REPORT OF THE SEVENTH SESSION OF THE INTERNATIONAL RICE COMMISSION

Held in Saigon, Viet-Nam
16-20 November 1960

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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March, 1961 Rome, Italy

CORRIGENDUM

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P. 22. Last line: Sentence beginning "In India...." should read:

"In India, for early rice varieties, the application of N in 2 doses, viz. 1/3 at planting and the remainder about 3 weeks later gave better results than single application. However, for normal or late varieties, application of N in three doses viz; at planting....."

P. 35. At botton of page, add following paragraph:

"The First Meeting of the ad hoc Working Group on Storage and Processing of Rice was held in Calcutta, India, 1956, immediately prior to the Fifth Session of the International Rice Commission."

P. 41. Future Plans of the Working Party

Under (1) the last word should be "usage" instead of "requirements"

e.g. "Equipment.....to reduce water usage."

P. 47. Item 3, second line, should read:

".....to obtain greater facilities for the dissemination of technical information....."

P. 52. Summary of Recommendations:

11. Second line should read:

".....facilities for the dissemination of technical information....."

14. Second line should read:

"..... incorporating the amendments contained in the text...."

CONTENTS

INTRODUCTION

The Seventh Session of the International Rice Commission was held in Saigon, Viet Nam, from 16 - 20 November, 1960, at the kind invitation of the Government of Viet Nam. The delegates to the Session considered reports of the re-organized Working Parties on Rice Production and Protection; Rice Soils, Water and Fertilizer Practices; and Agricultural Engineering Aspects of Rice Production, Storage and Processing. Discussion of these and other topics on the Agenda of the Seventh Session are summarized in this report.

His Excellency, Le Van Dong, Secretary of State for Agriculture of Viet Nam, in declaring the Session open, expressed his pleasure at having the International Rice Commission Session at Saigon, and mentioned that the presence of delegations from many Member Countries indicated the solidarity and united efforts of those countries in adhering to the common objective of providing adequate food for millions by endeavoring to solve the world-wide problem of hunger and inadequate nutrition. Although there had been a temporary setback after the war, rice production had since increased and now reached the prewar level. However increasing population trends call for the utmost efforts to meet the anticipated demand for more food in the future. He felt certain that the IRC would go thoroughly into the various factors concerned withincreasing yields as well as dealing with problems connected with the reduction of losses in storage and processing, and maladjustments in distribution. His Excellency also referred to the efforts made by the Government of Viet Nam to strengthen research, advisory and extension services; and in this connection expressed his appreciation of the Technical Assistance provided by FAO in the implementation of the three programs.

Mr. Cummings, Regional Representative of the Director-General in the Far East, in his address on behalf of the Director-General of FAO, thanked the Government of the Republic of Viet Nam for acting as host and explained that the present inadequate food situation, as well as the future outlook in relation to population-increase requires an intensification of FAO's activities. In order to invite the cooperation of public and private institutions as well as Governments and individuals for promoting such efforts, the Director-General of FAO had inaugurated the Freedom-From-Hunger Campaign on 1 July, 1960. He pointed out that the IRC had a significant role in this connection as rice is the staple food of more than half the world's population. From its inception in 1949, the IRC had expanded its activities in promoting and stimulating research in the relevant fields connected with rice production. It has now an increasing role to play in providing assistance in the formulation of well-integrated action projects as well as in their implementation for increasing rice production and productivity, so that the present living standards of rice farmers will be raised and the economies of their countries strengthened.

Dr. P. S. Deshmukh, Chairman of the International Rice Commission, reviewed the work of the IRC during the last two years, and referred especially to the main recommendations made at the Working Parties on Rice Production and Protection and Rice Soils, Water and Fertilizer practices held at Peradeniya, Ceylon, during December, 1959. While awaiting the recommendations of the Working Party on Agricultural Engineering Aspects

of Rice Production and Processing, held just before the present IRC Session, the Chairman stressed the necessity for providing efficient, labor saving implements for the use of rice farmers and mentioned steps taken to establish factories for the manufacture of such implements in each of the States of India. He also referred to plans for an integrated approach to increased rice production in India with the cooperation of the Ford Foundation. Welcoming the establishment of the International Rice Institute at Los Banos, the Philippines, he pointed out the necessity for strengthening rice research on a regional basis in view of the diverse conditions under which rice is grown. Finally he recalled his earlier suggestion for the promotion of National Committees on Rice in Member Countries to enable the IRC to focus attention on rice problems at national level. He expressed satisfaction at the progress made to date by the IRC and envisaged future possibilities for greater achievements in the field of Rice Production and Research.

Dr. A. M. Salimullah, Delegate from Pakistan, on behalf of the Delegations and Observers present, thanked the Government of Viet Nam for the excellent Facilities and hospitality provided for the Session.

PARTICIPATION IN THE SESSION

Delegations from Member Countries

Australia

C. S. Christian, Member of Executive Committee, Commonwealth Scientific and Industrial Research Organization, Canberra City, A.C.T.,

C. W. Strutt, Assistant Secretary, Department of Primary Industry, Canberra City, A.C.T.

Burma

Sao Win Kyi, Minister for Land Use, Shan State Government, Union of Burma.

U Maw Maw, Chief Procurement Officer, State Agricultural Marketing Board, 70 Phayre Street, Rangoon.

U Kyaw Myint, Economist, Agricultural and Rural Development Corporation, Rangoon.

U Ohn Maung, Agricultural Engineer (Extension), 74, Pagoda Road, Rangoon.

U Khin Maung, Economic Botanist (Upper Burma), Department of Agriculture, Meiktila.

U Khin Maung Iatt, Deputy Secretary, Ministry of Agriculture and Forests, Government of the Union of Burma, Rangoon.

Ceylon

A. V. Richards, Director of Agriculture, Peradeniya, Ceylon.

France

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India

P. S. Deshmukh, Minister of Agriculture, Government of India, Krishi Bhavan, New Delhi.

S. Mullick, Joint Secretary, Ministry of Food and Agriculture, Government of India, Krishi Bhavan, New Delhi.

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Indonesia

Tan Sin Houw, Senior Officer, Department of Agriculture, Paddy Center, 16, Salemba Raya, Djakarta.

Italy

Salvatore Corsini, Charge d'Affaires, Ambassade d'Italie au Vietnam.

Japan

Katsumi Amatatsu, Project Leader, Supervisor for Rice Culture, Development Bureau, Ministry of Agriculture and Forestry, Tokyo.

Hideo Kaburaki, Chief, Farm Machinery Division, Kanto-Tosan Agricultural Experiment Station, Ministry of Agriculture and Forestry, Konosu, Saitama, Japan.

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Korea

Young Chul Chang, Director, Agricultural Experiment Station, 210-2 Seoudundong, Suwon City.

Nam Song Woo, Assistant Chief of Food Administration, Ministry of Agriculture and Forestry, Seoul.

Chong Hoon Kim, Officer in Charge of FAO Affairs, Ministry of Foreign Affairs, Seoul.

Laos

Chao Sopsaisana, Counsellor of the Royal Embassy of Laos, 93 Pasheur Road, Saigon.

Malaya

Van Thean Kee, Senior Agricultural Officer, Department of Agriculture, Kuala Lumpur.

Chee Sek Pan, Agronomist, Department of Agriculture, Kuala Lumpur.

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A. M. Salimullah, Joint Secretary, Government of Pakistan Ministry of Food and Agriculture, 262/c/2, Ingle Road, Karachi-1, West Pakistan.

Abdul Alim, Economic Botanist, Tejgaon, Dacca, East Pakistan.

Philippines

Eugenio E. Cruz, Director of Plant Industry, Manila.

Ricardo T. Marfori, Director, Bureau of Soils, Manila.

Jose V. Rodriguez, Manager, Rice and Corn Corporation, Manila.

Portugal

Manuel Sergio Portela Feijao, Agricultural Engineer, Praca Olegario Mariano, No. 1 - 1° Dir., Lisbon.

Thailand

Prince Chakrabandhu, Director-General, Rice Department, Ministry of Agriculture, Bangkok.

M. R. Chakratong Tongyai, Director-General, Department of Agriculture, Ministry of Agriculture, Bangkok.

M. R. Debriddhi Devakul, Chief, Engineering Division, Rice Department, Bangkok.

United Kingdom

N. M. Garrard, Liaison Officer, National Institute of Agricultural Engineering, Wrest Park, Silsoe, Bedford, England.

United States of America

Dexter V. Rivenburgh, Rice Specialist, Foreign Agricultural Service, U. S. Department of Agriculture, Washington, D.C.

William C. Dachtler, Research Coordinator, Office of Administrator, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C.

Lee Hines, USOM Agricultural Division, Djakarta, Indonesia.

Leigh Copley, USOM, American Embassy, Saigon, Viet Nam.

Viet Nam

Truong Van Hieu, Director of Agriculture.

Tran quang Nhi, Cehif of Division, Department of National Economy.

Nguyen phuc Sa, Director, General Directorate of the Plan.

Vu dinh Khoa, Commissariat of Land Development.

Tran van Hich, General Christian Labour Union.

Phan van Hoanh, General Christian Labour Union.

Nguyen ngoc Dan, President, Syndicate of Cereals Exporters, Castandet, Saigon.

Nguyen van An, Agricultural Engineer, Chief of Division of Statistics, Ministry of Agriculture, Saigon.

Truong dinh Phu, Technical Assistant, Directorate of Research, Ministry of Agriculture, Saigon.

Doan minh Quan, Agricultural Engineer, Chief of Division of Cereals, Ministry of Agriculture, Saigon.

Nguyen van Dam, Agricultural Engineer, Chief of Division of Parasites Research, Ministry of Agriculture, Saigon.

Tran van Ngo, Agricultural Engineer, Ministry of Agriculture, Saigon.

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Mali

P. Bouchet, Directeur de la Recherche Agronomique, Bamako.

International Rice Research Institute

Robert F. Chandler Jr., Director, International Rice Research Institute, Manila, The Philippines.

FAO Staff:

W. H. Cummings, Regional Representative of the Director-General of FAO for Asia and the Far East, Bangkok, Thailand.

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J. Kahane, Chief, Grains and Rice Branch, Commodities Division, FAO, Rome, Italy.

G. E. Mulgrue, Regional Information Adviser, FAO Regional Office for Asia and the Far East, Bangkok, Thailand.

P. Peperzak, Regional Irrigation Agronomy Specialist, FAO Regional Office for Asia and the Far East, Bangkok, Thailand.

Officers of the Commission

The Commission elected Mr. Truong Van Hieu of Viet Nam as its Chairman, and M. Angladette of France and Mr. Van Thean Kee of Malaya as Vice-Chairmen. These men will, in accord with the Constitution, retain office until new officers are elected at the beginning of the Eighth Session of the Commission. Dr. N. Parthasarathy will continue to serve as Executive Secretary.

The following staff members of FAO served as technical secretaries of the session when the subjects indicated were under discussion:

Rice Production and Protection	Dr. N. Parthasarathy	Plant Production and Protection Division
Rice Soils, Water and Fertilizer Practices	Dr. H. N. Mukerjee	Land and Water Development Division
Agricultural Engineering Aspects of Rice Production, Storage and Processing	Mr. A. Aten and Mr. G. Bryce	Land and Water Development Division
Relationship of Commission with the International Rice Research Inst.	Dr. J. Vallega	Director, Plant Production and Protection Division
Long-Term Programs of the International Rice Commission	Dr. J. Vallega	Director, Plant Production and Protection Division
Amendment of the Constitution and Rules of Procedure of the IRC	Mr. G. Saint Pol	Legal Counsel, Department of Public Relations and Legal Affairs

Acknowledgments:

The Commission expressed its deep appreciation to the Government of Viet Nam for the facilities provided for the Seventh Session; to the Chairman and Vice-Chairmen for the efficient manner in which they had supervised the work of the Session; and to the FAO staff for the excellent preparations made for, and the work carried out during the session. Appreciation was also expressed for the work of the interpreters, translators and others who had effectively carried out their duties in connection with the session, including the preparation of the report.

The Commission also expressed its special appreciation of the work performed over a period of 8 years by Mr. C. W. Chang, former Executive Secretary of the IRC, who, because of pressure of other FAO duties was obliged to give up his work as Executive Secretary as from the end of 1958.

SUMMARY OF DISCUSSIONS

The discussions and the conclusions reached with regard to each of the items on the agenda of the Seventh Session of the International Rice Commission are summarized below:

Progress Report by the Executive Secretary of the Commission:

Dr. N. Parthasarathy, who has served as Executive Secretary of the International Rice Commission since January, 1959, when, owing to pressure of other FAO duties, Mr. C. W. Chang was obliged to relinquish this position, referred briefly to the work of his predecessor.

He then reported on activities of the Commission since the Sixth Session held in Tokyo in 1958, exptressing satisfaction at the establishment of the International Rice Research Institute at Los Banos, the Philippines, which will fulfill a long-felt need of member governments of the Commission.

He then referred to the 8th Meeting of the Working Party on Rice Production and Protection and the 7th Meeting of the Working Party on Rice Soils, Water and Fertilizer Practices which were held concurrently at Peradeniya, Ceylon, in 1959, and to the First Meeting of the Working Party on Agricultural Engineering Aspects of Rice Production, Storage and Processing which had been held immediately preceding the 7th Session of the Commission at Saigon.

Reference was also made to the appointment of 3 new Regional Advisors to the Far East Regional Office at Bangkok on Irrigation Agronomy, Agricultural Engineering and Farm Management.

It was noted that three Regional Farm Management Development Centers had been held: one in Saigon, Vietnam, in 1958; one in Bangkok, Thailand in 1959; and the third in Manila, and Los Banos, Baguio, the Philippines during 1960.

The FAO World Catalogue of Genetic Stocks of Rice - Supplement No. 7 had been published, as well as two Working Bulletins, e.g. No. 2 on "Equipment for Rice Production under Wet Paddy Conditions" and No. 15 on "Methods and Equipment for Rice Testing." The IRC Newsletter had entered its 9th year of publication and its circulation had greatly increased.

With the help of Member Countries, FAO is preparing a list of important improved rice varieties adaptable to a wide range of climatic and soil conditions which will be circulated to all countries concerned.

The Regional Rice Improvement Specialist had paid a visit to West African Countries; a full report on this visit would be submitted to FAO.

The Executive Secretary also mentioned recommendations made by the FAO Group of Experts on Grading and Standardization of Rice at the February 1960 Session of the CCP Consultative Sub-Committee on Economic Aspects of Rice, and indicated that while some of these recommendations have already been discussed in the relevant Working Parties of the IRC, further consideration will be given to them at future meetings of the Working Parties concerned.

Report of Working Party on Rice Production and Protection:

The Eighth Meeting of the Working Party on Rice Production and Protection was held in Peradeniya, Ceylon, from 14 to 19 December, 1959 with Dr. M. F. Chandraratna of Ceylon as Chairman, Mr. S. Hedayetullah of Pakistan as Vice Chairman and Dr. G. Julen and Dr. H. C. Walker of FAO as Technical Secretaries. The meeting was attended by 46 participants representing 16 Governments, and 2 Observers from 2 Organizations. A summary of the main activities of the Working Party is presented below.

International Rice Hybridization Project:

Since this project was commenced in 1950, 96 indica varieties have been crossed with 10 japonica varieties, giving 490 cross combinations. All crosses were made at the Central Rice Research Institute in Cuttack, India, where the F_1 generation was also grown. F_2 material was distributed to various countries for selection. In a similar Indian project, 97 indica varieties were crossed with japonica giving 320 combinations. Reports on the results from selections were given by Burma, Indonesia, Malaya, Pakistan, The Philippines, Thailand, Viet Nam, Australia and India. Very promising results were reported from Australia and India. In several of the other countries new lines with a good combination of characters have been obtained from the two parent types. From the results so far obtained it can be concluded that the F_1 generation shows a high degree of heterosis with regard to such characters as height and tillering, but also a high degree of sterility. This F_1 sterility is of no disadvantage as selection for fertility could be made in later generations and fully fertile homozygous lines obtained. Among the japonica varieties used as parents a few were found to be more useful than others. The most promising parent varieties are those with a high degree of general adaptability, such as Rikuu 132. On the basis of experience gained in this project, it was suggested that the material available from the indica-japonica hybridization projects should be tested under two, or preferably three levels of fertility, the highest being at least 80kg.nitrogen per hectare with sufficient amounts of phosphorus and potassium, and that one of the check varieties should be the indica variety used as the parent in the cross. It was also recommended that countries should produce new hybrids using as the indica parent the best varieties with respect to characters such as high yielding capacity, stiff straw, wide adaptability, high fertilizer response, disease resistance, etc., and as the japonica parent varieties which show low sensitivity to photoperiod and wide adaptation, such as Rikuu 132, Taichung 65, Norin 1, Norin 17, and Fujisaka 5. Selection for yield should not be made before the fifth or sixth generation. Selection for other characters governed by major genes should be done in the early generations. Each generation should be grown under a high fertility level from F_2 onwards and selection for yield should be made under medium and high levels of fertility. Emphasis should be placed on resistance to disease and pests in the course of selection.

Linkage Studies and Nomenclature of Rice

In order to encourage genetic studies on rice, the Working Party on Rice Breeding, at its Sixth Meeting, held in Malaya in 1955, nominated a Committee consisting of Mr. N. E. Jodon of the U.S.A., Dr. S. Nagao of Japan

and Dr. N. Parthasarathy of India to examine the present position of linkage studies in rice and resolve difficulties of genic nomenclature. A report was presented to the meeting. Following the rules for gene symbols adopted by the Tenth International Genetics Congress, the Committee had prepared a list of 92 gene symbols for qualitative characters reported in the literature on rice genetics. The committee in its report also summarized linkage studies in rice and indicated 12 groups corresponding to the 12 haploid chromosomes. Maps of these groups were presented. The Working Party adopted the list of symbols prepared by the Committee and recommended that they should be used by all rice geneticists in future publications and that new gene symbols should be given in conformity with the rules adopted by the Tenth International Genetics Congress. A list of the IRC recommended symbols were later published in the IRC Newsletter.

Cooperative Variety Trials

A summary report was given on the cooperative variety trials conducted since 1956 in participating countries: Egypt, Japan, Korea and the U.S.A. in the temperate region, and Burma, India, Indonesia, Malaya, Madagascar, East Pakistan and Viet Nam in the tropical region. Results indicated that, although in most cases those introduced from other countries were inferior to the best indigenous varieties, some had given very promising results. Thus Norin 29 from Japan and Caloro from U.S.A. showed good performance in Korea, Pebifun from Taiwan gave good results in the U.S.A. and the Japanese varieties, Norin 6 and Tsurugiba gave high yields in Egypt. Similarly, some Indian varieties gave good results in Burma, Malaya and Indonesia, while varieties from Burma, Ceylon, Indonesia, the Philippines and Japan gave promising results in several Indian States. The continuation of trials on a cooperative basis and the value of the project in its present form were discussed. It was felt that a modified program might be worked out with the object of testing varieties which have already shown wide adaptability in their own countries for adaptability in other countries. It was suggested that for this purpose each country should send to FAO a list of such varieties and that FAO should formulate a detailed plan for this project.

Variety-Fertilizer Interaction

Since 1951, member countries of the International Rice Commission have conducted active search for *indica* varieties showing marked fertilizer response. Results of investigations from Australia, Ceylon, Egypt, French West Africa and Madagascar, India, Indonesia, Iran, Pakistan, the Philippines and the U.S.A. were reported. In all reporting countries except Pakistan and the Philippines, significant variety-nitrogen interaction has been reported, some varieties showing good response. Australia reported that 2 selections from *japonica x indica* hybrids have shown high fertilizer response, high ratio of grain to straw and lodging resistance. There are now definite indications that in Ceylon and India *japonicas* give high fertilizer response under tropical conditions. Several countries reported that *indica* varieties with good fertilizer response have been found. According to results in Ceylon, there is greater possibility of obtaining good fertilizer response if selection is made after crossing the different *indica* varieties rather than in direct selection. The desirability of establishing response curves for all varieties under test in order to make possible a detailed comparison of

the behaviour of these varieties was stressed. It was also pointed out that, if nitrogen response is to be studied accurately, all other limiting factors must as far as possible be removed. As large doses of nitrogen will increase susceptibility to lodging and blast, it is necessary to determine whether, with low yields at high fertility levels, these yields are due to low fertilizer response or to damage by lodging or disease.

The Working Party recommended that the investigations on variety-fertilizer interaction should continue and requested Dr. Chandraratna of Ceylon to continue to act as coordinator. In all variety-fertilizer experiments, the number of fertility levels should be adequate for calculation of response curves, and the best cultural practices should be used. In breeding for high fertilizer response, emphasis should be given to resistance to lodging and disease. Countries whichmaintain world genetic stocks of indicas should grow these stocks also at a high level of fertility and should take records of the straw/grain ratio as well as of the panicle number and panicle weight.

Ways and Means of Reducing the Number of Varieties

The number of varieties is very high in many countries. Many varieties can be grown only in restricted areas due to great sensitivity to environment. Some are low yielding; in order to increase the average yield these should be removed and replaced by higher yielding varieties. In order to promote schemesfor the multiplication and distribution of high-quality seed of good variety efficient, the number of varieties should be as low as possible and these should have enough adaptability to be grown over large areas. When after testing and selection the number of varieties has been reduced, future breeding work should be directed to the development of varieties with wider adaptability. This is now recognized by all member countries.

Programs on the extensive testing of varieties were reported from many countries and as a result the number of recommended varieties has been reduced considerably. The importance of short or medium maturing varieties with low sensitivity to photoperiod was stressed; genes for low sensitivity to photoperiod may be transferred by back crossing and selection.

The Fourth FAO Regional Conference for Asia and the Far East held in Tokyo in 1958 suggested that the IRC should consider the setting up of a study group to investigate ways and means of reducing the number of rice varieties. The Working Party found that in most countries work was well under way and that in several good results had been obtained. It was therefore not considered necessary to set up a study group. However, it is important to intensify work in many countries. The Working Party recommended that in all countries extensive regional testing should be conducted as the basis for the evaluation of existing and new varieties, and that the best varieties should be multiplied and distributed to farmers as soon as possible. In each country a list of recommended varieties should be issued, and revised from time to time. In breeding programs greater emphasis should be given to the selection of varieties with the widest possible adaptability, and fundamental studies on photoperiodism and thermosensitivity of varieties should receive greater attention.

Seed Multiplication, Certification and Distribution

At the previous meeting, it was recommended that FAO should furnish an outline of the essential features of the best seed improvement schemes in operation. Information submitted by Australia, Ceylon, France, India, Japan, the Philippines, Portugal, Taiwan, Thailand, U.S.A. and Venezuela was presented.

FAO World Seed Campaign

Interest in the use of improved seed is increasing in all countries of the region. In several countries a well-organized seed multiplication scheme is in operation and in others plans for such programs are being developed. The Working Party recommended that in all member countries steps should be taken to strengthen the work on rice seed improvement, giving special emphasis to varietal trials, reduction in the number of varieties, and production and distribution of seed of improved varieties.

Breeding and Testing for Resistance to Blast and Other Diseases

Due to increasing losses caused by blast (piricularia oryzae), the Sixth Meeting of the Working Party on Rice Breeding recommended that countries should intensify the breeding of new varieties resistant to blast. Information has been collected regarding the availability of resistant varieties from Burma, Ceylon, Egypt, India, Indonesia, Japan, Malaya, Pakistan, the Philippines, Taiwan, Thailand and U.S.A. Arrangements have been made to distribute seed to testing centers in Egypt, India, Japan, the Philippines, Taiwan, Thailand and U.S.A.

Many varieties have been tested in several countries, but none has been classified as resistant in all countries. Varieties which are regarded as resistant in their country of origin are often badly attacked by blast when introduced into other countries. This is due either to the occurrence of different biotypes of the fungus or to the influence of environment. In Japan, 15 different races of blast have been identified, and the Working Party recommended that work on blast race identification should be conducted wherever facilities exist.

The Working Party felt that breeding for resistance to blast should be intensified. In order to find reliable resistant parent material, it was suggested that uniform blast nurseries should be established. A committee consisting of L. H. Ferando (Ceylon), Dr. H. Okamoto (Japan) and Dr. S. Y. Padmanabhan (India) was appointed to prepare plans and instructions for them.

As the damage caused by other diseases does not equal blast in importance, it was agreed that the cooperative work should be concentrated on blast. Work on breeding for resistance to other diseases and pests should be continued and strengthened in those countries where resistant varieties were needed, and the results should be reported to the next meeting.

Rice Protection

General. Technical specialists working on the insects, diseases, weeds, nematodes, rodents, crabs, birds and other pests of rice expressed appreciation that plant protection had been recognized as an important phase of rice

production by their being included as active participatns of the Working Party. However, they expressed regret that so few specialists had been able to attend the Meeting and that more time was not available for the discussion of many important widely varied problems.

Recognizing the need for accurate information on the known distribution of rice pests and diseases, the Working Party recommended that member governments make a careful survey of all pests including insects, diseases, weeds, nematodes, birds, crabs, rodents and other miscellaneous pests attacking paddy in the field, and provide FAO with a list of these pests, including their scientific names, indicating whether they are of major or minor importance. It further recommended that, as an aid to this project, FAO should prepare a list giving the distribution of species reported to be pests of rice and circulate it to member countries for corrections, additions and suggestions, including an indication of the importance of the species in the different countries. As new species are found or new distribution records are obtained, the data should be forwarded to FAO for use in preparing and keeping up-to-date records of all pests of rice. It was emphasized that the scientific names of all species should be included in reports on experiments dealing with them.

A brief review of the major groups of pests by the Working Party indicated the following:-

Insects: Stem borers (several species) are the most widespread and serious insect pests of rice causing serious losses in some areas nearly every year, especially in the Far East. Other insects which often cause serious losses include various leaf feeding caterpillars, grasshoppers and beetle larvae. Other important insects include gall midges, various sucking bugs, mealy bugs, froghoppers and leafhoppers which not only injure paddy by direct feeding but act as vectors for a number of diseases including Hoja Blanca which has only recently been found in South, Central and North America. Other important insects include root feeding insects, thrips, leaf miners, etc.

Diseases. Although more than 50 rice diseases are known, by far the most important and widespread is blast. Other important diseases include brown spot, foot and root rots, stem rot, seedling blights, sheath blight, downy mildew, various virus and physiological diseases etc.

Weeds. There are a great many species of weeds which may compete with rice for water and plant nutrients. Some of these are present in relatively small localized areas, while others occur over a wide area. It was generally agreed that the most important, widespread, and injurious species are the graminaceous weeds, Echinochloa spp. and Panicum spp. It was emphasized that weed control problems are much more serious in broadcast than in transplanted paddy.

The Working Party, recognizing the serious losses caused by weeds and the need for further work on the relative merits of different methods of weed control, including all factors such as cropping procedures, the availability and cost of labour, the use of machinery, chemical weed killers, etc., recommended that member countries should thoroughly study all phases of this complex problem and be prepared to report on the results obtained at the next meeting of the Working Party.

Nematodes: The Working Party, aware that, as information becomes available, nematodes are proving much more serious pests of many crops than previously recognized, noted the scarcity of information on the nematodes attacking rice, recommended that FAO investigate the possibility of developing cooperative surveys of rice growing areas for the presence of nematodes.

Assessment of crop losses

By Insects: The Working Party, aware that large increases in yield frequently result from the use of chemicals for the control of stem borers and other insect pests, recognized the need for additional accurate information on the magnitude of losses caused by insects in the majority of member countries, and realizing the value this information would be to member governments in deciding upon the efforts their governments should make to reduce or eliminate these losses, recommended that member governments should take immediate steps to secure information on the overall losses caused by insect pests, and, wherever possible, the losses caused by individual paddy pests. In this connection a technical group composed of Dr. H. Fernando (Ceylon), Dr. Akira Kawada (Japan), Dr. Ahmad Yunus (Malaya) M. R. Chakratong Tongyai (Thailand) and Dr. H. G. Walker (FAO) drew up a set of suggested recommendations for conducting tests. Copies of this have been prepared and circulated to member governments.

By Diseases: Comparatively little information was available on methods for assessing losses caused by disease. The Working Party recommended that major attention should be concentrated on evaluating losses caused by blast, this being the most serious disease in the majority of the territories. It also recommended that available information on this subject should be sent to FAO and circulated to member governments.

Forecasting outbreaks of pests and diseases

The Working Party recognized the importance of, and need for an effective forecasting service to predict impending outbreaks of insects, diseases and other pests in order that pesticide applications may be properly timed to avoid losses and planting dates varied to avoid peak infestations, etc. It recommended that the most effective local methods be used to warn growers of impending outbreaks, and that where possible detailed biological and ecological studies be conducted on the major insect pests and diseases (especially blast) to secure the basic information needed to evolve the most effective forecasting methods for different species. The results obtained to be reported at the next Meeting of the Working Party.

Methods of controlling pests and diseases

Insects: Cultural and Mechanical: Due to a shortage of time it was decided not to include a discussion of the important cultural and mechanical methods of insect control, such as the prompt destruction of crop residues containing pests, variations in planting time to avoid peaks of pest emergence etc.

Biological control: Much interest was expressed in the possibilities of developing effective biological control for stem borers and other insect pests of paddy. As a first step in promoting this project, the Working Party recommended that member countries should make detailed surveys and collect as much information as possible on natural enemies, including pathogens of rice stem borers and other insect pests of paddy, and supply FAO with copies of the information collected for use in preparing a revised, comprehensive list, giving the host range and known distribution of the beneficial species. In addition, FAO was requested to investigate the possibility of securing safe passage of insect parasites and predators in heated cabins of airplanes at the lowest rates possible. Further, where necessary, member governments were asked to amend their plant quarantine regulations to expedite shipments of properly certified beneficial insect parasites and predators.

Chemical control: Many countries reported excellent results with pesticides in controlling insect pests attacking paddy. Endrin, parathion, malathion and other organic phosphates are being widely used for control of stem borers, but because of their toxicity to man, fish, etc., efforts are being made to find safer materials. DDT, BHC, dieldrin, toxaphene and other pesticides are often used for control of other pests with effective results. The Working Party recognized the necessity for and the outstanding benefits to be derived from the use of pesticides, considered the need for adequate precautions to protect the user from the hazards of highly toxic pesticides and the consumer of treated crops and recommended:-

that member governments keep FAO regularly informed of effective new or improved pesticide techniques for control of various paddy pests and that FAO circulate this information to member countries;

that member governments consider enacting regulations to control the importation, manufacture, formulation, packaging, labelling and distribution of chemicals within their territories and consider ways and means of developing effective methods for the control of pesticide residues to protect consumers of treated crops from possible harm by them;

that FAO consider the possibility of obtaining and disseminating recent and new information on the safe use of new or recommended pesticides;

that FAO consider the possibility of organizing a technical study group to review the latest developments in the control of stem borers, gall midges and other important insects of rice, especially those that feed within the stems of paddy plants, in order to develop a well coordinated program for the study of the biology, ecology and control of those pests which are considered to be of greatest international importance.

Varietal resistance to insect attack: The Working Party noted that evidence was being accumulated to indicate that it might be possible to breed varieties at least partially resistant to damage by some species of insects. It was recommended that entomologists be encouraged to examine rice variety and breeding trials in order to secure information on the possible resistance or variations in the susceptibility of the varieties to insect damage for use in possible future breeding programs.

Diseases: Chemical Control: Seed treatment with formalin and mercurial compounds is widely used in some areas for control of foot rot and seedling blights with excellent results and some areas report promising results for the control of brown spot. Mercurial lime dusts are widely used in Japan for control of blast, but are not widely used in other areas because of injury to the indica varieties and possible toxicity hazards. Copper compounds are also being tested and used in some areas for blast control. Experimental work with antibiotics has shown some promise for blast control but a tendency to be phytotoxic will have to be corrected before they can be recommended for general use. The Working Party noting the need for safer and improved chemical control measures for such diseases as blast recommended that member countries keep FAO informed of new developments in fungicide control of rice diseases and that FAO circulate this information to member countries.

Varietal resistance to disease attacks: The importance of varieties resistant to various diseases was stressed. Results so far obtained with regard to the development of resistant varieties and recommendations for future cooperative work in this field have been dealt with earlier in this report.

Nematodes (control): Pakistan reported that burning of infested stubble had given good control of Ditylenchus spp. in deep water paddy, but since the straw was being collected and used for fuel, the nematodes are again becoming a serious problem. The USA reported that a hot water treatment of rice seed would give good control of white tip (Aphelenchoides oryzae Yahoo), but that the use of resistant varieties has largely replaced the need for this treatment.

Weeds: Chemical control: Copper sulphate is widely used for control of algae. Large amounts of 2,4-D, MCPA and 2,4,5-T are used for control of broad-leaved weeds in paddy fields in some areas. A combination of deep seeding (about two inches) and the use of CIPC gives hope for control of Echinochloa spp. in the U.S.A , but results were not promising in Australia. There TCA has shown good results experimentally.

Miscellaneous Pests

The Working Party noted that miscellaneous pests such as birds, crabs, fish, rodents, etc., often cause serious losses in paddy fields and regretted that time was not available for a discussion of those pests. However, the delegation from France noted that the herbivorous fish, Tilapia melanopleura and T. zillii, were pests of rice in some areas of Madagascar and suggested that countries where those species do not occur might wish to take the necessary steps to prevent their being introduced. It was recommended that member countries make a study of the miscellaneous pests in their areas and prepare a report on the status and control of these pests for presentation at the next meeting of the Working Party.

In addition the Working Party noted that Japanese scientists have made many valuable contributions to the knowledge of insects, diseases, weeds and other pests of rice, much of which is published in the Japanese language and is not available in abstracting journals. It was recommended that FAO

investigate the possibility of having these articles translated into English and French either in full or in abstract form and circulated to members of the International Rice Commission and its Working Party on Rice Production and Protection.

Discussion Regarding Rice Production and Protection:

General:

Several countries reported on their progress since the last meeting of the Working Party. The delegation from Thailand mentioned the assistance provided by an FAO expert on investigations on blast, and resistance to the disease. Progress of the work has convinced the Government of the importance of the problem and the need for building up a comprehensive program for plant protection. In India, coordinated schemes for the breeding of blast resistant varieties with US cooperation have been finalized under the Third Plan and it is expected that the results will be made available in due course to member countries of the IRC. Rice research throughout India is being reorganized with the establishment of main rice research stations in each of the States with regional and sub-stations.

Expansion of rice research and development in Pakistan and the increased tempo of rice research in Malaya, with the participation of FAO and the Colombo Plan were also reported. The delegation from France stressed the necessity for greater attention to the rice problems of African countries and their future participation in the various cooperative projects of FAO. In Ceylon recent developments relate to the reduction of the number of recommended varieties from 14 to 8 and the evolution of a superior variety H4 which is not only more widely adaptable, but highly responsive to fertilizer application besides being tolerant to blast. In the field of seed multiplication plans have been made for the distribution of required amounts of certified seed to ensure renewal of seed every four years. The delegation from Ceylon also mentioned recent developments in mechanization for sowing under both dry and wet conditions. The representatives of Madagascar and Mali attending the Commission for the first time reported on progress in rice production. The delegation from France suggested the desirability of overall revision of the catalogue of genetic stocks and its supplements.

The delegation from Australia informed the Commission of the establishment of a new rice research station in North Australia under CSIRO, to be known as the Coastal Plain Research Station. He felt that, in view of the fact that fertilizers will not be available to a large proportion of rice producing areas throughout the world for many years to come, current breeding programs, not only for high fertility but also for prevailing fertility conditions, should be intensified and assisted by the application of modern methods of increasing genetic variability and selection.

In the light of the recommendations submitted by the Working Party on Rice Production and Protection and the general discussion, the Commission stressed the importance of the following subjects:

Indica/Japonica Hybridization Project

In view of the encouraging results obtained in some States in India, this project is now being intensified by the provision of additional funds and facilities for carrying out a coordinated scheme. Work in Madagascar is progressing with the object of getting early varieties, resistance to blast and high-yield. In Viet Nam district trials are now in progress with improved selections. Promising selections are being studied in Australia.

Cooperative Variety Trials

Member governments are now being requested by FAO to give a list of varieties which have shown wider adaptation in their respective countries so that a full list of suitable varieties may be compiled with details regarding the various characteristics and this completed list, when ready, will be circulated to all the member countries to enable them to select suitable varieties for trial. The delegation from France and the Observer from Madagascar expressed their desire to cooperate in this project.

Breeding for Special Conditions such as Salinity and Tolerance to Submersion, Drought, Disease and Lodging Resistance

Delegations from different countries indicated the need to evolve, especially for flooded areas, varieties which could tolerate submersion. In this connection it would be desirable to have early maturing varieties for replanting in damaged areas. There was also need for salt tolerant varieties in areas which are subject to salinity.

The Commission expressed the hope that research work in upland rice would be intensified since large areas of countries like Brazil, West Africa, the Philippines etc., are under this system of cultivation. The Commission directed the attention of the Working Parties to this problem.

Biological Control

The Commission welcomed the increased interest being taken in biological control and felt that such work should be encouraged. However, a warning was given that biological control by insect parasites could not be expected to be effective in all areas and therefore there should not be any reduction in research on chemical control methods. The delegation from Thailand requested FAO to look into the possibility of control of insect pests such as stem-borers by bacterial and virus pathogens. The systematics and biology of parasites should also receive greater attention.

Pesticides Legislation

In view of the hazards to which farmers are exposed by the indiscriminate use of an increasing number of pesticides put on the market, it is felt very necessary to introduce legislation suitable to tropical conditions to control the use of such pesticides.

Fundamental Research

The delegates unanimously felt that governments should be urged to promote basic research, especially on rice physiology. The countries which

maintain genetic stocks should also be requested to assess the stocks for their food value, protein, vitamins, minerals, etc. Emphasis was again placed on the need for studies on photo-periodism and thermo-sensitivity for development of varieties suitable to a wide range of latitude and altitude conditions.

National Rice Committees

The delegation from Pakistan drew attention to the importance of setting up national rice committees in countries of the region which have not yet developed such committees. This would facilitate strengthening of national projects and international collaboration to advance the rate of progress. The delegation from Thailand pointed out that the complexity and close inter-relation of different disciplines in any single project called for a comprehensive program with adequate financial and technical aid. In view of the increasing amount of foreign aid, proper channelling of such aid without overlapping could be effected only if countries in the region could develop programs on a national scale. This would also help the Working Parties of the IRC to strengthen weak links, fill up any existing gaps, and thereby improve international cooperation.

Recommendations Relating to Rice Production and Protection

The Commission commended the Working Party on Rice Production and Protection for the work carried out during the last two years, indicated its general agreement with the recommendations of the Sixth Meeting of the Working Party, and recommended that:

1. Greater attention be paid to the development of basic research in planning of future research activities.

2. In countries having significant areas in upland rice, steps be taken to study the various technical aspects of increasing production of rice grown under this system of cultivation.

3. FAO should provide appropriate assistance to member countries of the tropicalregion for the framing of suitable legislative measures to prevent and control the indiscriminate use of dangerous agrochemicals.*

4. Where appropriate due consideration be paid to the setting up of National Rice Committees in Member Countries which have not established the same so far.

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* This recommendation refers to safety measures for farmers handling agrochemicals, and consumers of treated crops.

Report of Working Party on Rice Soils, Water and Fertilizer Practices:

The Seventh Meeting of the above Working Party was held in Peradeniya, Ceylon, from 14 to 19 December, 1959, at the same time as the Eighth Meeting of the Working Party on Rice Production and Protection. Dr. J. Takahashi of Japan was unanimously elected Chairman, and Dr. V. Ignatieff, Chief, Soil Survey and Fertility Branch, FAO, served as Technical Secretary. The meeting was attended by 32 participants representing 15 Governments. A summary of information received from delegations from member countries on the various items of the Agenda follows:

Efficacy of Different Nitrogen, Phosphorus and Potassium Carriers:

Ammonium Sulphate and Superphosphate have been so far the commonly used fertilizers on rice in the Far East. There are, however, other forms of N and P which are cheaper to produce or import, but due to certain disadvantages such as deliquiscence, lower nutrient availability, etc., they have not yet come into general use. Due to lack of sulphur deposits in most of the countries of the Far East Region, it is difficult to manufacture ammonium sulphate and superphosphate at a sufficiently low cost. Hence the Governments in this region are interested in exploring the possibility of using non-sulphur fertilizers, provided these prove to be of almost equal efficiency to ammonium sulphate and superphosphate. Accordingly considerable attention has been paid in recent years to comparing the relative efficiency of different N and P carriers and a number of delegations briefly described the results of tests in their countries.

In Australia, it was found that ammonium sulphate, urea and blood and bone fertilizers, as sources of nitrogen, did not show any significant differences when applied at shallow depths at the Kimberley Research Station; but in New South Wales, urea and ammonium nitrate were not as efficient as ammonium sulphate.

In Ceylon, on a grey non-lateritic soil of the dry zone, ammonium sulphate urea and ammonium phosphate were equally good sources of nitrogen, but ammonium sulphate was superior to Calcium Cyanamide; on the brown acid and strongly acid lateritic soils of the wet zone, ammonium phosphate was the best nitrogen source.

In the French Community countries of Africa, ammonium chloride was equivalent to or slightly better than ammonium sulphate while urea was as efficient or slightly less efficient than the latter. Ammonium nitrate was less efficient than ammonium sulphate.

In India, ammoniacal fertilizers were better than sodium nitrate, potassium nitrate and calcium cyanamide. Ammonium sulphate was best, closely followed by ammonium phosphate, ammonium chloride and ammonium sulphate-nitrate. Results obtained with urea were not consistent, although on cultivators' fields, it gave better response, and it appeared that all these could be used as alternative fertilizers, depending on their comparative cost and local availability. Calcium ammonium nitrate was better than ammonium nitrate, though both were hygroscopic.

In Italy, urea is now considered to be the best nitrogen carrier because of its quick conversion to ammonium carbonate and fixation in the soil, and also because it can be absorbed in molecular form, either by the roots or directly by the leaves. Hence it fits in well with different methods of application viz: basal dressing, top dressing, sprinkler irrigation etc.

In Pakistan, urea showed a higher response than ammonium sulphate, while ammonium nitrate, potassium nitrate and calcium cyanamide showed lower responses.

In Thailand, ammonium sulphate was found to be as good as urea as a source of nitrogen, although in most cases the former appeared to show a slightly better effect.

Of the phosphorus carriers it was found that in Ceylon there was no difference between ordinary and concentrated superphosphate, rock phosphate, basic slag and bone meal; in the African French Community countries there was little difference between the different forms of P. excepting at one station, where the soluble form appeared to be better; in India, no significant difference was found between superphosphate, bone meal, rock phosphate and dicalcium phosphate in the few soils tested; in Thailand, it was found that there was no significant difference between superphosphate, Christmas Island rock phosphate, hyperphosphate and bone meal at lower rates, but at higher rates of application rock phosphates were mostly better than superphosphate.

In Italy, the use of "organic-P" fertilizers prepared by adding ground rock phosphate to the compost heat was found to be very efficient for ensuring a constant supply of available P during the whole period of vegetative growth of the rice plant. The rock phosphate activates the biological decomposition of organic matter, promotes the solution and assimilation of non-soluble compounds and helps to form humic-mineral complexes which are very efficacious in raising soil productivity.

Time and Method of Application of Fertilizers:

To obtain the maximum efficiency from fertilizers, these should be applied at particular times and by particular methods suited to the existing conditions. Extremely variable results have however been obtained in experiments conducted to determine the best times and methods of applying fertilizers and further work is indicated on the subject.

Regarding the time of application of nitrogen, it has been found that in Australia, in one season N
applied at sowing time was inferior to N applied about one month before ear emergence, while in another season the earlier application was better. In Ceylon N applied three weeks after sowing was better than applications (i) at sowing and (ii) six weeks after sowing. In the French Community countries of Africa, no significant difference was found by applying N at different times, but the best results were often obtained by applications during tillering and heading times. In two of the stations there, split N application was better than single application. In India, for early rice varieties, the application

of N in two doses viz; at planting, one month after planting and two to three weeks before flowering was more efficient. In Pakistan, N in two doses viz: just before transplanting and before heading, was better than a single application at transplanting. P applied before transplanting gave better results than when applied before heading.

Regarding the method of fertilizer application, it was found that in Australia, N fertilizers showed better results, when placed at 3" depth, as compared to surface, 1" or 6" depth applications. In Ceylon, best results were obtained by the deep placement of ammonium sulphate after transplanting, but in the French Community countries, no difference was found between surface application and deep placement. In India, deep placement of N fertilizers has shown 50-60% better response than surface application. In Pakistan, 2" deep placement of N was better than surface application or deeper placements.

It appears that the efficiency of nitrogen fertilizers can be considerably increased by deep placement coupled with adjustment of the time of application to coincide with the critical growth stages viz. active vegetative growth, tillering, and flowering initiation, when the nitrogen needs of the crop are high.

Effect of Lime

Liming is not usually practised in the Far East, even for acidic rice soils, but striking increases in rice yields were obtained in Ceylon, where a single application of lime at 6 tons per acre of slaked lime gave a yield increase of 700 lbs of paddy per acre for four successive seasons. Average responses on cultivators' fields were 920 lbs per acre and residual effect a year later was 500 lbs. of paddy per acre. On the other hand, in India, the continuous application of ammonium sulphate for 10 years on a soil of PH 6, did not produce any deleterious effect and liming of such soils did not give any additional yield response. On lateritic soils, however, 10-24 percent yield increases were observed by liming, which also resulted in increased phosphate availability.

Summaries N, P and K Fertilizer Trials

Responses to N, P, and K vary considerably under different soil and management conditions and hence careful experimentation is essential before arriving at definite conclusions about the nutrient requirements of individual cultivators' fields.

In Australia, greater responses to high rates of N were obtained on a clay loam soil than on a virgin clay soil and a positive NP interaction was obtained with the highest rate of N on the latter soil, but this was negative in the former.

In India, N doses ranging from 15-80 lbs. and in a few places up to 120 lbs. per acre were tested. Increasing responses were obtained up to 40-60 lbs of N and with further increase there was depression in yield. The highest response of 18.4 lbs. of paddy for every pound of N was obtained with an application of 20 lbs. N per acre. While N response was general, response to P was obtained at several places and to K in certain places.

In the Philippines, different rice soils showed different responses to fertilizer application. While one soil showed 100 percent yield increase by P application, another did not respond to N, P or K when applied singly, but showed 63 percent yield increase with a combined NPK application. One soil did not respond to fertilizers with one rice variety, but showed a 65 percent response with another. Residual effect of P was observed only on the following rice crop and in soils highly deficient in available K, small applications generally did not give significant increases, but with larger applications, higher yields were obtained.

In Viet Nam, marked yield increases were obtained by N application in nearly all soils, and P alone generally increased yields, but this varied considerably in the different regions. Good residual effects of P were obtained and NP combinations were best. K responded only in limited areas.

Effects, Deficiencies and Toxicities of Trace Elements

Only a few countries reported the results of investigations on the effects of trace elements on rice. Due to the paucity of information on this subject, more extensive work should be undertaken.

In Orissa, India, the yields of rice did not seem to be affected by the addition of trace elements, but the incidence of nematode affected plants was found to be associated with the absence of manganese, copper, boron and magnesium.

In Japan, application of silicon in some soils has increased yield, but a recent investigation shows that any reduction in the vegetative growth of the rice plant cannot be attributed to lack of silicon. In fact, the role of silicon in plant life has not yet been clearly established, except that silicon is one of the more important factors contributing to plant resistance to diseases and insects.

In the French Community countries, solution culture experiments were conducted to establish the toxicity symptoms of excess iron and manganese on the rice plant and it was found that the toxicity threshold of both these nutrients is below 200 parts per million.

Physiological Diseases

Information on physiological diseases was collected by Dr. Takahashi of Japan, the project coordinator, from 14 countries. The dominant group of diseases, known by different names in different countries, appears at the tillering stage of paddy in areas of high water table, e.g. in Burma, Ceylon, Taiwan, Indonesia, India, Japan, Korea, Malaya and Pakistan. The disease is attributed to iron toxicity in Ceylon and Taiwan; to ferrous iron, toxic organic acids and lack of oxygen at the roots in Japan; and to reduced conditions in the soil and low P and K availability in Indonesia. The concensus of opinion is that the disease can be controlled by providing internal and external drainage to the affected fields.

In the U.S.A. a disease (straight-head) is liable to occur on soils with high organic matter and poor drainage, which can be cured by draining the fields at the initiation of the reproductive stage of the crop. As draining the land is not economic, attempts are being made to breed resistant varieties. A similar disease has also been reported from Japan.

In Japan, two diseases ('akiochi' and 'aogare') occur on well-drained sites at the reproductive and milky stages of paddy respectively. The former, caused by sulphide injury, can be controlled by stopping the use of sulphate-containing fertilizers, applying iron-rich materials and using resistant varieties, while the latter is presumed to be due to excess of nitrogen and shortage of potash. A disease like 'akiochi' has also been reported from India.

A disease (Myit-po) in Burma can be cured by phosphate application and another (yellowing) in Burma and India can be cured by the application of sulphate containing materials.

Simple Fertilizer Tests on Cultivators' Fields

The Working Party having considered the reports of member countries came to the conclusion that fertilizer experiments on experimental stations were of limited value in advising cultivators on the economic use of fertilizers. Realistic advice can be based only on the results of experiments carried out extensively at random on the fields of cultivators to sample all possible conditions of soil, climate, water-regimes, management conditions, residual effects of previous crops and manuring etc. More accurate advice is especially required in the Far Eastern countries, where on the one hand the farmers have little spare cash and on the other hand the cost of fertilizers is high and the price of the produce is low for most crops. This leaves only a small margin of profit in many cases and hence the advice should be such that the farmer need not waste any money on fertilizers which are not really needed by his crops. It was noted that the first Meeting of the Working Party in 1951 recommended that member countries should adopt the technique of simple fertilizer trials on cultivators' fields, which have been successfully carried out in Bihar State, India, since 1948. At subsequent meetings the Working Party has consistently supported the adoption of this technique and the 1953 Meeting recommended the appointment of a Soil Fertility Specialist to implement these recommendations in different countries. As a result of such action by the Working Party, experiments on cultivators' fields have been initiated in many countries in varying intensity, depending on the funds and trained personnel available e.g. Burma, Cambodia, Ceylon, Hongkong, India, Iran, Indonesia, Japan, Korea, Laos, Malaya, Pakistan, Philippines, Sarawak, Senegal, Taiwan, Thailand and Viet Nam. In some countries only a few tests have been conducted; in others many thousands of tests have been carried out.

Reports presented to the meeting re-affirmed the previous conclusions that fertilizer tests on cultivators' fields are essential for:

(a) making recommendations to cultivators for the most economic use of fertilizers, by definitely demarcating the areas where different doses of N, P and K would be most effective, either singly or in combination;

(b) obtaining realistic information regarding fertilizer responses under existing conditions;

(c) providing demonstrations to cultivators for encouraging fertilizer use;

(d) deriving quantitative information on the potential increase in production that can be brought about by the efficient use of fertilizers, required for the formulation of agricultural development plans.

In Ceylon in addition to fertilizer needs these tests have indicated the areas where limiting factors such as lack of water control, adverse weather and unfavorable soil conditions were operating. Their great demonstration value was shown by the keen interest of the cultivators.

In India, it was previously believed that N was the main deficiency, P was required in a very few areas and K was not required at all. The tests on cultivators' fields revealed that P was also required in almost all soils like N, and K was effective under certain specific soil conditions. Realizing the importance of conducting simple fertilizer trials on cultivators' fields, an all-India project was started in 1956, which will cover 200 districts by 1961 and all the 318 districts of India by 1965.

In Japan, the results of 460 experiments on cultivators' fields have shown that on an average 64.5 kg. N, 47.3 kg. P_2O_5 and 56.3 kg. K_2O per hectare would be expected to give a yield of 4,200 kg. per hectare of brown rice. It was found that some cultivators were using too much fertilizer others too little. Some were using unbalanced combinations resulting in average yields of about 3,375 kg. per hectare. The results of the above tests should help in rectifying the situation.

In Malaya, it was concluded from the results obtained that the technique of random selection of sites for test plots and the operation of such tests as research projects are compatible with one another. Information on farmers' practices is essential for the determination of factors responsible for low yields, and the objectivity of this information is guaranteed by the random selection of sites.

In Pakistan, in calculating the economics of fertilizer use, the ratio between the price for increased yield of paddy and the cost of fertilizers had been used. Application of fertilizers is considered to be profitable when this ratio assumes a numerical value of two or more. This ratio has been found to be more than two in all soil tracts of East Pakistan, except two areas.

In the Philippines, tests showed that increases in yield of rice, due to fertilizer application were very profitable during the dry season, but during the wet season there was little response to fertilizer application.

In Senegal, tests showed that applying phosphates on the two kinds of soils examined improved their response to N and allowed a profitable use of high doses of fertilizers. Applying phosphates to green manure seems to be the solution to the maintenance of soil fertility of the tropical ferruginous soils.

Soil Analysis and Foliar Diagnoses

Fertilizer experiments on a few experiment stations are of limited value in correctly advising cultivators. Extensive randomized fertilizer tests on cultivators' fields are more reliable but still not accurate enough in advising individual farmers. Chemical soil-testing of individual farmers' fields can provide a better basis for offering sound advice about the most

economic doses of fertilizers to be applied to the soil before the crop is sown. Plant tissue testing during the growing period of the crop can provide information about any deficiencies that might develop during this period, so that these may be made good, by top-dressing with the appropriate fertilizers. Such work in connection with the rice plant has so far been very limited. Extensive investigations are needed to establish correlations between the soil and plant analytical values and the actual crop response to added nutrients.

In India, more than 50,000 soil samples of which 30,000 were rice soils, have been analysed during the last three years. The nitrogen status of rice soils is generally low and they are also lower in available P and K compared with all-India averages. Little correlation has been found between total nitrogen and crop response, but the available N as determined by treatment with alkaline permanganate showed good correlation. For P, out of 11 methods tested, it was found that Olsen's method for neutral and alkaline soils and Bray's and Truog's methods for acid soils appeared to be suitable for basing recommendations for phosphate fertilizers. Potash extracted by the common reagents did not show any significant correlation, but in light textured soils a high correlation between exchangeable K percent value and response of paddy to K application was obtained. In Bihar State, the percent K saturation of the exchange complex gave a better correlation than the exchangeable K. Soil testing has become popular amongst farmers and follow-up information shows that they are obtaining increased rice yields by following the recommendations.

In Viet Nam, 93 soil samples analysed for available P by six different methods showed that only two methods viz; hydrochloric acid and Olsen's may be of some value in predicting the P needs of rice soils. Although these methods have given reasonable correlation with crop response, they are far from satisfactory in the case of many individual samples.

In the French Community countries of Africa, leaf test for nitrogen showed rather disappointing results because of great variations in N uptake, due to changes in climatic and soil factors. Nevertheless some correlation between N intake and rice yield has been found. Correlation with leaf P test values has been found only in soils which are very deficient in P, but no correlations have been obtained between potassium and calcium content of the leaves and yield.

In India, a quick tissue-testing procedure, viz; transferring the plant sap on a filter paper and developing a chromatograph with a suitable organic reagent was tried to determine the nitrogen needs of a growing rice crop. The color intensity and the width of the bluish violet rings thus developed have been taken as a measure of the fertilizer needs of the crop and is useful in detecting N requirements at the early growth stages up to 40 days after transplanting. The method suggested by Japanese workers viz; the absence or presence of asparagine in the under-developed flag-leaf just before flowering, indicating the need or otherwise of N top-dressing, has not been found suitable in India.

Classification of Soils on which Rice is Grown

There exists an increasingly urgent need for a better basic knowledge of the soils of rice producing areas of the world. The establishment of a consistent system of soil classification of the rice growing areas of the world will often permit the application of improved management practices

developed in one country, to similar soils in another country, even though it may be situated in another continent. The opinion was expressed that for the present activities should be limited to the field of soil classification proper and not land classification (applied soil classification), though stressing the necessity of more complete and detailed studies on the behaviour of rice when grown on different soil units.

It was recognized that the terms 'rice soils' and 'paddy soils' indicating (i) soils on which dry-land rice is grown and (ii) soils which are periodically submerged for growing rice were hardly satisfactory when used in the framework of a soil classification system, because these terms give an indication of land use without giving any precise information on the soil itself. It was therefore recommended that where possible the classification of soils on which rice is grown should adhere to an internationally accepted valid system. In this connection attention was directed to publications of the United States Department of Agriculture, particularly Soils and Men Yearbook of Agriculture 1938, and Soil Survey Manual Agriculture Handbook No. 18. It was also felt that certain characteristics relevant to many soils under wet rice need to be studied more closely. The need for exchange of information between member countries on soil surveys and the different levels of classification was clearly recognized and guide-lines for the classification of soils at high levels, medium levels, series level and lower levels were indicated.

The Salt Tolerance of Rice

Although work has progressed in a number of countries on the salt tolerance of the rice plant, there is still some divergence of opinion on this subject.

According to work conducted in the United States of America, it was concluded that the effect of salinity on the growth of rice depends on the stage of development at which the salinity occurs. Rice is apparently most sensitive to salinity during the young seedling stage and less sensitive during the tillering and elongation stages. Among the twelve varieties tested (from Egypt, Portugal, Japan, India, and U.S.A.) none of the varieties could be considered as salt tolerant, on the basis of grain yield. In Guinea, water culture experiments have shown that the salt tolerance of the rice plant depends on the stage of development and that different varieties show considerable differences in tolerance. In Viet Nam paddy appears to grow under fairly high salinity conditions.

Optimum Physical Conditions of Paddy Soils

Reports from Madagascar, Japan and India were discussed. In Madagascar swamps may be reclaimed for rice production by gradual improvement in drainage, followed by appropriate cultural practices, thus creating a physico-chemical and biological balance which would ensure optimum productivity.

In Japan, increases in yields have been obtained through the use of heavy dressings of fertilizers, but interest is now developing to increase the yields further by the adoption of other techniques along with fertilizer use. Deep ploughing was tried with little success, but there are indications that better use of weather conditions, timely irrigation and drainage practices to maintain oxidative condition in soil, together with heavy applications of fertilizers and composts would increase the yields beyond the eight ton per hectare level.

In India it was found that 8 ploughings gave an increase in yield of 10-18 percent as compared to 2-6 ploughings, and ploughing 15-23 cm. deep was superior to ploughing 7-8 cm. deep. However it was found that a deep "puddle" makes animal movement difficult and also creates a hard impervious layer below the plough sole after a few years.

Soil, Water and Fertilizer Projects for Increasing Rice Yields.

Experience has shown that judicious fertilizer and water use can increase per hectare yields considerably in all countries, but that further information is needed to make those two factors most effective. The Working Party prepared a list of 19 projects and requested the participating delegates to indicate the importance priorities of the projects for their own countries and the feasibility of implementing such projects with the facilities currently available. FAO will analyse the statements made and communicate with Member Governments.

The projects mentioned above suggested investigations on simple fertilizer tests on cultivators' fields, testing responses to N, P and K, etc.; responses to other major and minor elements; efficacy of different fertilizer materials; time and method of fertilizer application; correlation between soil-testing data and crop response, interaction of fertilizers with varieties, irrigation and cultural practices; fertilizer requirements of complete rotations; amelioration of problem soils; effect of water on paddy plant and soil; physiological diseases; optimum physical condition of soils; classification of paddy soils; foliar diagnosis and nutrient uptake; more suitable methods of paddy soil sampling and analysis; effect of fertilizer on grain quality etc.

Technical Data for Extension Services and for Cultivators

The question of how technical information on fertilizer use can best reach the cultivator was discussed by the Working Party and examples of what is being done in some countries were presented.

The Working Party also considered the question of preparation of suitable pamphlets on fertilizer use for distribution to farmers. The conclusion was reached that although in more developed countries agricultural journals and pamphlets suitably prepared are of value to farmers, in less advanced countries where illiteracy is high amongst the cultivators, reading material is of little benefit. Field demonstrations and field days held at progressive farms tell the story more effectively.

In the United States of America it is generally felt that close association of research worker, college professor, and agricultural extension specialist by having them together in the State University is a most desirable thing. It promoted the ready transfer of research results to the extension specialist, who, in turn passed them on to the county agent.

In Japan every village has an Agricultural Agent and an Extension Office is responsible for 3-5 villages. Technical information obtained by the National Agricultural Stations is communicated through the Extension Bureau to the prefectural specialist's office, which in turn communicates it to the extension offices. If an agricultural agent cannot solve a local problem, he refers it to the prefectural office and finally to the prefectural agricultural station, if necessary.

In New South Wales, Australia, extension officers work in cooperation with research officers in their region and where necessary carry out experiments on farmers' properties to assess the value of results under practical field scale conditions.

In Iran, extension agents working in 10 villages each, help the farmers in connection with all aspects of agricultural development. Special effort is being made to popularize fertilizers amongst the farmers as a result of which the demand for fertilizers is increasing rapidly.

In India village level workers working in 10 villages each are in charge of all aspects of extension work, viz. agriculture, irrigation, veterinary, education, health, road construction, village welfare etc.

Recommendations of the Seventh Meeting of the Working Party on Rice Soils, Water and Fertilizer Practices

1. Since an urgent need is felt for more basic knowledge on the soil conditions of rice producing regions of the world, soil surveys in these regions be strongly promoted especially to obtain an inventory of the soils on which rice can be grown.

2. The classification of soils on which rice is grown be developed where possible in accordance with an internationally accepted system of soil classification.

3. Precise descriptions be prepared of the main rice producing soils in terms of a generally accepted morphological terminology, which however needs improvement for certain soils under sustained irrigation. It was further recommended that this kind of information be widely circulated amongst the Member Countries.

4. Although the fertilizer trials at the experimental stations should undoubtedly be the basis for developing knowledge on fertilizer use because such trials can cope with many factors and can be adequately supervised, the results of such trials cannot be directly used beyond the experimental station area; therefore, Member Governments should undertake numerous simple fertilizer tests on cultivators' fields selected at random within any particular soil unit to enable statistical interpretation of the results. Such tests would provide the information needed for the efficient use of fertilizers by cultivators. The Working Party further recommended that these investigations be parallelled by economic studies to determine the net financial returns from the use of the most efficient combinations of fertilizer materials and that the staff necessary to supervise the simple field tests be recruited and trained.

5. As there still appears to be disagreement on the best method and time of application of fertilizers, especially with reference to nitrogen fertilizers, this subject should receive special attention by Member Countries.

6. In view of the urgent need for increasing yields per hectare, which can only be achieved through sustained efforts on the part of Member Governments, the list of projects prepared by the Working Party be circulated by FAO to Member Governments for their consideration and action. In circulating

this information FAO present to the Governments the views expressed in the Working Party on the importance and priorities of these projects. The Working Party further recommended that those countries which are likely to implement such projects but are unable to do so with their own resources should seek the help of FAO under the Expanded Technical Assistance Program or the UN Special Fund.

7. The attention of Member Countries be drawn to the value of large scale soil testing for establishing the fertility levels. It was further recommended that the chemical tests be correlated with field fertilizer responses. In this connection the Working Party noted with satisfaction the progress achieved in India with the establishment and operation of 24 soil testing laboratories.

8. Since different methods for determination of available phosphorus and potassium have shown different degrees of correlation with crop responses to fertilizer treatment, Member Countries should evaluate on cooperative bases these methods to select the most suitable ones. Exchange of information amongst the participating countries in this project may be of considerable assistance.

9. In view of the importance of maintaining the soil in good physical condition for increasing rice yields and as not enough data are yet available on the physical condition of soils in relation to irrigation, drainage and tillage practices, Member Governments undertake coordinated projects to investigate the problems concerning time, method and depth of tillage, intercultivation of crops, fertilizer use, irrigation and drainage control in relation to the physical condition of the soil and the effect of these factors on the productive capacity of the soil. The Working Party further considered that these problems could best be resolved by the concerted efforts of a number of specialists working together, such as soil physicist, soil chemist, irrigation agronomist and an agricultural engineer (tillage).

10. In view of likely considerable increase of fertilizer use in Asia and Far East Region, FAO be requested to advise Member Governments on the adoption of uniform fertilizer control legislation including fertilizer specifications, standardization, terminology, methods of analysis; sales regulations, etc.

11. Since no accurate statistics are available in many of the Member Countries on the amounts and rates of fertilizer used on different crops, this information be collected through properly conducted surveys to help in future country planning for increased crop production and fertilizer manufacture and imports.

12. In view of the reconstitution of the Working Party on Rice Soils, Water and Fertilizer Practices which has to deal with many diverse and specialized subjects, Member Governments, to the extent possible, ensure that the composition of their delegations would be such as to enable specialists in the different disciplines to present and discuss the information which is of importance and mutual benefit to all Member Countries.

13. Those Governments who have not as yet appointed a Liaison Officer for the Working Party, as recommended by the Sixth Session of the International Rice Commission, be requested to do so at an early date.

14. Since a number of papers reporting fertilizer responses did not describe the climatic, soil and water conditions under which the experiments were conducted, more attention be given to these aspects in the future to facilitate interpretation of the results obtained.

15. In presenting the result of field experiments at international meetings a uniform system of measurement be used such as a metric system and explanation be given whether the figures refer to milled or unmilled rice.

16. The Regional Soil Fertility Specialist for Asia and the Far East continue to contact Member Governments concerning the implementation of the recommendations of the Working Party.

At the Joint Sessions of the Working Parties on Rice Production and Protection and on Rice Soils, Water and Fertilizer Practices it was recommended that:

17. Member Countries should strengthen their investigations on physiological diseases of rice on a cooperative basis and that Dr. J. Takahashi of Japan be requested to act as coordinator.

18. In view of the great possibilities for increasing rice production through the use of fertilizers, the investigations on variety fertilizer interaction be continued and that Dr. M. F. Chandraratna of Ceylon be requested to act as coordinator.

19. In conducting the variety X fertilizer interaction trials a sufficiently large number of fertility levels be included to make calculations of response curves practicable and that to the extent possible all other limiting factors be removed by applying sufficient amounts of the plant nutrients not being tested and by using the best cultural practices.

20. In the future, in plant breeding strong emphasis be given to breeding for high fertilizer response, for resistance to lodging and diseases and that testing for yield should be done at least at two levels of fertility (norman and high).

21. Countries which maintain the world genetic stocks of indicas be requested to grow these stocks under high level of fertility and that records be taken of the straw: grain ratio as well as the panicle number and weight.

Discussion Regarding Rice Soils, Water and Fertilizer Practices

The introductory statement was followed by a discussion on several topics, which is summarized below:

The Delegation from India pointed out the desirability of undertaking investigations on:

(i) breeding of new green manure crops to suit different soil-climatic conditions to serve as a cheap source of nitrogen;

(ii) the efficacy of cheap bacterial fertilizers; and

(iii) the effect of fertilizers under deep-water paddy conditions.

The Delegation from France suggested that fundamental work on the decomposition of organic matter under rice soil conditions should be undertaken. It was also pointed out that the soils of the existing agricultural experiment stations have become rather "artificial" and the results obtained are unreal beyond the station. Fertilizer tests on these stations are therefore of limited value as a basis for advising farmers and the Commission supported the necessity of conducting a series of simple experiments in specific ecological zones.

The Delegation from the Philippines reported that soil-testing had proved useful in making fertilizer recommendations and increasing rice yields very considerably. It was pointed out that liberal use of potash fertilizers was necessary to achieve high yields and soils showing high organic matter by soil-testing could still be in need of soluble nitrogen. Better methods for the assessment of available nitrogen in soils is therefore necessary.

The Delegation from Viet Nam suggested the desirability of research on the use of bio-catalysts which may increase the response of indicas to high levels of fertilizers. An account of simple tests on cultivators' fields and soil-testing correlations was also presented. It was pointed out that a consistant response to fertilizers on specific soil types had been obtained and that more fundamental studies on soil-testing and crop response correlations were needed.

The Delegation from Pakistan explained the organization of the research and extension services in his country. Extensive simple fertilizer trials on cultivators' fields had given very valuable results. It was easier to convince the farmer about the benefits of fertilizer use than about other techniques of rice improvements as a result of which the demand for fertilizers was steadily increasing. It was also pointed out that many experiments on deep water paddy had shown that there is no effect of fertilizer application on this crop, beyond the fact that it stimulates growth in the early stages.

The Delegation from Ceylon explained the constitution of the extension organization in the country. Many thousands of simple fertilizer tests on cultivators' fields had been conducted since 1958, but care is necessary in planning the nitrogen levels to be applied on different varieties, since incidence of blast through high nitrogen application on susceptible varieties may shake the confidence of farmers. Liming had increased rice

yields considerably on the acid lateritic soils in certain areas, but the cost of lime was prohibitive. No effective remedy for the physiological disease "bronzing" had yet been found, but the hybrid H_4 had been found to be more tolerant than other recommended varieties.

The Observer from Madagascar explained that a network of simple fertilizer tests was being conducted in his country. Detailed soil studies were needed for the use of fertilizers and provision for this had been made in the agricultural research program. The fertility problem was not a simple one, for instance the yield depressing effects of green manures under poor soil and water conditions, and the ineffectiveness of fertilizers on the soils of the west-coast delta, which are regularly flooded. He indicated that leguminous crops (vetches and clover) sown in the rice field 20 days before the rice harvest produced an excellent fodder/green manure crop when used at Lake Alaotra, 780 meters above sea level.

The Delegation from Malaya asked whether extensive simple tests or a few complex experiments should be conducted if funds and personnel are limited. The Technical Secretary explained that if the simple tests were to be of any value they should be extensively scattered at random on many locations and the work should be carefully supervised for which sufficient staff and funds are required. In the absence of such facilities, a limited number of complex experiments on specific soil types, on cultivators' fields should be initially conducted.

The Delegation from Australia pointed out that there is no "best time" for the application of nitrogen. This would vary with different conditions. Similarly the best method of soil-testing for correlation with crop response would vary according to soils. Because of this each country should seek its own solution. It was also noted that in many areas more water is being used than is necessary, and therefore investigations on the efficient use of water were required.

The Delegation from Australia agreed that it was desirable that a number of specialists should attend the meetings of this Working Party, but this was not always practicable. The Delegation suggested that the agenda should be circulated well in advance to permit adequate briefing, and that one particular topic should be given special importance in each meeting so that Governments could select the appropriate specialist.

With reference to the recommendations concerning soil and land classification the Delegation from Australia indicated that one of the first requirements in planning a research program was delineation of the areas with similar or different rice growing conditions. Soil was only one factor affecting the production of rice; others, such as water supply, drainage and climate being equally important. The Working Party was asked to give further consideration to the application of land type mapping within countries as a basis for research planning and the application of results.

Recommendations Relating to Rice Soils, Water and Fertilizer Practices.

The Commission commended the Working Party on Rice Soils, Water and Fertilizer Practices for the work it had carried out during the last two years, and indicated its general agreement with the recommendations of the

Seventh Meeting of the Working Party. It suggested that the following be added to the list of projects for investigation:

(a) the decomposition of organic matter under rice soil conditions;

(b) suitable green manure crops for different soil climatic conditions;

(c) effects of bacterial fertilizers and biocatalysts.

The Commission recommended that:

1. FAO should continue the activities indicated by the Working Party on Rice Soils, Water and Fertilizer Practices in view of the need for effective means of facilitating exchange of information and developing cooperation among countries.

2. As it may not be always practicable to depute a number of specialists to represent different disciplines to be discussed in working party meetings, FAO should circulate the agenda of these meetings as much in advance as possible, so that the limited number of delegates who would attend may be properly briefed. It would be helpful if one item on the agenda is given special consideration in a particular working party meeting, so that the specialist concerned may be deputed.

3. Countries be encouraged to develop land type mapping as a basis for research planning.

Report of the First Meeting of the Working Party on Agricultural Engineering Aspects of Rice Production, Storage and Processing.

The First Meeting of the Working Party on Agricultural Engineering Aspects of Rice Production, Storage and Processing was held in Saigon, Viet Nam, from 10 - 15 November 1960, with M. R. Chakratong Tongyai of Thailand as Chairman and Mr. Tan Sin Houw of Indonesia as Vice-Chairman.

Mr. G. E. Bryce, Agricultural Engineer, and Mr. A. Aten, Rural Industries Specialist, both of the staff of the Agricultural Engineering Branch, Land and Water Development Division, served as Technical Secretaries of the Meeting, which was attended by 32 participants representing 16 Governments and 2 Observer Countries.

A summary of the main activities of the Working Party is given below:

Background:

This Working Party was established at the Sixth Session of the International Rice Commission, held in Tokyo, Japan, on 3-4 October, 1958. It brought together the two ad hoc Working Groups on Mechanization of Rice Production under Wet Paddy Conditions and on Storage and Processing of Rice, respectively.

The First Meeting of the ad hoc Working Group on Mechanization of Rice Production under Wet Paddy Conditions was held in Peradeniya Ceylon, in 1956.

Their final reports contained a comprehensive analysis of the variou problems.

Terms of Reference

The terms of reference of the newly formed Working Party are as follows:

"This Working Party is to promote international collaboration in resolving Agricultural Engineering problems related to rice, including the following

(a) Agricultural Engineering relating to mechanization of rice production, with special emphasis on improved methods and equipment for cultural practices, and on the engineering, construction and grain handling aspects of storage; all aspects of rice processing including all processes to which rice is normally subjected between threshing and the production of the finished product, such as testing, cleaning, grading, milling, whitening, polishing, parboiling, packaging and the utilization of by-products.

(b) When desirable, the activities of this Working Party will be coordinated with those of the Working Party on Rice Production and Protection in relation to the protection of rice during storage; and with that Working Party and the Working Party on Rice Soils, Water and Fertilizer Practices when cultural methods and practices involving the use of improved tools, equipment and machines are being treated. Further, due attention will be given to nutritional questions which arise during storage processing and parboiling, and the FAO staff concerned with these questions will collabora with the FAO Nutrition Division."

In FAO, from 1 January 1959, the following technical officers were designated to serve the Working Party as joint technical secretaries in their respective subject matter fields:

A. Aten, Rural Industries Specialist, Agricultural Engineering Branch, Land and Water Development Division, FAO Headquarters, Rome, Italy.

George E. Bryce, Technical Officer (Agricultural Engineering) Agricultural Engineering Branch, Land and Water Development Division, FAO Regional Office for Asia and the Far East, Bangkok, Thailand.

Machines and Implements for Rice Production.

During the discussion it was observed that in many rice growing countries, a number of development programs have been successfully launched over the last few years.

Implements such as the wooden plough are still in use for tillage, and in practically all countries concerned, interest is increasing for improved indigenous tools.

A comprehensive analysis of farm implements was presented by the Delegation from Korea. Several other Delegations reported on studies and attempts made to improve indigenous implements. The Delegation from the Philippines pointed out the need for testing draft of the farm animals used. In the introduction of modified animal drawn tools or newly designed animal drawn tools, the power requirements must not be excessive for the animal.

In Mali attempts are being made to adapt animal drawn implements already used in dry paddy cultivation.

The Delegation from the United Kingdom reported progress on development of an animal drawn tool-bar implement, the tool-bar being used as a basic frame and carriage for several cultivation tools. Actual tests are now being made in Africa by the "National Institute of Agricultural Engineering." A detailed report will be prepared in about four months when it is expected that all of the tests will be completed.

The most important and progressive advancement in mechanization of tillage operations for wet paddy production has been the use of the Four Wheeled Agricultural Tractor with the tine tillage implement. As reported from Burma, the tractor is used with a locally made Rotary Blade Roller.

Tractors have been successfully used:

(a) with rubber tires plus cage wheels; as reported from India and Madagascar;

(b) with rubber tires plus retractable lug cage wheels, as reported developed in Burma;

(c) with hollow lugged floating steel wheel, as reported from Thailand.

There was agreement that the cage wheel and the retractable lug type cage wheel performs part of the tillage function. There is also little doubt that the rotary blade roller (three point hydraulically operated as used in Burma) will not function well as a puddling tool. This has been an indigenous animal drawn implement, which in a certain province in Malaya is known as the "Kedah" blade roller. Wet tillage operations as required for the puddle were reported to be performed without the use of the mould-board or disc plough and thus had a lower power requirement.

Several Delegations reported that further attempts have been made to introduce certain new devices to replace some of the old implements in order to meet changing demands. It is understood that at this stage attention will have to be given to the local manufacture of such implements and to adequately equipping existing small manufacturing industries.

Other topics discussed were:

1. Seed drills for direct-row-seeding under wet mud conditions.

2. Pedestrian tractors, with attached implements for land preparation, weeding, wet land puddling etc.

3. Rice transplanters.

4. Inter-row weeding tools and tools for weeding in the row.

5. Threshing practices including the use of rubber tyred tractors for tread threshing.

6. The use of centrifugal pumps for water lifting (many countries reported these to be very efficient).

7. In-service training; to disseminate technical information to Extension Workers, Rural Development Workers, local blacksmiths etc.

Pre-Processing Practices

Harvesting and Threshing. From Burma trials were reported with self-propelled combines, front-mounted binders, winnowers and threshers. Threshing and winnowing can be carried out efficiently with machines, but reaping with mechanical power is not satisfactory as yet, the main problem being the lodging nature of paddy.

In Japan experiments with small harvesters indicated that plants leaning over 30° off vertical could not be harvested. Combine harvesters could be used but would involve loss of straw, now being used for ropes and bags.

In Korea conventional sickles are popular and different types are used, generally made at a local forge near the farm. Foot pedal operated threshers are used, and fans as cleaning implements are popular. The common sickle is also used for harvesting in Pakistan.

The Delegation from the United Kingdom reported on a thresher for small scale paddy growers, developed by the National Institute of Agricultural Engineering, from experimental work carried out in Malaya.

In Korea improved harvesting and threshing implements as well as processing equipment suitable for local conditions are urgently needed.

Drying.

As drying conditions have a determining influence on the proportion of brokens formed during processing, and thus on the nutritional and keeping quality, it is important to establish adequate harvesting and field curing practices. Where natural drying is insufficient, attention will have to be given to artificial drying techniques.

The Delegation from France reported on further experiments carried out in Tchad and Madagascar on the relation between harvesting and drying methods, processing and milling yields. The Observer from Madagascar also referred to this problem, and confirmed the relation existing between drying conditions and milling yields. Drying conditions have a determining influence on the proportion of brokens formed during processing. Better results are obtained if paddy is dried less drastically, e.g. protected from the sun.

In Japan almost all paddy is dried naturally, but artificial drying is practised to some extent, and driers, operating by forced ventilation with or without supplemental heat, are becoming popular.

In Pakistan, drying of paddy is done in the field, except during the monsoon period, when the harvested paddy is carried directly to the homes.

In Burma, drying paddy in the field caused excessive breakages. Two artificial driers with a capacity of 100 tons of paddy per 24 hours have been erected. In paddy godowns drying by forcing air, either heated or unheated, through the grain has been developed advantageously. Paddy in storage can thus be aerated without turning the grain from one bin to another.

In Madagascar sack drying of seeds by heated air is carried out at the Agronomy Station at Lake Alaotra.

In the Philippines . paddy drying experiments have been carried out with heated air in flat bed driers.

In the United States of America studies have shown that the moving of air at low airflow rates through undried rice with a moisture content from 18 to 24 proved effective for periods of a week or 10 days in preventing spoilage. The quality of rice with moisture content below 16 percent was maintained for several months in either cool or warm weather with the aid of aeration. Commercial drying of rice is performed by continuous flow driers.

Bin drying of rice with unheated air offers some advantages over drying with supplemental heat. Unheated air drying requires less equipment, reduces fire hazards and results in more uniform drying of the rice. There are, however, certain specific limitations.

Although considerable information is available on the handling, drying, and aeration of paddy, additional studies are needed to provide information on the most efficient and effective methods and equipment for performing these operations.

Cleaning and Grading

The Delegation from France reported on cleaning and grading equipment used in France and French Communities, and characteristics and functions of the various types of equipment from 49 plants were examined.

In Burma, mobile paddy-cleaners, having an intake of 16 tons per hour were put into operation recently.

In Korea Government-owned rice mills usually have a grading, polishing and cleaning section.

Storage

In Burma, paddy in storage can be aerated without turning the grain from one bin to another. There are also facilities for fumigation.

In Japan, development in rice storage at low temperature (13°C and relative humidity lower than 70 percent was reported. Research was carried out on changes in chemical composition, palatability, and infestation by fungi, in comparison with changes in rice stored under natural conditions. (Natural atmospheric temperatures of 5 to 30°C during the year and natural relative humidity of 60 to 80 percent). Rice stored at low temperature showed little diminution in the activity of various enzymes, and its percentage of germination was as high as 80 percent after one year. Rice storage at low temperature is therefore recognized as an excellent practice in Japan.

The application of insecticide PGP (Pyienone Grain Protectant) and smoke generator (a compound substance) is widely appreciated. The application of an unstable solid fumigant and the effect of a rat repellent were also discussed.

Rice Testing, Processing and Parboiling

Rice Testing

In Burma modern rice testing equipment for commercial milling is coming into use. In India, Indonesia, Korea, Malaya and Thailand, rice testing is carried out in order to guide the development of new varieties.

In Japan a simplified electric moisture meter is also in use. The Japanese Food Agency has developed portable moisture meters which are widely distributed.

In Madagascar several types of moisture meters are used in experiments on the relationship between drying conditions and milling yields.

Processing

In Burma 12 modern rice mills, each of 100 tons capacity per 24 hours are planned, whilst 12 other rice mills are selected for modernization. Means for handling rice shipments are however still inadequate and need further improvement.

A bag loading plant with a capacity of about 1,000 bags per hour (162 pounds) will soon start operation on the Rangoon River.

In Japan the number of large scale mills is increasing, though they are still small in comparison with those of other countries. Horizontal tramping and air blowing milling machines are widely used and this machine is well suited for milling the round-type rice.

In the Philippines some farmers and millers made use of Government facilities for carrying out processing trials to determine the performance of milling equipment from a variety of manufacturers. The Delegations from France, Japan, Korea, Madagascar, Thailand and the United Kingdom took part in a discussion on the rubber roller which resulted from the report on testing milling equipment.

Parboiling

The Delegation from France reported on two parboiling units used in Guinea and Upper Volta, which are suitable for the rural village level, The rice meets the consumers' taste and parboiling reduces losses.

Parboiling is practised in some States in India, and the Central Food Technology Institute in Mysore designed an improved pilot plant which is becoming popular.

In Indonesia a modern parboiling unit is available in the Rice Research Institute in Krawang.

Parboiling is not practised in Japan.

In Mali, because of floating rice, parboiling is becoming very popular. Details of the parboiling plant in Tamani were made available to the meeting.

In East Pakistan parboiling is also a universal practice. Indigenous tools are used for dehusking, although there are also some 500 small rice mills.

In the United States of America 4 plants presently manufacture parboiled rice. The processes are similar in that all involve soaking paddy, steaming, vacuum drying, and finally milling. The soaking operation is carried out in warm water.

In Viet Nam a small processing plant for rice parboiling suitable for rural communities is in an experimental stage.

Future Plans for the Working Party

The Delegations from Burma, France, India, Indonesia, the Philippines, Thailand and the Observer from Madagascar participated in the discussion which follows:

The Vice-Chairman stressed that in the non or less industrialized countries, rice is considered in the first place as food, so that the paddy is not treated as a raw material for an industrial milling outfit. The milling industry in such countries receives a very small portion of the total paddy production. These countries, however, are much interested in the results of this Working Party which can be of direct help to farmers and millers.

The Working Party drew up the following list of activities to be pursued:

1. Equipment for water application in rice production to reduce water requirements.

2. Most economical use of power for small rice farms.

3. Lowest cost sources of power for small rice farms.

4. Primary tillage operations performed with a reduced variety of implements (Problem of whether soil inversion in primary tillage is necessary)

5. Direct-row-seeding of paddy with inter-row cultivation in comparison with results obtained by transplanting, and corresponding inter-row cultivation practices for weed control.

6. Application methods and techniques for most effective use of fertilizers: (a) organic; and (b) chemical.

7. Mechanical harvesting of: (a) lodging resistant varieties; (b) non-lodging resistant varieties; and (c) floating paddy.

8. Various stacking and field curing practices, affecting storage and processing.

9. Threshing and cleaning of paddy.

10. Threshing of wet paddy and immediate parboiling after threshing.

11. Machinery and methods for cleaning and grading of paddy.

12. Artificial drying, aeration and drying with unheated air in various types of driers.

13. Research on milling equipment.

14. Testing equipment for determining quality and potential milling results for paddy.

15. Small modern mills for rural farming communities.

16. Small parboiling units, suitable for rural communities.

17. Low cost storage construction particularly at rural level.

18. By-products processing and utilization.

The Working Party recommended that its future activities be subdivided into the following categories:

(a) Studies of particular importance to be carried out on a national basis as follows:

(1)
(i) Traditional implements which are suitable and still used.

(ii) Traditional implements which continue to be used with slight modifications.

(iii) New implements which are found more suitable than former traditional implements.

(2) Primary tillage operations performed with a reduced variety of implements. (Problem of whether soil inversion in primary tillage is necessary)

(3) Various stacking and field curing practices, affecting storage and processing.

(4) Artificial drying by aeration and unheated air.

(5) Low cost storage construction, particularly at rural level.

(6) Small parboiling units, suitable for rural communities.

(b) Studies to be carried out as a cooperative effort by Member Countries of the IRC, and which would be coordinated by a project coordinator.

(c) Projects that FAO could undertake, such as the preparation of technical documentation on specific subjects.

In order to establish solid working relations between FAO's Secretariat and Member Governments, it was recommended that Governments be requested to nominate liaison or information exchange officers, so that, through correspondence, more work could be initiated and coordinated.

Recommendations of the First Working Party on Agricultural Engineering Aspects of Rice Production, Storage and Processing.

Improvement of Farm Implements for Rice Production

1. To request the Director-General of FAO to recommend to Member Governments of the International Rice Commission to give particular attention to experimental study, trial, development and improvement of farm implements for rice production, hand, animal and power operated.

2. Governments should establish national testing and research centers for such farm implements, or strengthen the means of action of existing centers.

Illustrated Glossary of Farm Implements Required for Hand, Animal and Power Use in Rice Production

In view of recent modifications of indigenous implements, the increasing use of relatively new machines and the present cooperation which now exists between Countries, it is necessary that Common Terminology be used.

3. FAO should collect the necessary information and prepare an Illustrated Glossary with suitable terminology.

Regional and Sub-Regional Training Centers

4. To request the Director-General of FAO to assist Governments in organizing regional and sub-regional training centers on tools and equipment used in the mechanization of rice culture so that further training in the selection, operation and servicing of such equipment would result.

5. To request the Director-General of FAO to assist Governments in organizing regional and sub-regional training centers in methods and use of equipment for rice testing, and pre-processing operations such as cleaning, grading and drying.

Selected Harvesting and Processing Equipment Trials

6. Governments should conduct trials with selected harvesting equipment. Where possible, trials should also be conducted on processing in small to medium sized mills.

7. FAO should, through its newly appointed Agricultural Engineer for Asia and the Far East, co-ordinate trials and advise and assist Governments in their planning and conduct.

Drying Experiments for Preservation and Milling Yields of Paddy

8. To avoid excessive losses of quality and yield, the Working Party requests the Director-General of FAO to recommend to Member Governments of the International Rice Commission:

(a) to continue and expand experimental work on paddy drying, especially at small farm level and with cooperative paddy storage;

(b) to undertake basic studies on moisture-heat-balance during drying and storage.

Such experimental work should be conducted in various environments, but particularly in the tropics, where farmers grow more than one rice crop per year.

General

9. The attention of Governments should be called to the possibility of making use of assistance afforded by the United Nations Special Fund for demonstration projects involving research or training designed to solve technical problems. Such demonstration projects should be designed to facilitate further investment.

10. The Director-General of FAO should be asked to request Member Governments of the International Rice Commission to appoint a liaison officer until the next meeting of the Working Party.

Collection and Dissemination of Information.

11. FAO should continue to collect and to disseminate to Member Governments of the International Rice Commission relevant information on subjects related to the activities of this Working Party.

Such information should be made available through Agricultural Development Papers, Informal Working Bulletins, articles to be published in specialized periodicals, and any other means.

Discussion Regarding Agricultural Engineering Aspects of Rice Production

The introductory statement was followed by discussion in which several countries joined. This discussion is summarized below:

General: The Delegation from India opened the discussion and stated that although in most countries in Asia and the Far East, labor costs still were not expensive, this condition may not continue. Governments should be prepared to make funds available for tools, implements and equipment in order to initiate further mechanization in the field of Agricultural Engineering, Storage and Processing. The Delegation also felt that some further clarification would be desirable with particular emphasis on whether FAO could give some additional practical help.

The Chairman of the Commission stressed the fact that this particular Working Party had just completed its First Meeting. Consequently, it was trying to find its way amongst the many different subjects falling within its terms of reference, covering all technical aspects of cultivation practices, storage and processing.

The Delegations from Pakistan, the Philippines and Viet Nam, and the Observers from Madagascar and Mali shared the viewpoint of the Delegation from India that some of the Working Party's recommendations were of vital importance to Governments and should be implemented.

The Observer from Madagascar invited FAO to serve as intermediary between manufacturers of small implements and the rice growing countries interested in this equipment with a view to introducing and testing these implements in the areas of production concerned, with the minimum of cost.

The Observer from Mali recommended that FAO should prepare a catalog of implements.

Reference was made to specific problems, such as collection and dissemination of relevant technical information on implements and equipment at all levels, and the question of exchange of implements between countries of the region.

There was general agreement that on both questions FAO should give necessary guidance.

The Chairman requested the Technical Secretary to advise the Commission on how far such assistance could be given by FAO. In his reply the Technical Secretary indicated that the Branch dealing with the problems of the Working Party was involved in many different subjects. There was a limited budget for publication purposes, but the Agricultural Engineering Branch, in its program of work over the past years had given high priority to problems connected with rice. As a result some Agricultural Development Papers, Informal Working Bulletins and special technical papers had been made available to Member Governments.

Experimental work could be carried out only occasionally by FAO through its Expanded Technical Assistance Program, but valuable information collected in this way will continue to be made available. However, it must be realized that not only engineering aspects are involved in such a program. Depending on the traditional and cultural pattern of the farmer, certain specific implements may not be easily adapted to a community. The Branch was well prepared within the available budget, to make more information available.

With reference to exchange of tools and equipment, the Technical Secretary did not know of funds allocated for that purpose.

As stated by the Delegation from Pakistan, foreign currency, often not readily available, retarded plans to use improved tools, equipment and machinery which needed to be imported. In this respect the Technical Secretary brought to the attention of the Delegates that some of these development programs may well fit in with the objectives of the United Nations Special Fund, so that the retarding factor of foreign currency might be eliminated.

The Delegation from India expressed appreciation for this reply and further suggested that agricultural engineering programs should be increased. The matter of additional funds being of vital importance, should be raised at the next Conference of FAO.

The Chairmanof the Commission suggested that Delegations discuss the matter of an exchange pool with their Governments.

The Delegation from India stated that most countries now have facilities for trials of equipment and Governments could cooperate with FAO in making available relevant technical details of such trials. FAO, in turn, could use this material and disseminate the information. With reference to the exchange, the Delegation did not think this would be expensive and expressed the view that with funds which may come from the Freedom-from-Hunger-Campaign, such an exchange, as well as purchase of specific selected implements and equipment, could be carried out.

FAO's Regional Representative supported this proposal, as such projects could very well fall within the scope of the Campaign.

The Delegations from Ceylon and India also referred to the fact that in some instances exchange of trained personnel may be required.

Some additional information was made available by the Delegations from Australia, Ceylon, Thailand, Viet Nam, and the Philippines.

The Delegation from Australia referred to losses in storage and suggested that due attention to losses should be given at the next Meeting.

In Ceylon an implements factory had been established with foreign aid and portable row seeders, rotary weeders, etc., made available to cultivators. Mechanization of rice production is increasing and tractors equipped with cage wheels and tractor drawn seed drills were widely used. Threshing paddy with rubber wheel tractors was becoming popular and it had been demonstrated that there is hardly any seed damage if sufficient straw is used; viability has been above 80%. Certified seed paddy is now made available to the cultivator. Mechanised harvesting was still a problem due to lodging.

In Thailand more parboiled rice had been manufactured over the past year, and there was an increasing demand in Near East countries.

As a result of a recommendation made at the Meeting of the ad hoc Working Group in Calcutta in 1956, studies on parboiling along traditional techniques were now being carried out in Viet Nam.

In the Philippines, Agricultural Engineering was relatively new, but was becoming more important in agriculture. Irrigation research studies have contributed to economic use of irrigation water resulting in increased farm production.

Research projects on tillage, seeding methods, improved and mechanized cultural practices, harvesting, storage and processing had been initiated and were fast producing valuable results. The Delegation from the Philippines hoped that in the future tests could be carried out on various soils with several types of tools and implements.

Recommendations Relating to Agricultural Engineering Aspects of Rice Production, Storage and Processing:

The Commission commended the Working Party on Agricultural Engineering Aspects of Rice Production, Storage and Processing for the work carried out since its inception and specifically recommended that:

1. FAO should assist Member Governments within the International Rice Commission in establishing a program for -

(a) the exchange of tools and equipment for rice production, with the aim of fostering demonstrations and testing;

(b) the introduction and adaptation of improved tools and equipment.

2. Funds be made available for such a program from the "Freedom-From-Hunger" Campaign.

3. Ways and means be found to enable the Agricultural Engineering Branch to obtain greater facilities for the exchange of technical information on Agricultural Engineering Aspects of Rice Production, Storage and Processin to Member Governments.

4. Member Governments be requested to give particular attention to experimental studies, trials, development and improvement of farm implements for rice production, hand, animal, and power-operated. To this end national testing and research centers should be strengthened or established.

5. FAO should assist Member Governments in obtaining agricultural tools and machines at minimum cost, and eliminating foreign exchange difficulties where they arise. It was suggested that "Freedom-From-Hunger" Campaign trust funds be used for this purpose.

Discussion of the Possible Relationship Between the Commission and the International Research Institute, Los Banos, The Philippines:

Dr. J. Vallega, Director of the Plant Production and Protection Division, addressed the Session on this item. He welcomed the establishment of the Institute, which will add its efforts to the significant work that is being done in Asia and the Far East in the field of agricultural training and research.

Dr. Robert F. Chandler, Jr., the Director of the Institute, described the developments that preceded the formation of the Institute under the joint support of the Rockefeller and Ford Foundations.

The Institute is receiving its funds for constructing, equipping, and furnishing the buildings from the Ford Foundation, and its annual operating costs are being met by the Rockefeller Foundation. The University of the Philippines has made certain lands available at Los Banos for building sites, and for a portion of the experimental fields. The remainder of the land for experimental purposes has been purchased by the University with Ford Foundation Funds. The Government of the Republic of the Philippines has granted the Institute free import privileges and other facilities.

Dr. Chandler stated that the principal objective of the Institute will be to conduct basic and applied research on all aspects of rice production. In addition, the Institute will establish a library and a documentation center which will contain a collection of the world's important literature on rice; it will conduct a resident training program for promising young scientists; it will distribute improved plant materials to interested

scientists at other research centers; and it will publish and distribute the research findings of the Institute.

Dr. Chandler described the Institute's physical plant and the general nature of the research which would be undertaken, and stated that the Institute would wish to cooperate to the fullest extent feasible with the Working Parties of the International Rice Commission. He also emphasized that the establishment of the Institute should not be considered to preclude the validity of initiating similar institutions elsewhere, pointing out the vast amount of research that is needed.

The Delegation from India suggested close liaison between the International Rice Institute and the IRC. It was suggested that the Director or members of the Staff of the International Rice Research Institute might attend the Sessions of the International Rice Commission and/or any of its Working Parties as Observers. The possibility that the International Rice Research Institute might nominate to the Chairman of the IRC as a Member of its Board of Trustees was also mentioned.

After due consideration of the subject it was recommended that:

The possible relationship be expressed in general terms so that the Director-General of the Food and Agriculture Organization and the Board of Trustees of the International Rice Research Institute would be free to give the matter further study.

Discussion of Long Term Programs of the IRC:

In his introductory statement on this agenda item, Dr. J. Vallega pointed out that the Divisions of the Technical Department of FAO were the unifying link between IRC and its Working Parties. The Department is now engaged in surveying and documenting the past and present work in the different subject-matter fields of the IRC Working Parties and the problems of the Member Countries. On the basis of the information thus compiled, a new long-term program of research and development will be evolved for submission to the IRC during its 8th Session in 1962. The long-term program will follow three main objectives:

1. To aid and support national efforts;

2. To strengthen collaboration and cooperation among the various countries; and

3. To help fill any important gaps in the technical program of the Member Countries. He emphasized that a realistic program can be built only by studying the problems where they occur.

The importance of the nutritive qualities of rice and more especially the biological value of rice proteins was stressed by Dr. K. K. P. N. Rao. The effect of breeding, processing, and storage on these qualities was mentioned previously by the various Delegations and its importance has been realized by the Working Parties, even though no definite studies have been made in that respect. This points to the role that well equipped rice research institutes can play in solving such problems. The hope was also

expressed that the International Rice Research Institute in the Philippin may include this field in its program.

The Delegations commenting on long-term projects in rice research discussed various programs either planned or already started in their respective countries. As illustrations of the type of project deserving of long-term programming, the following were mentioned:

1. The exchange of improved rice varieties among Member Countries.

2. The certification of seed.

3. The encouragement of fundamental research both on national and international levels.

4. The selection of specific basic research problems by the IRC Working Parties to be called to the attention of the International Rice Research Institute.

5. The use of atomic radiation and mutagenic agents to increase genetic variability.

6. Research on crop pests.

7. Research on the nutritive value of red rice varieties popularly believed to be of superior quality to white rice.

8. The bridging of the gap between high level research and applicat of results.

9. Encouraging countries to make surveys of natural resources to provide a factual basis for developmental planning and planning of research programs.

10. Studies on the cost of production, in order to determine where research might assist in reducing costs.

11. The development of a balanced program of research for the areas which are using advanced methods of production and areas where it is not possible to do so.

Some Delegations referred to problems connected with economic aspect of trade and marketing. As these do not come under the framework of the IRC, but are considered by the Committee on Commodity Problems Consultati Sub-Committee on Economic Aspects of Rice, no recommendation was made.

Amendment of the Constitution and Rules of Procedure of the International Rice Commission:

The Ninth Session of the FAO Conference by Resolutions No 43/57 and 46/57 adopted a set of principles relating to the granting of Observer status to Nations and governing Conventions and Agreements concluded unde Article XIV of the FAO Constitution and invited the parties to such Conventions and Agreements to amend the texts of their Conventions and

Agreements when feasible in order to bring them into line with said set of principles and procedures. These principles were set out in Appendices C and D of the Report of the Ninth Session of the FAO Conference. This matter was considered by the International Rice Commission at its Sixth Session held in Tokyo on 3 and 4 October 1958, at which Session it was decided that the International Rice Commission should as far as possible be subject to the application of the new principles contained in the FAO Constitution and the Rules adopted by the Conference as well as in Appendices C and D of the Report of the Ninth Session of the FAO Conference.

The Commission further requested the Director General to place this question on the Agenda of the Seventh Session of the Commission and to prepare and distribute in advance a background paper providing full information on all of the changes required.

In pursuance of this request a complete set of draft amendments to the Constitution and Rules of Procedure of the International Rice Commission were communicated by the Director-General to all Member Governments of the International Rice Commission by Letter C/X 226 of July 1960.

In accordance with the provisions of Rule XII of the Rules of Procedure of the Commission, proposals for the amendment of the Constitution may be made by any Member Nation of the Commission in a communication addressed to both the Chairman of the Commission and the Director-General of the Organization. In conformity with this provision the Italian Government by letters addressed to the Director-General and the Chairman of the Commission under covering Note Verbale 47/15695/56 of 4 August 1960 officially proposed the adoption of the amendments to the Constitution and Rules of Procedure of the International Rice Commission as contained in the Appendix to the Director-General's letter C/X 226 of 19 July 1960.

The Seventh Session of the International Rice Commission had before it the paper referred to above containing the draft amendments to its Constitution and Rules of Procedure.

After full consideration of all the amendments involved, the Commission adopted these amendments with minor modifications which consisted mainly of the addition of a new paragraph 6 to Rule I as well as the addition of a new paragraph 6 to Rule X of the Rules of Procedure of the International Rice Commission, and decided that the text of the Constitution and of the Rules of Procedure of the IRC, incorporating the amendments referred to above which text is appended to this Report as Annex I, shall be substituted for the Constitution and Rules of Procedure of the International Rice Commission heretofore in force.

In accordance with the relevant provisions of the Constitution of the International Rice Commission, the revised text of the Constitution of the Commission shall come into force upon approval at the next Session of the FAO Conference.

During the discussion on the amendments to the Constitution of the International Rice Commission it was suggested that Article I - Object should be redrafted as follows:

"The object of the Commission, which is established within the framework of FAO, shall be to promote national and international action with respect to the technical aspects of production, conservation, distribution and consumption of rice, except matters relating to international trade."

Considering however that this proposal entailed an amendment to a fundamental provision of the Constitution, with respect to which the notice required under Rule XII-2 of the Rules of Procedure of the Commission had not been given to Member Governments of the Commission, it was recommended that this matter should be put on the agenda of the next Session of the Commission, it being understood that the formal adoption of that amendment would be proposed by a Member Government of the Commission in good time, in a communication addressed to both the Chairman of the Commission and the Director-General of the Organization in accordance with the provisions of Rule XII-1 of the Rules of Procedure of the Commission.

Decisions Relating to the Amendment of the Constitution and Rules of Procedure of the International Rice Commission:

1. The text of the Constitution and of the Rules of Procedure of the IRC, incorporating the amendments referred to above, which text is appended to this Report as Annex I, shall be substituted for the Constitution and Rules of Procedure of the International Rice Commission heretofore in force.

2. In accordance with the relevant provisions of the Constitution of the International Rice Commission, the revised text of the Constitution of the Commission shall come into force upon approval at the next Session of the FAO Conference.

3. The suggested redrafting of Article I - Object as mentioned in the text of this Report should be put on the agenda of the next session of the Commission, it being understood that the formal adoption of that amendment would be proposed by a Member Government of the Commission in good time, in a communication addressed to both the Chairman of the Commission and the Director-General of the Organization in accordance with the provisions of Rule XII-1 of the Rules of Procedure of the Commission.

Time and Place of Future Meetings:

Invitations were extended by Pakistan, the Philippines, Madagascar and Burma for the holding of the next Session of the IRC and next meeting of the Working Party on Agricultural Engineering Aspects of Rice Production, Processing and Storage in 1962.

The Government of India offered to act as host for the Working Party on Rice Production and Protection, and the Working Party on Rice Soils, Water and Fertilizer Practices at New Delhi during 1961.

These invitations were received by the Commission with great appreciation and it was recommended:

That they be submitted to the Director-General of FAO for necessary further action.

SUMMARY OF RECOMMENDATIONS

The Commission, having considered the various items on the Agenda of the Seventh Session, and having:

(a) commended the Working Parties on Rice Production and Protection; Rice Soils, Water and Fertilizer Practices; Agricultural Engineering Aspects of Rice Production, Storage and Processing, for the good work they had performed; and

(b) generally approved the recommendations put forward by these Working Parties; considered the specific action that should be taken to further the work in various fields:

recommended that:

Rice Production and Protection:

1. Greater attention be paid to the development of basic research in planning of future research activities.

2. In countries having significant areas in upland rice, steps be taken to study the various technical aspects of increasing production of rice grown under this system of cultivation.

3. FAO should provide appropriate assistance to Member Countries of the tropical region for the framing of suitable legislative measures to prevent and control the indiscriminate use of dangerous agrochemicals.

4. Where appropriate, due consideration be paid to the setting up of National Rice Committees in Member Countries which have not established the same so far.

Rice Soils, Water and Fertilizer Practices:

5. FAO should continue the activities indicated by the Working Party on Rice Soils, Water and Fertilizer Practices in view of the need for effective means of facilitating exchange of information and developing cooperation among countries.

6. As it may not be always practicable to depute a number of specialists to represent different disciplines to be discussed in working party meetings, FAO should circulate the agenda of these meetings as much in advance as possible, so that the limited number of delegates who would attend may be properly briefed. It would be helpful if one item on the agenda were given special consideration in a particular working party meeting so that the specialist concerned may be deputed.

7. Countries be encouraged to develop land type mapping as a basis for research planning.

Agricultural Engineering Aspects of Rice Production, Storage and Processing:

8. FAO should assist Member Governments within the International Rice Commission in establishing a program for:

(a) the exchange of tools and equipment for rice production, with the aim of fostering demonstrations and testing;

(b) the introduction and adaptation of improved tools and equipment;

9. Funds be made available for such a program from the Freedom-From-Hunger Campaign.

10. Member Governments be requ sted to give particular attention to experimental studies, trials, development and improvement of farm implements for rice production, hand, animal, and power operated. To this end national testing and research centers should be strengthened or established.

11. Ways and means be found to enable the Agricultural Engineering Branch to obtain greater facilities for the exchange of technical information on agricultural engineering aspects of rice production, storage and processing to Member Governments.

12. FAO should assist Member Governments in obtaining agricultural tools and machines at minimum cost, and to eliminate foreign exchange difficulties where they arise. It was suggested that Freedom-From-Hunger Campaign funds might be used for this purpose.

The Possible Relationship of the Commission with the International Rice Research Institute, Los Banos, The Philippines:

13. That the possible relationship be expressed ingeneral terms so that the Director General of FAO and the Board of Trustees of the International Rice Research Institute would be free to give the matter further study.

Discussion of Long Term Programs of the International Rice Commission:

A number of suggestions were offered, illustrative of projects deserving long-term programming by the International Rice Commission in 1962. It was hoped that a new long-term program of research and development would be evolved for submission to the Eighth Session of the IRC in 1962.

Amendment of the Constitution and Rules of Procedure of the International

14. The text of the Constitution and of the Rules of Procedure of the IRC, incorporating the amendments referred to in the text appended to this Report as Annex I, shall be substituted for the Constitution and Rules of Procedure of the International Rice Commission heretofore in force.

15. In accordance with the relevant provision of the Constitution of the IRC, the revised text shall come into force upon approval at the next Session of the FAO Conference.

16. The suggested redrafting of Article I - Object should be put on the agenda of the next session of the Commission ingood time, in accordance with the provisions of Rule XII-1 of the Rules of Procedure of the Commission.

Time and Place of Future Meetings:

17. The invitations received be submitted to the Director-General of FAO for the necessary further action.

PAPERS PRESENTED TO THE SEVENTH SESSION BY DELEGATIONS FROM MEMBER COUNTRIES

The following papers were presented by delegations and were made available to participants where possible. Further copies are not available for distribution by FAO, but may be obtained by direct request to Governments or authors.

Report on the IRC International Cooperative Variety Trials Conducted at the Agricultural Station, Mandalay, Burma
(U Khin Maung, Economic Botanist, Upper Burma)

Progress Report on the Breeding of Japonica-Indica Rice Hybrids at Mandalay, Burma, during the years 1959 and 1960.
(U Khin Maung, Economic Botanist, Upper Burma)

Experiments on the Time of Application of Nitrogen Fertilizer on Rice Crops conducted at Mandalay, Burma, during the years 1957 and 1958.
(U Khin Maung, Economic Botanist, Upper Burma)

The Major Pests of Rice (Paddy) in Burma.
(U Kyaw Myint, Economist, Agricultural and Rural Development Corporation, Rangoon, Burma)

Production et Selection du Riz au Viët-Nam

Progress Report on the growing of IRC Hybrid paddies (Indica and Japonica) at Hmawbi, Lower Burma, under rain-fed conditions for the year 1959-60.
(U Ba Khin, Economic Botanist, Lower Burma, Rangoon)

Rice Production and Grain Policy, Korea.
(Ministry of Agriculture and Forestry, Republic of Korea)

Chemical Fertilizers, Compost, Agricultural Machinery, Korea
(Ministry of Agriculture and Forestry, Republic of Korea)

Statement of the Philippine Delegation during the Seventh Session of the International Rice Commission.

ANNEX I

Constitution and Rules of Procedure of the INTERNATIONAL RICE COMMISSION

CONSTITUTION

PREAMBLE

The Fourth Session of the Conference of the Food and Agriculture Organization of the United Nations (hereinafter referred to as "the Organization"), having considered the recommendations of the Rice Meeting held in Baguio, Philippines, in March 1948, as approved in principle by the Council of the Organization at its meeting in April 1948, approved the establishment of an International Rice Commission (hereinafter referred to as "the Commission") in accordance with the provisions of the Draft Constitution drawn up at the Rice Meeting at Baguio.

Article I
OBJECT

The object of the Commission, which is established within the framework of FAO, shall be to promote national and international action with respect to production, conservation, distribution and consumption of rice, except matters relating to international trade.

Article II
MEMBERSHIP

Members of the Commission shall be such Member Nations and Associate Members of the Organization, as may accept this Constitution in accordance with the provisions of Article VIII hereof. As regards Associate Members, the Constitution of the Commission shall in accordance with the provision of Article XIV-5 of the Constitution of the Organization and Rule XXI-3 of the General Rules of the Organization be submitted by the Organization to the authority having responsibility for the international relations of such Associate Members.

Article III
SEAT

The seat of the Commission shall be the same place as the seat of the headquarters of the Organization's Regional Office for Asia and the Far East.

Article IV
FUNCTIONS

The Commission shall have the functions of:

(a) keeping under review the scientific, technical and economic problems that bear upon the object of the Commission as stated in Article I;

(b) encouraging and co-ordinating research on the above-mentioned problems and promoting its practical application;

(c) undertaking, where necessary and appropriate, co-operative projects directed to the solution of the above-mentioned problems;

(d) recommending to Members of the Commission, through the Director-General of the Organization, such national and international action as may appear to the Commission to be necessary or desirable for the solution of the above-mentioned problems;

(e) recommending to the Director-General of the Organization the provision of technical assistance to Members of the Commission in measures directed to that end;

(f) assembling, collating and disseminating, through the publications of the Organization or otherwise, information relating to the problems and activities pertinent to the functions of the Commission; and

(g) transmitting at appropriate intervals to the Director-General a report embodying its views, recommendations and decisions, and making such other reports to the Director-General of the Organization on matters relating to the production, conservation, distribution and consumption of rice, as the Commission itself may consider expedient or the Director-General or the Conference of the Organization may request. Reports of the committees and working parties of the Commission established under Article VI shall be formally transmitted to the Director-General through the Commission.

Article V
ORGANIZATION

1. Each Member of the [illegible] as defined in Article II hereof shall have the right to be represented at sessions of the Commission by one delegate, who may be accompanied by an alternate and advisers. Alternates and advisers shall be entitled to take part in the proceedings of the Commission but not to vote, except in the case of an alternate who is duly authorized to act for a delegate.

2. Each Member shall have one vote. The presence of delegates representing a majority of the Members of the Commission shall constitute a quorum. Except as otherwise provided by the Constitution or Rules of Procedure of the Commission, all decisions in a plenary meeting shall be taken by a majority of the votes cast.

3. The Commission shall elect, at the beginning of each regular session, a Chairman and two Vice-Chairmen from amongst the delegates who shall serve until the beginning of the next regular session, without prejudice to the right of re-election.

4. The Commission may, by a two-thirds majority of its membership, adopt and amend its own Rules of Procedure, which shall be consistent with the General Rules of the Organization. The Rules of the Commission and any amendments thereto shall come into force as from the date of approval by the Director-General of the Organization, subject to confirmation by the Council.

5. The Director-General of the Organization, after consultation with the Chairman, shall convene a regular session of the Commission at least once every two years, unless otherwise directed by a majority of the Members. The site and date of all sessions shall be determined by the Director-General of the Organization in consultation with the Chairman.

6. Any Member of the Commission shall have the right, with the concurrence of the Director-General of the Organization, to call for a special session of the Commission, and such a session shall be convened if at least one-third of the Members so request.

7. The Director-General of the Organization shall appoint and provide the secretariat of the Commission from the staff of the Organization who shall be responsible to him.

Article VI
COMMITTEES AND WORKING PARTIES

1. The Commission may establish temporary, special or standing committees to study and report on matters pertaining to the purpose of the Commission.

2. The Commission may establish working parties to study and recommend on specific technical problems. These working parties shall be convened by the Director-General of the Organization at such times and places as are in accordance with the objectives for which they were established.

3. The establishment of committees and working parties referred to in paragraphs 1 and 2 above shall be subject to the availability of the necessary funds in the relevant chapter of the approved budget of the Organization; the determination of such availability shall be made by the Director-General. Before taking any decision involving expenditures in connection with the establishment of committees and working parties the Commission shall have before it a report from the Director-General on the administration and financial implications thereof.

4. The members of committees and working parties shall be Members of the Commission. The Commission shall determine the membership of such committees and working parties and the representatives of members on committees and working parties shall be designated by their respective governments.

5. Each committee or working party shall elect its own Chairman and the Organization shall provide its secretariat.

6. Each committee or working party may adopt and amend its own rules of procedure which shall be consistent with the Rules of Procedure of the Commission and the General Rules of the Organization. Such rules of procedure shall come into force upon approval by the Commission. In the absence of rules of procedure the Rules of Procedure of the Commission shall apply "mutatis mutandis" to its committees and working parties.

7. Committees or working parties shall report to the Commission.

Article VII
EXPENSES

1. Expenses incurred by delegates and their alternates and advisers in attending meetings of the Commission and expenses incurred by representatives sent to committees or working parties established in accordance with Article VI, shall be determined and paid by their respective governments.

2. The expenses of experts invited, with the concurrence of the Director-General, to attend meetings of the Commission, committees or working parties in their individual capacity shall be borne by the budget of the Organization.

3. The expenses of the Secretariat of the Commission, and any expenses incurred by the Chairman of the Commission in performing duties connected with its work in intervals between sessions of the Commission, shall be determined and paid by the Organization within the limits of the budget of the Organization prepared and approved by the Conference of the Organization in accordance with the General Rules and Financial Regulations of the Organization for the time being in force.

4. Expenses for co-operative projects by Members as authorized in Article IV(c), unless they are met by the Organization or from any other source, shall be determined and paid by Members in such manner and proportions as they may mutually agree. Co-operative projects shall be submitted to the Council of the Organization prior to implementation. Contributions for cooperative projects shall be paid into a trust fund to be established by the Organization and administered by the Organization in accordance with the Financial Regulations of the Organization.

Article VIII
ACCEPTANCE

1. Acceptance of this Constitution by any Member Nation or Associate Member of the Organization shall be effected by the deposit of an instrument of acceptance with the Director-General of the Organization and shall take effect on receipt of such instrument by the Director-General, who shall inform all the Member Nations of the Organization of such receipt.

2. Acceptance of this Constitution may be made subject to reservations which shall become effective only upon unanimous approval by the Members of the Commission. The Director-General of the Organization shall notify forthwith all Members of the Commission of any reservation. Members of the Commission not having replied within three months from the date of the notification shall be deemed to have accepted the reservation. Failing such approval the Nation making the reservation shall not become party to this Constitution.

Article IX
TERRITORIAL APPLICATION

The Members of the Commission shall, when accepting this Constitution, state explicitly to which territories their participation shall extend. In the absence of such a declaration, participation shall be deemed to apply to all the territories for the international relations of which the Member is responsible. Subject to the provisions of Article XII-2 below, the scope of the territorial application may be modified by a subsequent declaration.

Article X
AMENDMENTS

1. This Constitution may be amended by the vote of a two-thirds majority of all the Members of the Commission, any amendment becoming effective only after concurrence of the Council of the Organization unless the Council considers it desirable to refer the amendment to the Conference for approval. An amendment shall become effective as from the date of the decision of the Council or Conference as appropriate. However, any amendment involving new obligations for Members shall come into force with respect to each Member only on acceptance of it by that Member. The instruments of acceptance of amendments involving new obligations shall be deposited with the Director-General of the Organization who shall inform all the Members of the Commission as well as the Secretary-General of the United Nations of the receipt of acceptances and the entry into force of such amendments. The rights and obligations of any Member of the Commission that has not accepted an amendment involving additional obligations shall continue to be governed by the provisions of the Constitution as they stood prior to the amendment.

Article XI
INTERPRETATION AND SETTLEMENT OF DISPUTES

Any dispute regarding the interpretation or application of this Constitution, if not settled by the Commission shall be referred to a committee composed of one member appointed by each of the parties to the dispute, and in addition an independent chairman chosen by the members of the committee. The recommendations of such a committee, while not binding in character, shall become the basis for renewed consideration by the parties concerned of the matter out of which the disagreement arose. If as the result of this procedure the dispute is not settled, it shall be referred to the International Court of Justice in accordance with the Statute of the Court, unless the parties to the dispute agree to another method of settlement.

Article XII
WITHDRAWAL

1. Any Member may give notice of withdrawal from the Commission at any time after the expiration of one year from the date of its acceptance of this Constitution. Such notice of withdrawal shall take effect six months after the date of its receipt by the Director-General of the Organization who shall inform all Member Nations of the Organization and the Secretary-General of the United Nations of such receipt.

2. A Member of the Commission may give notice of withdrawal with respect to one or more of the territories for the international relations of which it is responsible. When a Member gives notice of its own withdrawal from the Commission it shall state to which territory or territories the withdrawal is to apply. In the absence of such a declaration, the withdrawal shall be deemed to apply to all the territories for the international relations of which the Member of the Commission is responsible. Any Member of the Commission that gives notice of withdrawal from the Organization shall be deemed to have simultaneously withdrawn from the Commission, and this withdrawal shall be deemed to apply to all the territories for the international relations of which the Member concerned is responsible, except that such withdrawal shall not be deemed to apply to an Associate Member.

Article XIII
TERMINATION

This Constitution shall be considered terminated if and when the number of Members of the Commission drops below ten unless the remaining Members of the Commission unanimously decide otherwise.

Article XIV
ENTRY INTO FORCE

The Constitution shall enter into force as soon as notifications of acceptance have been received by the Director-General of the Organization from at least ten Member Nations of the Organization representing in the aggregate not less than half of the world production of rice in the crop year 1947/48 as shown by official statistics.

RULES OF PROCEDURE

Rule I
SESSION OF THE COMMISSION

1. The regular session of the Commission shall be held biennially unless otherwise directed by a majority of Members of the Commission. The date and site of any regular session of the Commission shall be determined by the Director-General in consultation with the Chairman.

2. In pursuance of Article V, paragraph 6, of the Constitution, the Director-General of the Organization shall, after consultation with the Chairman, convene the Commission to meet in special session at such time and place as the Director-General of the Organization may designate.

3. In accordance with the provisions of Rule XXXIII-4 of the General Rules of the Organization, when determining the site of a session of the Commission, the Director-General should be satisfied that the host government is willing to grant to all delegates, representatives, experts, observers and members of the secretariat of the Organization attending such a session, the immunities that are necessary for the independent exercise of their functions in connection with the session.

4. Notices convening a session of the Commission shall be issued by the Director-General of the Organization or his authorized representative, not less than fifty days in advance of the date fixed for the opening of the session, to Members of the Commission and international organizations eligible to participate.

5. Participation of international organizations in the work of the Commission and the relations between the Commission and such organizations shall be governed by the relevant provisions of the Constitution and the General Rules of the Organization as well as by the rules on relations with international organizations adopted by the Conference or Council of the Organization. All such relations shall be dealt with by the Director-General of the Organization.

6. Member Nations and Associate Members of the Organization that are not members of the Commission may upon their request, be represented by an observer at sessions of the Commission and its subsidiary bodies in accordance with the Statement of Principles adopted by the Conference of the Organization relating to the granting of observer status to nations.

7. Nations which, while not Members of the Commission, nor Members or Associate Members of the Organization, are Members of the United Nations, may, upon request, and with the approval of the Council of the Organization and of the Commission attend sessions of the Commission and its subsidiary bodies in an observer capacity, in accordance with the statement of principles adopted by the Conference relating to the granting of observer status to nations.

8. In the furtherance of cooperative projects provided for in Article IV(c) of the Constitution of the Commission, arrangements may be made with Governments that are not Members of the Commission. All such arrangements shall be made by the Director-General of the Organization.

Rule II
AGENDA

1. A provisional agenda of each session of the Commission shall be sent by the Director-General of the Organization or his authorized representative, to Members of the Commission and to participating international organizations not less than fifty days before the date fixed for the opening of the session, except as provided in Rule XII, paragraph 2.

2. The provisional agenda of each regular session of the Commission shall consist of:

(a) a progress report by the Executive Secretary of the work of the Commission since its last regular session, including a review of expenditures by the Organization in connection with work sponsored by the Commission;

(b) a financial statement, audited according to the established procedures of the Organization regarding any cooperative projects sponsored by the Commission to which the Members have made special contributions;

(c) budgetary proposals for the ensuing years, covering any projects requiring special contributions from Members;

(d) reports by committees and working parties;

(e) approval of the reports of the Commission;

(f) any items which have been requested by Members of the Commission in accordance with paragraph 3 of this Rule;

(g) any items which have been determined by previous sessions of the Commission;

(h) any items which the Conference, Council, or Director-General of the Organization refer to the Commission; and

(i) other business arising out of the Commission's functions.

3. Proposals for items to be discussed, other than those included in the provisional agenda, may be made by a Member of the Commission, provided such items are received by the Director-General at least ten days in advance of the opening of the Session. Any such items, if adopted by the Commission for inclusion in the Agenda, shall not be discussed until at least forty-eight hours after the Agenda has been adopted.

4. At each session the provisional agenda, together with any additions proposed in accordance with paragraph 3 above or any proposed deletions, shall be submitted to the Commission for approval as soon as possible after the opening of the session and, on approval of the Commission with or without amendments, shall become the agenda of the Commission. The Commission may by a two-thirds majority of the votes cast amend the adopted agenda by the addition or modification of any item. However, no item referred to the Commission by the Conference, Council, or the Director-General of the Organization may be omitted from the agenda.

5. The agenda of a special session of the Commission, convened in pursuance of Rule I, paragraph 2, shall be subject to approval by the Director-General of the Organization.

Rule III
CREDENTIALS

1. The credentials of delegates and the names of other members of their delegations and of the representatives of the participating international organizations shall, in so far as possible, be deposited with the Executive Secretary not later than the opening day of each session of the Commission.

2. The Executive Secretary shall examine the credentials and report thereon to the Commission.

Rule IV
PLENARY MEETINGS OF THE COMMISSION

1. Plenary meetings of the Commission shall be held in public unless the Commission decides otherwise. When the Commission decides to hold a private meeting, it shall at the same time determine the scope of such a decision with respect to observers.

2. Subject to any decision of the Commission, the Executive Secretary shall make arrangements for the admission of the public, and of representatives of the press and other information agencies, to plenary meetings of the Commission.

Rule V
SECRETARIAT

1. The Secretariat of the Commission shall, as determined by the Director-General, consist of an Executive Secretary, Technical Secretaries and if necessary a Secretary-General, together with other staff members provided by the Organization in pursuance of Article V, paragraph 7, of the Constitution. The Executive Secretary shall serve in a continuing capacity and the rest of the Secretariat shall serve only during the sessions of the Commission and its working parties and committees.

2. The Secretariat shall be responsible to the Director-General of the Organization.

3. It shall be the duty of the Secretariat to receive and circulate documents, reports and resolutions of the Commission and of its committees and working parties; to prepare the records of their official meetings, to certify expenditures and financial commitments; and to perform such other work as is required of it by these rules, or by the Commission or any of its committees or working parties.

Rule VI
WORKING LANGUAGES

English and French shall be the working languages of the Commission.

Rule VII
ELECTION OF OFFICERS

1. Nominations shall be called for by the Chairman from the floor for the offices of Chairman and First and Second Vice-Chairmen of the Commission for the ensuing term of office as provided for in the Constitution.

2. Each nomination shall be supported by a mover and seconded, and shall carry the endorsement of the nominee.

3. A majority vote shall be required to elect.

4. The elected officers shall hold office from the time of their election to the time when their successors are elected at the next regular session of the Commission.

Rule VIII
POWERS AND DUTIES OF CHAIRMAN AND VICE-CHAIRMEN

1. In addition to exercising such powers as are conferred upon him elsewhere by these Rules, the Chairman shall declare the opening and closing of each plenary meeting of each session of the Commission. He shall direct the discussions in the plenary meetings, and at such meetings ensure observance of these Rules, accord the right to speak, put questions and announce decisions. He shall rule on points of order and, subject to these Rules, shall have complete control over the proceedings at any meeting. He shall request the Director-General of the Organization to organize such committees and working parties as are recommended to be established, observe their progress and help to coordinate their efforts. When requested by the Director-General or the Council of the Organization, he shall represent the Commission at meetings of other international bodies, and undertake other specified activities to help promote the objects of the Commission.

2. The First Vice-Chairman shall assume the duties of the Chairman while he is in office in the event that the Chairman is unable to be present or if he is otherwise prevented from serving in the capacity of Chairman. The Second Vice-Chairman shall replace the First Vice-Chairman if the latter is unable to serve.

Rule IX
PROCEDURES AND VOTING ARRANGEMENTS

1. When any delegate is unable to attend any plenary meetings, his place may be taken by another member of his delegation designated by him.

2. Voting arrangements and other related matters not specifically provided for by the Constitution of the Commission or by these Rules shall be governed "mutatis mutandis" by the provisions of the General Rules of the Organization.

Rule X
RECORDS, REPORTS AND RECOMMENDATIONS

1. Summary records of the meetings of the Commission, committees and working parties shall be kept by the Executive Secretary and shall be circulated as soon as possible to participating members of delegations.

2. At each session the Commission shall approve a report embodying its views, recommendations, resolutions and decisions, including, when requested, a statement of minority views.

3. The conclusions and recommendations of the Commission shall be transmitted to the Director-General of the Organization at the close of each session, who shall circulate them to Members of the Commission, nations and international organizations that were represented at the session and make them available to other Member Nations and Associate Members of the Organization, for their information.

4. Recommendations having policy, program or financial implications for the Organization shall be brought by the Director-General to the attention of the Conference through the Council of the Organization for appropriate action.

5. Subject to the provisions of the preceding paragraph, the Director-General may request Members of the Commission to supply the Commission with information on action taken on the basis of recommendations made by the Commission.

6. Pending the formal transmission of the reports of Committees and working parties to the Director-General through the Commission as provided for in Article IV-g of the Constitution of the Commission, the Director-General may transmit informally these reports to the Members of the Commission.

Rule XI
FINANCE

1. Except as may be otherwise provided in these Rules, the Financial Regulations of the Organization as implemented by the Financial Rules Administrative Manual and memoranda and procedures based thereon, shall apply to the activities of the Commission.

2. The Commission shall prepare a detailed budget estimate for the ensuing first financial year, and a budget estimate for the ensuing second financial year with as much detail as practicable, covering any special projects which the Members may agree to undertake and which require special contributions. These budget estimates shall be submitted by the Director-General of the Organization or his authorized representative to the participating Members for determination of the extent to which each Member shall contribute the funds. Any proposals for work involving expenditures by the Organization shall be referred to the Director-General for consideration in preparing the program of work and budget of the Organization.

3. When adopted by the Conference of the Organization as a part of the general budget of the Organization, these budgetary provisions shall constitute the limits within which the Secretariat may commit funds for activities recommended by the Commission.

4. The Executive Secretary shall submit monthly to the Director-General of the Organization, on appropriate forms, statements accompanied by appropriate vouchers, setting out the expenditure effected and commitments incurred.

5. The examination and audit of the accounts of the Commission shall be conducted at the Headquarters of the Organization.

6. Funds contributed by Members of the Commission for cooperative projects under the terms of Article VII, paragraph 4 of the Constitution shall be administered by the Organization in accordance with its established procedures for the administration of such funds and with any agreement made with the Members of the Commission participating in such projects.

Rule XII
AMENDMENT OF THE CONSTITUTION

1. Proposals for the amendment of the Constitution under Article X of the Constitution may be made by any Member of the Commission in a communication addressed to both the Chairman and the Director-General of the Organization. The Director-General shall immediately inform all Members of the Commission of all proposals for amendments.

2. No proposal for the amendment of the Constitution shall be included in the agenda of any session unless notice thereof has been sent by the Director-General of the Organization to Members of the Commission at least ninety days before the opening of the session.

Rule XIII
SUSPENSION AND AMENDMENT OF RULES

1. Subject to the provisions of the Constitution, any of the foregoing Rules other than Rule I, Rule II, paragraph 5, Rule V, Rule X, paragraphs 2, 3, 4 and 5, and Rules XI and XII may be suspended by a two-thirds majority of votes cast at any regular or special session of the Commission, provided that notice of the intention to propose the suspension has been communicated to the delegates not less than twenty-four hours before the meeting at which the proposal is to be made.

2. Subject to the provisions Article V-4 of the Constitution, amendments of, or additions to these Rules may be adopted at any regular or special session of the Commission by a two-thirds majority of the membership of the Commission provided that the intention to propose the amendment or addition has been communicated to the delegates not less than twenty-four hours before the meeting at which the proposal is to be considered.

3. Any amendment to Rule XII which may be adopted in accordance with the provisions of paragraph 2 of this Rule shall not become effective until the next session of the Commission.