologies in animal industry at family level
- Fish and prawn raising
- Appropriate technologies in food processing

141. During the next five years following aspects will be emphasized:

- Study of agrarian systems, integrated rural development
- Study of genetic resources
- Development of appropriate technologies in food and export crops

- Development of appropriate technologies in animal husbandry
- Agro-forestry
- Processing at family and village levels

142. Following research and technology aspects will be emphasized for sustainable agricultural development:

- Rational cropping systems adapted to different ecologies
- Appropriate technologies with low inputs
- Diversification of agriculture by developing animal husbandry, fishery, forestry, and food processing
- Improvement of marketing system
- Reform of extension system in order to reach different groups of farmers.

Western Samoa

143. An important feature of the Samoan economy is the predominant role of the primary sector (agriculture, forestry and fishery) which accounts for 36% of the total GDP. Of that contribution, 57.8% is attributed to the subsistence sector, signifying the prominence of subsistence production in the economy of the country. In 1987, US\$ 73.4 millions was attributed to agriculture of the total US\$ 214 millions GDP.

144. Total land area is 2,840 sq.km. Land ownership is distributed as follows:

Customary Land	85%
Private and Freehold	6%
Government Land	9%

145. Seventy percent of the total land is suitable for cultivation and cattle grazing. About 188,000 ha are suitable for forestry, watershed and catchment areas. As seen from the following indicators, average farm size (6 ha per household) in Western Samoa was one of the highest in the Region.

Total number of households	15,476
Total number of holdings	11,100
Total number of agricultural active households	10,884
Average size of the holdings (hectares)	6

146. The Ministry of Agriculture, Forests and Fisheries is responsible for coordinating the NARS and the coordination is headed by an Assistant Director of Research. Each sub-sector implements its own research activities. There is a proposal to coordinate these under a centralized unit at Niue Crop Centre.

147. The annual budget for research is not separated from the development budget. Based on the 1990 development budget, the research and extension budget allocations in US dollar were as follows:

Sub-Sector	Research	Extension
Crops	127,800	201,000
Livestock	40,000	70,000
Forestry	14,000	169,000
Fisheries	32,000	70,000
TOTAL (US\$)	213,800	510,000
	=====	=====

148. There are nine national agricultural centres, in addition to IRETA/USP at Alafua Campus which coordinates regional research of the SPC Island countries.

149. Current agricultural researches in crops are mainly related to crop introduction and testing for identifying high yielding varieties of the main export crops. As regards pests and disease control, biological control, as an important aspect of integrated pest management, was successful in the control of some introduced pests like the Rhinoceros and hispid beetles of coconut. Livestock research has been mainly in the area of improved breeds, through the use of imported high grade bulls for cross-breeding.

150. Forestry research has mainly been in the provenance of new timber spp. of tropical hardwood and eucalyptus. Wood utilization and timber treatment for local spp. have been emphasized.

151. There is no specific priority-setting mechanism in the country. Research priorities were generally project-oriented. Priorities are given to the main export commodities.

152. The Sixth National Development Plan (DP6) states the agriculture national policy, main objectives and priorities in agricultural development. A Research Committee, consisting of all heads of agricultural sectors, provides the overall directives.

153. There has been no impact study specifically undertaken, but funds have been approved under an ADAB project for studying the impact of the Cocoa Development Project on the socio-economic life of villagers and their farming systems. Although not quantified, the impact of the biological control of coconut Rhinoceros and hispid beetles has been impressive in reducing the infestation of these pests and protecting the coconut production. The country lacks the experience in impact study and there is a need for APAARI to provide back-up support to help the country to decide on the format, questionnaire and the methodology. The study of impact of training on agricultural production is another aspect and should also be undertaken.

154. The role of agricultural research and technology in relation to sustained agricultural development is recognized but the concept is perhaps not an immediate priority. Currently, the main objectives are to become self-sufficient in food supply and to increase production for export. The sustainability and conservation aspects are not of immediate importance as there is little population pressure as yet in Western Samoa. However, in order to ward off any adverse effects on environment, an Environmental and Conservation Division has been set up as a part of the Lands Ministry.

155. The concept of low inputs and high returns is being used by farmers to reduce the use of increasingly high-cost of agricultural inputs as the returns from tropical commodities like coconut and cocoa are fast declining. The need for increasing the efficiency of the inputs can hardly be over-emphasized.

156. The agricultural development policy of the Government to expand production of crops has led to the establishment of generous Bonus Schemes to replace the removal of subsidies in coconut, cocoa, banana and kava. Smallholders and commercial farmers have responded actively, resulting in accelerated production of these crops.

157. Major constraints in agricultural research include:

- Lack of funds and qualified staff
- Lack of due recognition of research through higher salaries and other incentives for research staff.

158. The Department has good access to the excellent library, documentation and information services available at IRETA/USP, Alafua Campus.

159. International and bilateral assistances in research come from FAO/UNDP, SPC, EEC and particularly from established donors like New Zealand, Australia, Germany, China and U.S.A. Japanese aid in agricultural research is new but is quickly becoming a significant factor in the development of the South Pacific area.

160. Linkages of research with extension are administered through the Ministry of Agriculture, Forest and Fishery and there is considerable scope for improving coordination among the major partners. IRETA/USP at Alafua helps greatly to strengthen such linkages through publications, video tapes and updated technical advice.

IV. OVERVIEW OF THE AGRICULTURAL RESEARCH SYSTEMS IN ASIA AND THE PACIFIC REGION

161. The Meeting considered the above subject on the basis of Document No. RAPA/APAARI/90/06. Dr. R.B. Singh introduced this document and briefly described the status of agriculture in the Region, compared the agricultural research systems in vogue in the Region, highlighted the emerging trends and issues in agricultural development, and pointed out certain aspects which should be kept in mind while formulating national research and technology development policies, plans, strategies and programmes.

162. The Meeting noted the following features of the Asia-Pacific Region:

- The Region accounted for 56% of the world's population, more than 70% of the world's farming households, but only 30% of the world's arable land.
- More than 40% of the Region's population lived below poverty line and about three-fourths (300 millions) of the world's malnourished people lived in this Region.
- Majority of the farmers were small holders and their access to production inputs was rather poor.

- Agriculture in general suffered from the vagaries of monsoon and rainfed agriculture was not only low in production but also highly unstable.
- Because of the high population pressure and developmental needs, the demand for food and other agricultural products would be felt much more intensively in this Region as compared with other regions.

163. In view of the above, the Meeting recognized that the urgency for science-based agriculture and technology development in the region is much more greater than in other parts of the world and urged that all countries in the Region should take note of the above-mentioned settings and develop appropriate agricultural research policy, plan, strategy and programme.

164. The Meeting observed that during the past decade the performance of the Region in terms of overall agricultural production has been much better than that in the rest of the world. However, it noted that there were several countries, including some least developed and food importing countries, whose performance was rather unsatisfactory. The Meeting recommended that such countries should review their policies and take urgent action to offset the low level of agricultural production and productivity.

165. The Meeting noted that the countries in the Region have established or are in process of establishing national agricultural research systems suited to their specific needs and developmental goals. It recognized the following six categories of agricultural research systems prevalent in the Region:

- The Ministry System
- The Autonomous or Semi-Autonomous System
- The University System
- The Private Sector, Joint Venture or Contract System
- The Council System, and
- The Mixed System

166. The Meeting noted the advantages and disadvantages of the different systems. It also recognized the successful implementation and significant impact of specific research systems adopted in individual countries, such as the Ministry System in Republic of Korea, the Autonomous System in Malaysia and the Council System in India. It further noted that within a given system there were considerable variations from country to country.

167. The Meeting recognized that agricultural universities and other universities play an important role in research and technology generation, however, their impact and linkage with the main stream of agricultural development varies widely from country to country. It noted that in some countries agricultural universities are under the Ministry of Agriculture while in other countries Ministry of Science and Technology or Education control agricultural universities. The advantages and disadvantages of these arrangements should be critically examined and documented for information and guidance of the member countries.

168. The Meeting noted that in some countries like New Zealand, Malaysia, etc. agricultural research is getting increasingly commercially oriented. Private sector is playing an increasingly important role. The Meeting recommended that it would be useful to examine the progress of this trend and analyse the socio-economic implications of such shifts, including its impact on small farmers. The Meeting urged Malaysia, New Zealand and Republic of Korea to document this development critically and share the information with other countries in the Region.

169. The Meeting observed that often there is a multiplicity of research stations and their control, which has often resulted in duplication of work and inefficiency. The Meeting recommended that consistent with government policies and developmental needs, individual countries should develop appropriate coordinating mechanism to ensure full integration of national agricultural research and technology development. In this context, the Meeting noted that several of the countries in the Region are in process of adopting the Council System. It urged that such countries should critically examine the success and limitations of the Council System currently operational in Bangladesh, India, Pakistan and the Philippines, and structure their councils according to their specific needs and taking into account the plus points from the different countries.

170. The Meeting recognized that priority needs, strategies and areas of research and technology development will differ from country to country and location to location within a country. It, however, recognized that there are certain general priorities which should be kept in mind in most of the developing countries. These included research on increased productivity, maintenance research on those crops and commodities which have already attained high productivity, increased yield for grain legumes and annual oilseed crops, and productivity of small animals and aquaculture. Research for increased agricultural sustainability including integrated pest management, integrated nutrient management, and integrated irrigation and water management should receive high priority. Farming system approach, particularly for small farmers and rainfed areas, is another priority area. The Meeting noted that, generally, socio-economic aspects are not given due attention during the process of technology development and recommended that this drawback should be remedied.

171. The Meeting noted that modern biotechnology has far reaching opportunities as well as challenges. It further noted that most developed countries perceive the new biotechnology as providing the next basis for international commercial competitiveness and have already taken action to strengthen their competitive position. On the other hand, while the developing countries are anxious to exploit modern biotechnology, they lag far behind in their manpower and other capabilities. The Meeting recommended that the developing countries should evolve appropriate policies, strategies and programmes for exploiting the new opportunities and for avoiding the adverse side-effects.

172. The Meeting appreciated that returns to investments in agricultural research have generally been quite encouraging. It recognized that there is generally a dearth of reliable studies on impact of agricultural research and technology development. It, however, noted that some models and approaches are already available for

impact analyses, but these have generally not been utilized due to lack of trained manpower. The Meeting recommended that training courses should therefore be organized to increase competence of member countries in impact analysis and urged the Secretariat of APAARI to monitor such studies in different countries.

173. The Meeting noted that in most developing countries of the Region about 0.2% to 0.4% of agricultural GDP is invested in agricultural research, against 1% to 2% in most developed countries. It further noted that although in the recent years there has been a considerable increase in investment in agricultural research, there is still a wide gap between the present level and the desired level. Therefore, the Meeting recommended that most of the developing countries in the Region should increase their investments in agricultural research and technology development. The Meeting asserted that the impact analyses as proposed in the above paragraph will be extremely helpful in providing guideline for streamlining investment in agricultural research as well as in prioritization of research programmes and in strategy formulation.

174. The Meeting recognized that linkages between research and extension were generally not satisfactory. It recommended that the status and prospects of improving the linkages should be analysed and discussed at a regional meeting. Successful experiences of effective linkages between research, extension and education should be documented and disseminated.

175. Based on information from some of the countries in the Region, the Meeting noted that the patterns of expenditure on extension and research vary widely from country to country. It recommended that individual countries should collect data on manpower and expenditure on research and extension separately and send the same to the Secretariat for further analysis and sharing of the information with other countries in the Region.

176. The Meeting expressed concern that the pattern and infrastructure for agricultural research and technology development in some of the countries were rather inadequate. This was largely due to the lack of adequately trained manpower. To alleviate this deficiency, the Meeting recommended that country-level as well as regional-level training courses on research management should be organized.

177. Given the diversity in agricultural research systems in various countries, the commonality of problems and possible solutions of agricultural development in the Region, and the demonstrated spirit of cooperation among the countries of the Region, the Meeting recommended that all countries in the Region should join the Asia-Pacific Association of Agricultural Research Institutions (APAARI) to increase the overall capability of the Region and to promote Technical Cooperation among Development Countries (TCDC) and linkages between developed and developing countries. In this context, the Meeting applauded the announcement by the distinguished participants from Iran, New Zealand, Papua New Guinea and Western Samoa of their countries becoming members of APAARI. The Meeting urged the remaining countries to join APAARI.

178. The Meeting noted that generally the planning organization, monitoring and evaluation aspects of research and technology development were rather unsatisfactory in most countries. Keeping in mind the importance of these activities, the Meeting recommended that APAARI should develop appropriate manuals and organize training courses on these subjects.

179. The Meeting observed that information on delineation of funds, responsibility and accountability for basic and applied research in agriculture is generally not available. It desired that some of the major countries in the Region should analyse the status of basic and applied research *vis a vis* allocation of resources to basic, strategic, applied and adaptive researches.

180. The Meeting found that the overview papers prepared by the Secretariat and the country papers prepared by individual experts were of high quality. It recommended that, with due editing and supplementation, wherever necessary, these papers should constitute a publication on agricultural research systems in Asia and the Pacific Region.

V. AGRICULTURAL RESEARCH AND TECHNOLOGY FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT

181. The Meeting considered the above subject on the basis of Document No. RAPA/APAARI/90/07 introduced by Dr. R.B. Singh. While introducing the paper, Dr. Singh briefly defined the concept of sustainable agriculture, pointed out the adverse effects of agricultural intensification in the Region, echoed the concern for sustainability, emphasized the need for science-based judicious exploitation of the resources, and finally referred to some successful experiences of generation and use of appropriate technology for increased and sustained agricultural production.

182. The Meeting noted particularly the following adverse effects of agricultural intensification in the Asia-Pacific Region:

- i) Erosion of genetic resources accelerated due to large-scale adoption of HYVs and displacement of primitive land races and due to high rate of deforestation.
- ii) High rate of land degradation and erosion, irrigation-induced salinization and waterlogging.
- iii) Deteriorating soil health, imbalance of macro and micro nutrients and accumulation of toxic levels of nutrients in ground water and soil.
- iv) Emergence of pesticide resistance in insect pests, increasing damages by pests and diseases and inefficient and excessive use of pesticides resulting in health hazards.

183. The Meeting appreciated the need for agricultural intensification to meet the ever-increasing demand for food and other agricultural products in the Region. It emphasized that there is no incongruity between sustainability and science-based intensive production systems. In fact, research and technological innovations have proven time and again that sustainability and increased productivity can go hand in hand -- the need in the Region. The Meeting identified technologies and

strategies for sustained improved production under high potential as well as low potential areas. Under high potential areas, it emphasized that attention should be given to maintenance of research to offset the slippage of gains already made. Integrated Pest Management (IPM) and Integrated Plant Nutrients System (IPNS), including intelligent use of organic and inorganic fertilizers and biological nitrogen fixation coupled with efficient and integrated management of water, should receive high priority for ensuring sustainability of the resource base as well as for high yield. The role of development of high yielding varieties resistant to biotic and abiotic stresses was emphasized. Research and development programmes for rehabilitation of degraded lands, including use of agro-forestry, are other important areas.

184. As regards the low potential areas, soil and water management based on watershed approach, conservation cropping, use of stress tolerant cultivars, development and adoption of dry farming technologies emphasizing timeliness and precision of agricultural operations should receive high priority.

185. Successful experiences of generation and adoption of appropriate technologies for sustainable agricultural development in several countries of the Region were noted. The Meeting recommended that the overview paper along with the country case studies should be published.

VI. AGRO-CLIMATIC ZONE SPECIFIC RESEARCH IN STATE AGRICULTURAL UNIVERSITIES IN INDIA

186. The Meeting considered the above subject on the basis of Document No. RAPA/APAARI/90/08 introduced by Dr. R.B. Singh. Dr. Singh highlighted the essential features of development and responsibilities of State Agricultural Universities in India and the role that these universities are playing in decentralized research through national and international funding supports.

187. The Meeting noted that in India the responsibility for regional agricultural research lies with the State Agricultural Universities, presently numbering 26 in 17 major States. The universities perform a trinity of functions of research, education and extension, and the bulk of their funding comes from the Indian Council of Agricultural Research (ICAR). The Council coordinates entire agricultural research in the country.

188. The Meeting observed that through the ICAR's initiative, the country was grouped into 126 agro-climatic zones. Generally, each agro-climatic zone covered 2 to 4 administrative districts and some zones covered an area as large as 40,000 to 50,000 sq.km. Each agricultural university was assigned jurisdiction of the zones surrounding it and was required to generate location-specific technologies. Different farming situations in individual zones were identified, classified and mapped.

189. The Meeting noted that for undertaking strategic and adaptive research at a large number of zonal and satellite stations, the internal resources were rather inadequate and the country had negotiated World Bank loan, amounting to US\$ 54 millions in the first phase, (1979-85), which met 50% of the total cost. After the project period (five years), the State governments were to bear the cost on permanent basis. The financial support was extended for non-recurring capital items like construction of office, laboratory buildings, residential houses for the

staff, training hostels, farm structures, equipment, vehicle, library, etc. and recurring items like staff salary and research operating costs. A multidisciplinary team of scientists covering major disciplines of agricultural sciences with supporting, administrative and field staff (numbering a total of 30-40 incremental staff based on requirement) was provided to each zone. Encouraged by the success of the Phase I, Phase II of the National Agricultural Research Programme (NARP) (1986-93) with extended research mandates covering horticulture, agro-forestry, animal drawn farm implements, animal nutrition and irrigated farming (including cash crops) was finalized with a project cost of US\$ 110 millions, out of which the World Bank's soft loan share is 65%.

190. The Meeting noted that in order to monitor and support the Programme, a Project Unit was established at the ICAR Headquarters. Research Review Teams were formed to decide on research projects to be undertaken in each zone. Appraisal teams to evaluate progress of the projects were instituted and the various reports were scrutinized by an Inter-Disciplinary Scientific Panel (IDSP) and Project Funding Committee (PFC), under the chairmanship of the Director General of ICAR. The PFC was a high-powered body with members drawn from Planning Commission, Ministry of Finance, Ministry of Agriculture and three Vice-Chancellors of State Agricultural Universities.

191. The Meeting noted that so far 343 research stations in 120 agro-climatic zones have been established/strengthened under the Programme. The main thrust of the Programme was multidisciplinary location-specific research and close linkage between research and extension in the field through regular joint diagnostic visits by researchers and extension staff and by jointly organizing monthly and quarterly farmers' training workshops.

192. The Meeting noted that through the NARP, several location-specific technologies with high pay-off were developed and adopted by the farmers. It recommended that those countries which are planning to embark upon decentralization of agricultural research through their agricultural universities or other such institutions may wish to make use of the Indian experience through the TCDC arrangement of APAARI.

LIST OF PARTICIPANTS**AUSTRALIA**

Ms. Catou Grinyer
Third Secretary
Australian Embassy
38 Sathon Tai Road
Bangkok 10500

THAILAND

Fax: (662) 2872029

CHINA

Prof. Wang Lianzheng
President
Chinese Academy of Agricultural
Sciences
30 Bai Shi Qiao Road
Beijing 100 081
Cable: AGRIACA
Telex: 222720 CAAS CN

FIJI

Dr. R.N. Duve
Director of Research
Koronivia Research Station
Ministry of Primary Industries
and Cooperatives
P.O. Box 77
Nausori
Fax: 679 410 862

INDIA

Mr. C.R. Mohapatra
Director
Department of Agricultural and
Education
Ministry of Agriculture
102 Krishi Bhawan
Dr. Rajendra Prasad Road
New Delhi 110 001
Cable: AGRISEC
Telex: ICAR IN 3162249

INDONESIA

Dr. Joko Budianto
Director
Center for Agricultural Research
Programming
Agency for Agricultural Research
and Development (AARD)
Jl. Ragunan 29
Pasar Minggu
Jakarta 12520
Cable: LITTANI JAKARTA
Telex: 46432 AARDJK IA
Fax: (021) 800644

IRAN

Mr. Abbas Keshavarz
Deputy Head
Agriculture and Natural Resources
Research Organization
and Head
Agricultural Engineering Institution
Ministry of Agriculture
Tabnak Ave.
Evin
Tehran
Telex: 214295 IADC IR

Mr. Najmeddin Hojjati
Member of Scientific Board of
Headquarters and Head
High Educational Affair
and University Relationship
St. Moghadesardebilly Agricultural
and Natural Resources Research
Organization
Tabnak Ave.
Evin
Tehran
Telex: 214295 IADC IR

JAPAN

Dr. Yoshimi Ueno
Representative of TARC in
Thailand
Tropical Agriculture Research
Center (TARC)
c/o Soil Science Division
Department of Agriculture
Paholyothin Road
Bangkhen
Bangkok 10900
THAILAND

MALAYSIA

Dr. Mohd. Yusof Hashim
Director General
Malaysian Agricultural Research
and Development Institute
Serdang, Selangor
P.O. Box 12301, General Post Office
Kuala Lumpur 50774
Cable: MARDI
Telex: MA 37115
Fax: (603) 9483664

NEW ZEALAND

Dr. Keith W. Steele
National Science Director
MAF Technology
Ministry of Agriculture and
Fisheries
Gillingham House
101-102
The Terrace
P.O. Box 2526
Wellington
Telex: NZ MFA 31532
Fax: (04) 744163

PAPUA NEW GUINEA

Mr. Edward C. Sitapai
Director
Agricultural Research Division
Department of Agriculture and
Livestock
P.O. Box 417
Konedobu
Cable: AGRI KONEDOBU
Telex: 22143
Fax: 217813, 213527

PHILIPPINES

Dr. Maripaz L. Perez
Supervising Science Research
Specialist
Socio-Economics Research Division
Philippine Council for Agriculture,
Forestry and Natural Resources
Research and Development (PCARRD)
Los Banos, Laguna 3932
Cable: AGRESPHIL Manila
Telex: 40860 PARRS PM

APPENDIX I**PHILIPPINES**

Ms. Flordeliz D. Tiamzon
Supervising Science Research
Specialist and Head
Project Resource and Development
Section
Crops Research Division
Philippine Council for Agriculture,
Forestry and Natural Resources
Research and Development (PCARRD)
Los Banos, Laguna 3932
Cable: AGRESPHIL Manila
Telex: 40860 PARRS PM

REPUBLIC OF KOREA

Dr. Chong Ho Kim
Director
Tropical Agriculture Division
Rural Development Administration
Suweon 441-707
Cable: ORD, Suweon
Telex: RURDEV K27361
Fax: (0331) 2924163

THAILAND

Dr. Tanongchit Wongsiri
Director General
Department of Agriculture
Paholyothin Road
Bangkhen
Bangkok 10200
Cable: DEPAGRI
Telex: 84478 INTERAG TH
Fax: (662) 5795358

VIETNAM

Dr. Dao The Tuan
Director
Vietnam Agricultural Science
Institute
D7 Phuongmai Dongda
Hanoi

WESTERN SAMOA

Mr. Tupuola Tavita
Director
Department of Agriculture,
Forests and Fisheries
P.O. Box 206
Apia
Telex: 233 TREASURY SX
Fax: 22567

OBSERVER

Mr. Damkheong Chandrapanya
 Director
 Farming Systems Research
 Institute
 Department of Agriculture
 Paholyothin Road
 Bangkhen
 Bangkok 10200
 Cable: DEPAGRI
 Telex: 84478 INTERAG TH
 Fax: (662) 5795358

Mr. Rasamee Kirithaveep
 Deputy Director
 Farming Systems Research
 Institute
 Department of Agriculture
 Paholyothin Road
 Bangkhen
 Bangkok 10200
 Cable: DEPAGRI
 Telex: 84478 INTERAG TH
 Fax: (662) 5795358

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO)

Mr. H. Tsuchiya
 Officer-in-Charge and Deputy
 Regional Representative
 FAO Regional Office for Asia
 and the Pacific (RAPA)
 Phra Atit Road
 Banglampoo
 Bangkok 10200
THAILAND
 Cable: FOODAGRI BANGKOK
 Telex: 82815 FOODAG
 Fax: (662) 2800445

Dr. B. Muller-Haye
 Chief
 Research Development Centre
 Research and Technology
 Development Division
 FAO Headquarters
 Via delle Terme di Caracalla
 00100 Rome
ITALY
 Cable: FOODAGRI ROME
 Telex: 610181 FAO I
 Fax: 5782610, 57973152, 57975155

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO)

Dr. R.B. Singh
Regional Plant Production
and Protection Officer
FAO Regional Office for Asia
and the Pacific (RAPA)
Phra Atit Road
Banglampoo
Bangkok 10200
THAILAND
Cable: FOODAGRI BANGKOK
Telex: 82815 FOODAG
Fax: (662) 2800445

APPENDIX II**AGENDA**

1. Opening of the Meeting
2. Election of Officers
3. Adoption of the Agenda
4. Progress report on the establishment of the Asia-Pacific Association of Agricultural Research Institutions (APAARI)
5. Agricultural research and technology development in individual countries of the Region
6. Agricultural research and technology for sustainable agricultural development in the Asia-Pacific Region
7. Agro-climatic zone specific research - Indian experience
8. Meeting of the General Assembly of APAARI
9. Adoption of the report
10. Closing of the Meeting

PART II

REPORT OF THE
FIRST MEETING OF THE GENERAL ASSEMBLY
OF THE
ASIA-PACIFIC ASSOCIATION OF AGRICULTURAL RESEARCH INSTITUTIONS
(APAARI)

I. ATTENDANCE

1. The First Meeting of the General Assembly, hereafter referred to as "Assembly" of the Asia-Pacific Association of Agricultural Research Institutions (APAARI) was held at FAO Regional Office for Asia and the Pacific (RAPA), Bangkok, Thailand, on 13 December 1990. Of the 14 members of the Association, 11 member countries, namely, China, Fiji, India, Iran, Malaysia, New Zealand, Papua New Guinea, Philippines, Republic of Korea, Thailand and Western Samoa were present and participated in the Meeting. Indonesia, Japan, and Vietnam participated as observers. A list of the member and observer participants is given as Appendix I. Three member countries, namely, Bangladesh, Pakistan and Sri Lanka were absent.

II. ADOPTION OF THE AGENDA

2. The agenda, as adopted by the Assembly, is set out as Appendix II.

III. ELECTION OF OFFICERS

Officers of the Association

3. The 11 member countries present at the Assembly unanimously elected Malaysia as Chairman and New Zealand as Vice Chairman of APAARI for a two-year period, 1991-92.

4. As regards the third officer of the Association i.e. the Executive Secretary, the Assembly endorsed the Article XII of the Constitution and requested FAO RAPA to permit the officer dealing with agricultural research to serve as Executive Secretary of the Association. The Assembly noted that the FAO RAPA Officer who was until now dealing with agricultural research will soon be transferred to FAO Headquarters. In order to maintain continuity and not to lose the impetus, the Assembly urged FAO to permit that particular officer to continue to work from FAO Headquarters, Rome, Italy as Executive Secretary of the Association until such time his substitute is effectively in position at FAO RAPA.

The Executive Committee

5. The Assembly noted that the Executive Committee of the Association shall comprise of three officers, viz. Chairman, Vice Chairman and Executive Secretary, and four Members. The three officers of the Association will also be the officers of the Executive Committee.

6. As regards the members of the Executive Committee, the Assembly unanimously elected China, India, Philippines and Western Samoa as the Members of the Executive Committee for a two-year period 1991-92.

7. With the above elections, the Executive Committee comprised of the following:

Chairman	-	Malaysia
Vice Chairman	-	New Zealand
Executive Secretary	-	FAO Officer
Member	-	China
Member	-	India
Member	-	Philippines
Member	-	Western Samoa

IV. ADOPTION OF THE CONSTITUTION OF THE ASIA-PACIFIC ASSOCIATION OF AGRICULTURAL RESEARCH INSTITUTIONS (APAARI)

8. The Constitution of the Asia-Pacific Association of Agricultural Research Institutions (APAARI), as adopted by the Assembly, is set out as Appendix III.

V. PROGRAMME OF WORK AND BUDGET

9. Consistent with the objectives and functions/activities of the Association, as detailed in its Constitution, the Assembly adopted the following programme of work and budget for the biennium 1991-92.

Information

10. Output 1.1: A publication on agricultural research systems in the Asia-Pacific Region, giving the pattern, policies, priorities and strategies, manpower, budget, and infrastructures.

Activity 1.1.1: Wherever necessary, countries will revise their country papers on agricultural research and technology development to render it not only suitable but also update for inclusion in the above publication and send the revised version to the Secretariat at the earliest.

Activity 1.1.2: Secretariat will scrutinize and edit the manuscripts received from member countries, and bring out the publication as soon as possible.

11. Output 1.2: A publication on technologies for sustainable agriculture in Asia and the Pacific Region.

Activity 1.2.1: Supplement the information contained in the Secretariat Document RAPA/APAARI/90/07 by inviting additional information from countries already included in the publication and by obtaining information from Japan, Malaysia and New Zealand and other countries not included in the publication.

Activity 1.2.2: Compile detailed accounts of selected success stories so that other countries could adopt the approach with suitable modification/adjustment, if necessary.

Activity 1.2.3: Edit and bring out the publication and circulate widely.

12. Output 1.3: A directory of agricultural research institutions/research coordinating bodies and senior research scientists of member countries, including professors and above in agricultural universities, with a brief description of the mandate, main research areas, achievements and areas of strengths of each institute.

Activity 1.3.1: The Secretariat will prepare a simple, practical but effective format for obtaining the desired information and send it to all member countries.

Activity 1.3.2: Each country will designate an institution/person to act as the focal point/coordinator for compiling the information. The focal points will send the duly completed proforma to the Secretariat.

Activity 1.3.3: The Secretariat will compile, edit and store the information in a machine-readable form and supply all members with printouts by the end of 1991.

13. Output 1.4: A half-yearly newsletter of the Asia-Pacific Association of Agricultural Research Institutions and occasional news bulletins.

Activity 1.4.1: All countries shall feed necessary information/news to the Secretariat to be included in the Newsletter.

Activity 1.4.2: The Secretariat shall collect information from other sources also.

Activity 1.4.3: The Secretariat will publish and distribute the Newsletter. The first volume should be brought out by first week of July 1991.

Activity 1.4.4: Should there be some very important news which needs to be flashed urgently, the concerned countries will issue special news bulletins/flyers and circulate to all members.

Servicing of Research Networks

14. Output 2.1: Selected research and technology networks sustained.

Activity 2.1.1: Subject to the availability of funds, on case by case basis, a few of the research and technology networks, which were operational through the support from UNDP, Trust Funds and other resources but face the problem of discontinuity due to phasing out of the external support, will be supported for continuing most selected activities. The extent and mode of support will be decided by the Executive Committee.

Activity 2.1.2: Participating countries will continue the minimal essential activities of regional character of the selected projects.

Manpower Development

15. Output 3.1: Trained manpower.

Activity 3.1.1: Organize one regional level training course on research management for the Asian members (for the Pacific Island member countries such a training course is already planned in March 1991).

Activity 3.1.2: Organize one regional level training course on impact analysis (of research and technology development).

The training courses will be organized in collaboration with other concerned and interested national and international organizations.

Cooperative Research

16. Output 4.1: New technologies on selected aspects.

Activity 4.1.1: Member countries will identify priority research topics of regional or sub-regional implication and send the list to the Secretariat.

Activity 4.1.2: The Secretariat, in consultation with the Chairman and Vice Chairman, will identify a couple of researchable problems as well as most suitable institutes in the Region which could tackle the problem and are willing to undertake the work.

Activity 4.1.3: Based on 4.1.2 above, the Secretariat will prepare proposals and put them up to the Executive Committee in December 1991 for consideration and approval. If approved, the Secretariat will contact the concerned institutions to undertake the work and inform all member countries of the arrangement.

Activity 4.1.4: The selected institutes will undertake the research and disseminate the results among the member countries.

VI. BUDGET OF ASIA-PACIFIC ASSOCIATION OF AGRICULTURAL RESEARCH INSTITUTIONS (APAARI) FOR 1991-92 (IN US DOLLARS)

Revenues

-	Membership Fees	100,000
-	FAO Support for Secretariat	70,000
-	FAO Support for Training Activities	50,000
-	Country Support (in local currency)	40,000
	TOTAL RECEIPTS	260,000
		=====

Expenditures

-	Secretariat Staff, including Travel	60,000
-	Office Supplies	3,000
-	Communication	3,000
-	Publications	20,000
-	Training	104,000
-	Cooperative Research	70,000
	TOTAL	260,000
		=====

VII. VENUE AND DATE OF SECOND MEETING OF THE ASSEMBLY

17. The Assembly welcomed the invitation by Malaysia to hold the second meeting of the Assembly in Kuala Lumpur. The offer was gratefully accepted.

18. Second week of December 1992 was tentatively fixed for the meeting.

VIII. VENUE AND DATE OF FIRST MEETING OF THE EXECUTIVE COMMITTEE

19. The Assembly decided that the First Meeting of the Executive Committee will be held at FAO RAPA, Bangkok, Thailand, in December 1991.

20. The Assembly also decided that the Second Meeting of the Executive Committee will be held in Kuala Lumpur, Malaysia, just before the Assembly Meeting in December 1992.

LIST OF PARTICIPANTSMEMBERSCHINA

Prof. Wang Lianzheng
President
Chinese Academy of Agricultural
Sciences
30 Bai Shi Qiao Road
Beijing 100 081
Cable: AGRIACA
Telex: 222720 CAAS CN

FIJI

Dr. R.N. Duve
Director of Research
Koronivia Research Station
Ministry of Primary Industries
and Cooperatives
P.O. Box 77
Nausori
Fax: 679 410 862

INDIA

Mr. C.R. Mohapatra
Director
Department of Agricultural and
Education
Ministry of Agriculture
102 Krishi Bhawan
Dr. Rajendra Prasad Road
New Delhi 110 001
Cable: AGRISEC
Telex: ICAR IN 3162249

IRAN

Mr. Abbas Keshavarz
Deputy Head
Agriculture and Natural Resources
Research Organization
and Head
Agricultural Engineering Institution
Ministry of Agriculture
Tabnak Ave.
Evin
Tehran
Telex: 214295 IADC IR

MALAYSIA

Dr. Mohd. Yusof Hashim
Director General
Malaysian Agricultural Research
and Development Institute
Serdang, Selangor
P.O. Box 12301, General Post Office
Kuala Lumpur 50774
Cable: MARDI
Telex: MA 37115
Fax: (603) 9483664

NEW ZEALAND

Dr. Keith W. Steele
National Science Director
MAF Technology
Ministry of Agriculture and
Fisheries
Gillingham House
101-102
The Terrace
P.O. Box 2526
Wellington
Telex: NZ MFA 31532
Fax: (04) 744163

PAPUA NEW GUINEA

Mr. Edward C. Sitapai
Director
Agricultural Research Division
Department of Agriculture and
Livestock
P.O. Box 417
Konedobu
Cable: AGRI KONEDOB
Telex: 22143
Fax: 217813, 213527

PHILIPPINES

Dr. Maripaz L. Perez
Supervising Science Research
Specialist
Socio-Economics Research Division
Philippine Council for Agriculture,
Forestry and Natural Resources
Research and Development (PCARRD)
Los Banos, Laguna 3932
Cable: AGRESPHIL Manila
Telex: 40860 PARRS PM

REPUBLIC OF KOREA

Dr. Chong Ho Kim
Director
Tropical Agriculture Division
Rural Development Administration
Suweon 441-707
Cable: ORD, Suweon
Telex: RURDEV K27361
Fax: (0331) 2924163

THAILAND

Dr. Tanongchit Wongsiri
Director General
Department of Agriculture
Paholyothin Road
Bangkhen
Bangkok 10200
Cable: DEPAGRI
Telex: 84478 INTERAG TH
Fax: (662) 5795358

WESTERN SAMOA

Mr. Tupuola Tavita
Director
Department of Agriculture,
Forests and Fisheries
P.O. Box 206
Apia
Telex: 233 TREASURY SX
Fax: 22567

OBSERVER**INDONESIA**

Dr. Joko Budianto
Director
Center for Agricultural Research
Programming
Agency for Agricultural Research
and Development (AARD)
Jl. Ragunan 29
Pasar Minggu
Jakarta 12520
Cable: LITTANI JAKARTA
Telex: 46432 AARDJK IA
Fax: (021) 800644

JAPAN

Dr. Yoshimi Ueno
 Representative of TARC in
 Thailand
 Tropical Agriculture Research
 Center (TARC)
 c/o Soil Science Division
 Department of Agriculture
 Paholyothin Road
 Bangkhen
 Bangkok 10900
THAILAND

VIETNAM

Dr. Dao The Tuan
 Director
 Vietnam Agricultural Science
 Institute
 D7 Phuongmai Dongda
 Hanoi

SECRETARIAT

Dr. B. Muller-Haye
 Chief
 Research Development Centre
 Research and Technology
 Development Division
 FAO Headquarters
 Via delle Terme di Caracalla
 00100 Rome

ITALY

Cable: FOODAGRI ROME
 Telex: 610181 FAO I
 Fax: 5782610, 57973152, 57975155

Dr. R.B. Singh
 Regional Plant Production
 and Protection Officer
 FAO Regional Office for Asia
 and the Pacific (RAPA)
 Phra Atit Road
 Banglampoo
 Bangkok 10200

THAILAND

Cable: FOODAGRI BANGKOK
 Telex: 82815 FOODAG
 Fax: (662) 2800445

APPENDIX II**AGENDA**

1. Election of the Officers of APAARI
2. Adoption of the Agenda
3. Adoption of the Constitution of APAARI
4. Programme of Work and Budget of the Association for the Biennium 1991-92
5. Any Other Matter
6. Closing of the Meeting

APPENDIX III

ASIA-PACIFIC ASSOCIATION OF AGRICULTURAL RESEARCH INSTITUTIONS
(APAARI)

CONSTITUTION

PREAMBLE

1. The agricultural research institutions in the Asia-Pacific Region:
- Aware of the problems and challenges facing the development of agriculture in the Region,
 - Conscious of the responsibilities which they must assume if they are to contribute to the process of social and economic development in the Region,
 - Convinced that the role and impact of the respective institutions can be enhanced through effective collaboration and consultation among them,
- Have decided to establish a regional association of agricultural research institutions in the pursuit of their common objectives under the sponsorship of FAO.

Article I

NAME

2. The name of this association shall be "Asia-Pacific Association of Agricultural Research Institutions" (APAARI), hereinafter referred to as the Association.

Article II

SEAT

3. The Association shall have its seat at Bangkok, Thailand.

Article III

OBJECTIVES

4. The overall objective of the Association shall be to foster the development of agricultural research in Asia and the Pacific Region.
5. More specifically, the objectives of the Association shall be to:
- a) promote the exchange of scientific and technical know-how and information in agriculture;

APPENDIX III

- b) encourage the establishment of appropriate cooperative research and training programmes in accordance with identified regional, bilateral or national needs and priorities;
- c) assist in strengthening of research organizational and management capability of member institutions; and
- d) strengthen cross-linkages between national, regional and international research centres and organizations, including universities, through involvement in jointly-planned research and training programmes.

Article IV**FUNCTIONS**

6. In pursuance of the above objectives, the Association may undertake one or more of the following activities:

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

Article V**MEMBERSHIP**

7. Membership shall be open to national agricultural research institutions/councils/organizations/universities, etc from countries of the Region. In countries where agricultural research is handled directly by a government department, the relevant unit/bureau will be eligible to become member of the Association. Membership in the Association may be sought by submitting an application to the Executive Secretary in consultation with the Chairman of the Association. The membership of the Association shall also be open to such other organizations or bodies as may be decided by the General Assembly of the Association.

8. Any member institution desiring to withdraw from the Association shall notify the Executive Secretary in writing, and such withdrawal shall take effect three months from the date of receipt of the notice by the Executive Secretary .

Article VI

MEMBERSHIP SUBSCRIPTION

9. For the purpose of determining annual subscription by member institutions, the countries where they are located shall be deemed to be categorized as follows:

- Category I: Australia, China, India, Japan, and New Zealand
- Category II: Bangladesh, DPR Korea, Indonesia, Iran, Malaysia, Pakistan, Philippines, Rep. of Korea, and Thailand
- Category III: Bhutan, Burma, Cook Islands, Kampuchea, Fiji, Laos, Maldives, Nepal, Papua New Guinea, Solomon Islands, Sri Lanka, Tonga, Vanuatu, Vietnam and Western Samoa.

The annual subscription from each member institution shall be as follows:

- Member institution falling in Category I: US\$ 6,000
- Member institution falling in Category II: US\$ 4,000
- Member institution falling in Category III: US\$ 2,000

Article VII

OTHER SOURCES OF FUNDS

10. In addition to the annual membership subscription, other sources of funds shall consist of:

- a) Grants and donations from governments, national, regional or international organizations and development banks, and others;
- b) Proceeds from the sale of publications issued by the Association; and
- c) Fees, if any, collected from participants of any technical meeting organized by the Association.

Article VIII

THE GENERAL ASSEMBLY

11. There shall be a General Assembly of the Association, in which each member institution shall be represented by one delegate.

12. The General Assembly shall meet at least once every two years.

13. Each country organization represented in the Association shall have one vote at all meetings of the General Assembly. Members from a country present in a General Assembly shall elect at the start of the meeting a member institution which should represent their country for

voting at ordinary or extraordinary meetings. The member institution elected as country representative shall become leader of the delegation consisting of members from that country attending that meeting. The Chairman shall allow some time for mutual consultation among members from each country prior to voting on any issue.

14. All decisions shall be taken by a simple majority vote, except for those decisions relating to amendments to the Constitution, and those related to the dissolution of the Association. In the case of equality of votes, the Chairman shall have a casting vote.

Article IX

DUTIES OF THE GENERAL ASSEMBLY

15. In fulfillment of its objectives, the General Assembly shall determine the policy of the Association, approve the Programme of Work and Budget formulated and put up by the Executive Committee, review progress, and shall exercise other powers conferred upon it by the Constitution.

Article X

EXECUTIVE COMMITTEE

16. There shall be an Executive Committee of the Association composed of three officers, namely Chairman, Vice-Chairman and Executive Secretary, and four members. The Chairman, Vice-Chairman and members shall be elected by the General Assembly from among the member institutions at the biennial meeting and shall hold office until the next biennial session and shall not be eligible for immediate re-election to the same office for more than two terms. No country will have more than one representative on the Executive Committee. The Executive Secretary, who shall be appointed according to Article XII paragraph 22, shall be an ex officio member of the Executive Committee.

17. If any one of the offices of Chairman or Vice-Chairman becomes vacant for any reason, the remaining members of the Executive Committee shall elect one of its own members to fill the vacancy. A position of member of the Executive Committee which falls vacant shall be filled by the unsuccessful candidate who has the highest number of votes in the election of the Executive Committee at the preceding General Assembly. Persons who become members of the Executive Committee under this provision will remain in office until the next Session of the General Assembly.

Article XI

DUTIES OF THE EXECUTIVE COMMITTEE

18. The Executive Committee shall manage the affairs of the Association in accordance with this Constitution and the policies and directives adopted by the General Assembly.

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19. The Executive Committee shall report to the Assembly on the implementation of the approved programme of work and the progress made in fulfilling the objectives of the Association.

20. The Executive Committee shall meet at least once every year and shall be convened by the Executive Secretary.

Article XIIEXECUTIVE SECRETARY AND SECRETARIAT

21. Secretariat of the Association shall be headed by the Executive Secretary.

22. During the initial years, FAO RAPA may permit the officer who deals with agricultural research to serve as Executive Secretary of the Association. After the initial period, the Executive Committee shall appoint the regular Executive Secretary with suitable experience in agricultural research.

Article XIIIDUTIES OF OFFICERS

23. The Chairman shall preside at all meetings of the General Assembly and the Executive Committee.

24. The Vice-Chairman shall perform all duties of the Chairman in the absence of the latter, and such other duties as may be assigned to him by the Chairman.

25. Executive Secretary shall be the chief of the Secretariat of the Association. He shall be responsible for the affairs of the Association and execution of all activities approved by General Assembly, including preparation of programme of work and budget, monitoring of progress, and arrangements for meetings of the General Assembly and Executive Committee. He shall collect and disseminate information pertaining to the activities of the Association. He shall prepare the minutes for the Assembly and Executive Committee meetings, and arrange for the publication, distribution and preservation of the reports and proceedings of all meetings of the Association. He shall receive annual subscriptions and any other financial contributions to the Association, account for all money received and make payments in accordance with policies established by the Assembly and the Executive Committee, and he shall submit audited accounts to the biennial General Assembly.

Article XIVRULES AND REGULATIONS

26. The General Rules of Procedure and Financial Regulations shall be prepared by the Executive Committee and approved by the General Assembly of the Association. Amendments to the Rules and Regulations may be adopted by a simple majority vote at any session of the General Assembly.

27. The Executive Secretary shall be responsible for utilization of the approved budget of the Association and shall maintain full accounts, records and documents. Duly audited accounts shall be presented at the General Assembly.

Article XV

QUORUM

28. The quorum at all meetings shall be 33% of the membership.

Article XVI

AMENDMENT OF THE CONSTITUTION

29. Amendment of the Constitution shall be considered only at a meeting of the General Assembly.

30. The Association may amend this Constitution by a two-thirds majority of the votes cast, provided that such majority is more than half of the countries from which the membership of the Association is drawn.

31. No proposal for the amendment of the Constitution shall be included in the agenda of any meeting of the General Assembly unless notice thereof has been dispatched by the Executive Secretary to members at least 120 days before the opening of the meeting.

Article XVII

DISSOLUTION

32. The Association can only be dissolved by a resolution approved at a General Assembly. The procedure to be followed for the dissolution of the Association shall be the same as detailed in paragraphs 30 and 31 under Article XVI.
