CURRENT PROGRAM OF CONTROL OF RICE PESTS AND DISEASES IN INDONESIA

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Introduction

The rapid increase in population growth has influenced food supply especially rice with the ever increasing demand for rice not only due to population increase but also to the increase in rice consumption per capita. For these reasons, the rice production program has been promoted rapidly and more successfully. To increase rice yield per unit area, the so-called intensification program through adequate water supply, good soil tillage, utilization of improved cultivars and pest and disease control has been undertaken. In the long run, crop area expansion program with special emphasis on rice production and development of rice estates represents an other effort to solve the food supply problem. However, pest and disease problems should also be solved at the same time.

Interrelated socio-economic as well as bio-ecological factors have been thought to be responsible for low yield on farmers' fields and the levelling off of rice production during the last few years. Customs, education, land tenure, credit facilities, production incentives, institutions and marketing are some of the socio-economic constraints. Bio-ecological factors such as prolonged drought or excessive rainfall destroy significant acreage of rice crop. Yet, inadequate pest and disease control measures are undoubtedly one of the main constraints on farmers' field. Increasing pest problems which have been observed tend to lead to production instability (Oka, 1979).

In recent years several pest species have caused a lot of damage to rice crop. Two pest species are considered dominant in formulating rice pest and disease control program, e.i. brown planthopper *(Nilaparvata lugens)* and rats (chiefly *Rattus argentiventer).* The other pest species that also create problems in rice production effort are the rice stem borers (*Tryporyza incertulas, Tryporyza innotata, Chilo suppressalis, Chilo polychrysa* and *Sesamia inferens*), rice bug (*Leptocorisa acuta*), stink bug (*Podops vermiculata*), leaf roller (*Cnaphalocrosis medinalis*), rice gall midge (*Orseolia oryzae*), virus diseases, fungal diseases and bacterial diseases. Rice virus diseases which are of importance are tungro virus, grassy stunt virus and ragged stunt virus diseases. Other rice pests which occasionally occurred are army worms (*Agrotis* spp., *Prodenia litura* and *Spodoptera mauritia*).

Rice damage caused by the brown planthopper and rats has very much affected rice production. Rat damage occurs every year in varying acreage and intensity. In the last five years, for example, yearly average of rat damage acreage covered 211,737 ha ranging from 122,940 ha to 385,143 ha. Since 1973 the brown planthopper has changed its status from a very minor pest into the most important rice pest and caused very significant yield losses (Oka, 1978). Based on survey data collected from different outbreak areas the yield losses have varied considerably depending upon the intensity of damage, but on the average they have been estimated at around 46 percent.

Demonstration trials carried out in various districts revealed that the average yield loss due to insect damage ranged between 19.4 and 24.1 percent (Soenardi, 1976). Although these pests occur every year, their population and damage fluctuate from time to time. A certain pest species may be more important in one agro-ecosystem than in another.

For many reasons, so far, control measures have not been properly conducted by farmers. Most of the farmers have little understanding and awareness of pest and pest control aspects in general and also insufficient skill in pest control practices. On the other hand, due to the weak economic position of the farmers, pest control equipment and pesticides are relatively expensive. This situation requires definite and concrete steps to be taken in due course. Pest problems must be solved and in the long run the principles of pest and disease control should be defined.

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Policy and organization

In principle farmers themselves are responsible for carrying out pest and disease control measures. They buy pesticides and pesticide applicators with their own funds. Due to the poor economic condition of the farmers, pesticides used for the intensification program are subsidized up to a reasonable price by the government. In case of emergency, e.g. pest outbreak, the government takes steps in advance to suppress the pest population. The government emergency support might be in the form of pesticides, pesticide applicators and may cover the operational cost. Control measures of pest outbreak are implemented by plant protection brigades in cooperation with farmers in the surrounding outbreak area. If the plant protection brigades at the provincial level cannot cope with the situation, because of the very rapid increase of the pest population and if the pest damage covers large areas, whenever possible, air spraying using safe and effective pesticides can be done. Pesticide application using airplanes has been done successfully to control the brown planthopper.

In the long run we plan to develop integrated pest management practices defined as a pest population management system that utilizes all suitable techniques to reduce pest populations and maintain them at a level below that causing economic injury (Smith and Reynolds, 1966). The development and implementation of this concept must evaluate all control techniques together with production practices to incorporate them into a single coordinated pattern aimed at profitable production of high quality products.

A nation-wide program for the adoption of integrated pest management with special emphasis on rice brown planthopper control has been launched and practised since 1975 (Oka, 1978). Brown planthopper outbreaks in large areas forced us to recommend and to demonstrate to the farmers how to prevent tremendous losses from occurring. Fortunately at the same time the International Rice Research Institute released several resistant cultivars, e.i. IR26, IR28, IR29 and IR30. It was also recommended to wait for sufficient seed supply and to apply chemical control in using effective insecticides.

The operational scheme of pest and disease control at the national level is under the supervision of the Directorate of Food Crop Protection at Pasarminggu, Jakarta which comprises 3 most competent technical divisions, e.i. observation and forecasting division, pesticide division and pest and disease control division. At the provincial level under the Provincial Agriculture Extension Service there is a subdivision of crop protection that is responsible for pest and disease control aspects. Depending upon the needs one or more plant protection brigades are mobilised to take steps for pest outbreak occurrence. At the district level there is also a special section of pest and disease control under the District Agriculture Extension Service organization. For more effective pest and disease control measures several pest observers are stationed in each district. Each pest observer has to be responsible for a certain area covering approximately 10,000 ha. The tasks of the pest observer consist of pest population and damage observation, collection of pest damage information and formulation of pest and disease control recommendations.

Undoubtedly the success of pest and disease control depends mostly upon the farmers themselves, since they are finally the ones who are doing the work. Due to socio-economic problems and for practical reasons, farmers are organized in farmers' groups. A farmers' group is led by a key farmer who keeps a close contact with 20 progressive farmers. Each progressive farmer is expected to contact 5 traditional farmers. It would be ideal if at least one farmer from such a farmers' group had sufficient experience in pest and disease control. He should have the necessary know-how about major pests and diseases and their practical control, operation and maintenance of pesticide applicators, safe and effective use of pesticides. He is also expected to be able to provide information on the existing pest and disease situation. The pest and disease control recommendations made by the pest observers are conveyed to these farmers' groups through senior agriculture extension workers and agriculture extension workers as connecting links for dissemination. The agricultural extension materials including pest and disease control recommendations are made by a senior agriculture extension worker who is also a specialized extension programmer. Bi-weekly meetings among agriculture extension workers are organized at the rural extension center. At that meeting the pest

observer is also present to obtain the general information especially pest situation from the agriculture extension workers and at the same time the pest observer informs and explains the pest and disease recommendations to the agriculture extension workers. Sometimes such meetings are also attended by a subject matter specialist depending upon the needs, e.g. a plant protection specialist. For detailed explanation a flow chart of the dissemination of pest and disease control information and recommendations is attached on Fig. 1.

Pest and disease control program

From the viewpoint of integrated pest management the agro- ecosystem is a unit composed of the total complex of organisms in the crop area together with the overall conditioning environment (Smith and Reynolds, 1966). The agro-ecosystem varies widely in stability, complexity and the area it occupies. Each factor has an important effect on the dynamics of pest populations.

The national evaluation and analysis reveal that the brown planthopper and rats are the most important pests. Pest control program consequently is centered on these two pests. However the national program is further translated into provincial and districts programs up to the lowest level programs where the agro-ecosystems reflect more or less the homogeneous pest complex. By this breakdown mechanism it is possible that at a certain level important pests might be different from what they are at the national or even at the provincial level. Adaptations of pest and disease control program to local specific pest and disease control recommendations are the basic principles of integrated pest management implementation.

Nowadays, planting of rice cultivars resistant to the brown planthopper is the main pest and disease control recommendation. At least 60 percent of the rice acreage should be planted with resis-

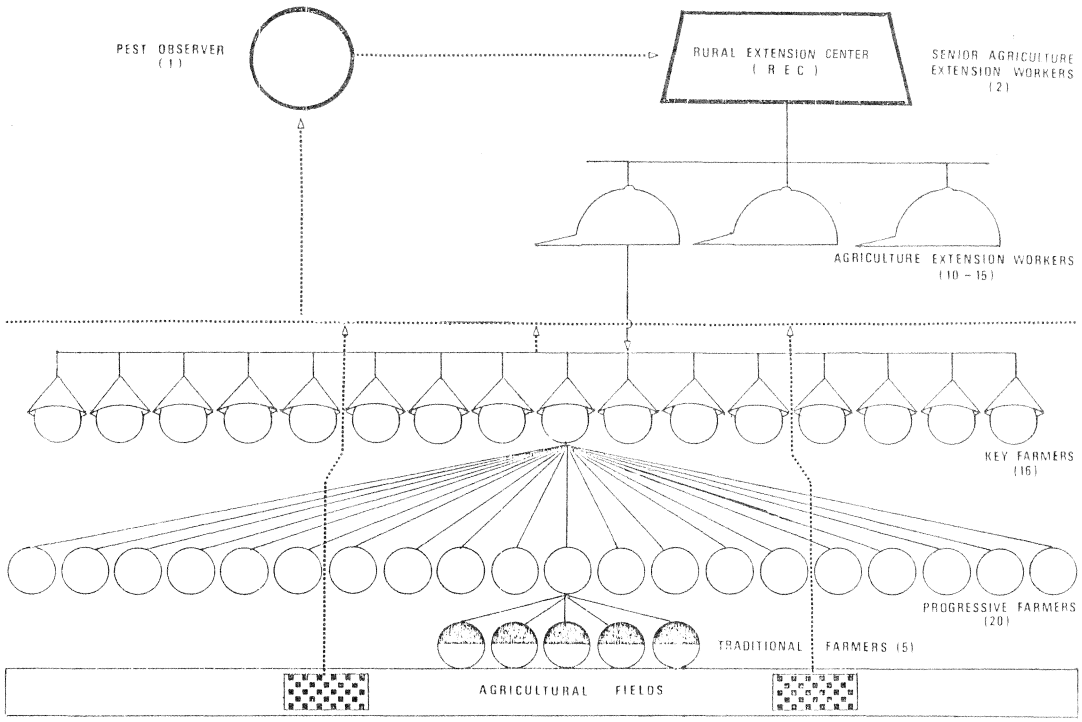

Fig. 1 Flow chart of the integrated pest management implementation in rural extension center area

tant cultivars. Brown planthopper biotype detection program has been conducted since the crop season of 1977. The results showed that 9 major rice producing provinces had already been attacked by brown planthopper biotype 2. According to these biotypes several rice cultivars have been recommended. Several rice cultivars resistant to brown planthopper biotype 1 have been recommended to the farmers, e.i. IR26, IR28, IR29, IR30, IR34, Asahan, Citarum, Serayu, Brantas. Rice cultivars which are resistant to brown planthopper biotype 1 and biotype 2 have also been recommended, e.i. IR32, IR36, IR38 and Cisadane. A rice cultivar for high altitude which is resistant to brown planthopper biotypes 1 and 2 called Semeru has been recently recommended. Further research on varietal resistance will also be carried out for other important pests and diseases.

Cultural control is another technique that is likely to support the pest and disease control program through planting regulation, crop rotation, crop sanitation, etc.

Chemical control is a pest control technique that is practised by the farmers. Safe and effective pesticides have been recommended by the Department of Agriculture. Evaluation of biological efficacy of pesticides is mainly done for important pests and diseases of food crops, especially rice crop. Recommendation of pesticide use is mainly based on the evaluation of their safety to man and environment, biological efficacy and on economic considerations. The most economical pesticides which are also safe and effective will be recommended by the Department of Agriculture. Due to heavy damage caused by the brown planthopper the pesticide supply is primarily considered to be effective to control brown planthopper population rather than other pests. Rodenticides, mainly anticoagulant rodenticides are recommended to be used by the farmers to control rat population. Zincphosphide is also recommended especially if the rat population is very high. A limited quantity of fungicides is also available. Cost of all kinds of pesticides to be used for intensification program except rodenticides is subsidized by the government. These pesticides are Furadan 3G, Diazinon 60 EC, Basudin 60 EC, Sevin 85 SP, Lebaycide 50 EC, Dimecron 50 WSC, Dursban 20 EC, Sumithion 50 EC, Folithion 50 EC, Agrothion 50 EC, Padan 50 SP, Azodrin 15 WSC, Sumibas 50 EC, Mipcin 50 EC, Hopcin 50 EC, Trithion 4 E, Nogos 50 EC, Elsan 60 EC, Daconil 75 WP, Antracol 70 WP, Dithane M-45. Several rodenticides recommended to the farmers are Tomorin, Racumin, Diphacin and Zincphosphide. Farmers may obtain these pesticides at retailers or kiosks on credit basis or cash.

Under the existing circumstances pest outbreaks appear rather frequently, causing tremendous losses. In such cases farmers individually are incapable to achieve effective control. For that purpose, 60 plant protection brigades have been set up in all the provinces. If the plant protection brigade cannot cope with the pest outbreak, then agricultural aviation units will be sent to the outbreak area to take action.

Training courses of 10-30 days for technical staff members are organized every year. The courses are conducted in cooperation with research institutes and agricultural universities. Farmers' courses (2-4 days) are also programmed at the district level especially for practical pest and disease control.

Various studies and field trials on pest control aspects are also programmed. A study of rat control in an integrated manner has been conducted since the wet season of 1978 at 2 locations each covering 1000 ha and lately enlarged to involve 5000 ha. Field trials on pest and disease control are also carried out in several provinces. The purpose of the field trials is to verify research findings in the various agro-ecosystems. In 1979 a pilot project on integrated pest management was initiated at 5 locations, each within a specific agro-ecosystem. This pilot project has involved the participation of research institutes, agricultural universities and agricultural extension centers. Each location covered about a 10,000 ha crop area that coincided with the rural extension center area.

Observation and forecasting of pest and disease occurrence is an important activity to be carried out intensively. Pest observation is conducted using 2 techniques, e.i. periodic observation on permanent observatory plots and special observations made by farmers and other sources. At present 704 pest observers have been recruited and each pest observer is responsible for the success of pest and disease control in each rural extension center area. Training courses for these pest observers are mainly centered on pest biology, crop damage assessment, pest population sampling, pest and

disease control techniques, safe and effective use of pesticides and formulation of integrated pest management recommendations.

Conclusion

Food supply especially rice should receive main priority to satisfy the ever increasing food demand. Intensification, crop area expansion and crop diversification programs are among the policies enacted by the government for securing food supply.

Two pest species, e.i. the brown planthopper and rats are the most important pests of rice crop causing considerable losses. Other pests and diseases are also causing damage which fluctuates from time to time. Even though pest and disease control program is implemented through various activities, in certain areas pest and disease outbreaks are still occurring. Plant protection brigades have been installed to cope with these emergency cases.

The rural extension center area is the operational base for pest and disease control program at the lowest level. To promote the pest and disease control practices in rural communities an integrated pest management pilot project was initiated at 5 different locations.

Planting of rice cultivars resistant to the brown planthopper is the main recommendation for coping with the present situation. Recommendations of pesticide use are mainly based on the evaluation of their safety to man and environment, biological efficacy and on economic considerations. Several pesticides at subsidized prices have been recommended for the implementation of the food crop intensification program.

Several activities were programmed to support the pest and disease control effort, e.g. training of staff members, farmers' courses, demonstration fields, field trials, pilot projects, pest and disease observation and forecasting, and dissemination of information.

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Discussion

Ishikura, H. (Japan): 1) You are conducting pest control activities as a part of the extension service. In Japan, pest control is independent from the organization supervising the extension services. What are the advantages and disadvantages in having pest control carried out as a part of the extension activities? 2) In Japan the farmers are organized at the village community level whereas it seems that in Indonesia they are organized physically in terms of number. Is there any advantage in this system?

Answer: 1) The advantage is that coordination and synchronization of all aspects of agricultural development programs can be achieved through the extension services so as to reach the farmers in order to promote food production. Extension work is thus comprehensive as it includes plant protection as well. Sometimes however, coordination between extension activities and plant protection itself may be difficult. 2) In practice, the farmers are organized on an area basis, that is a farmers' group covers approximately 50 ha.

Oka, I.N. (Indonesia) **Comment**: The extension services function as a link between researchers and farmers in disseminating and educating the farmers on various techniques of plant protec-

tion. Farmers are grouped into communities based on irrigated areas. One tertiary canal may cover a certain acreage where 50-100 farmers are working. These groups of farmers are being taught about new technology in agriculture, including plant protection. The government policy on plant protection is that the farmers themselves should be able to protect their own crops. Only in case of emergency will the government help them out in supplying pesticides and credits or in sending pest control brigades.