

General Discussion

Chairman: Reddy, B. (FAO, Bangkok): For the last two days we have heard very interesting and useful discussions. There were country reports as well as individual insect and crop reports on research, development and application of pest control or integrated pest control (IPC) or integrated pest management (IPM).

We realize that rice is a very important crop for the region which justifies our attention and this is the reason why 12 of the reports presented at the symposium dealt with rice problems whereas only 3 took up cocoa, sugar cane and citrus pest problems.

The important points raised during these two days will be highlighted. Above all it appears that the meaning of, the approach to and the level of understanding of the concept of IPC or IPM vary greatly. What we are trying to do is to coordinate the activities that were carried out before in the field of control of pests with more scientific knowledge and information which could be applied in the field. There are very few areas even in the developed countries where IPM is actually practised. We are still in the stage of formulating theories and various approaches to effective pest control. I believe that IPM should be developed for the farmer who ought to be at the center of such concept. Indeed in most developing countries, in particular, the number of scientists and the facilities available are comparatively limited. Therefore the main problems should be identified so as to improve the conditions in applying the latest research results and technology to increase yields, hence food production. The use of natural enemies, the cultivation of resistant varieties and the optimization of cultural practices were given as examples on how the situation at the farm level could be improved. Furthermore, the IPM concept is more of an area concept as farmers in the region usually have small holdings with very different cropping patterns.

I would like to take up the most salient points raised by the various speakers with regard to IPM.

One of the main problems in the developing countries is the lack of trained specialists and facilities. Accordingly, research should be stepped up and results should aim at reaching the farmer whose well-being remains the target of any program of pest control.

On the other hand, one of the problems which emerged from the discussions is that the brown planthopper (BPH) is the major pest of rice in the region. However, the role of rodents, diseases and weeds should not be overlooked in the implementation of IPM. Studies on long distance migration of planthoppers ought to be promoted.

The fact that the input/output ratio as well as energy are also fairly important aspects in pest management particularly with respect to the adoption of technology by the farmers was clearly brought out by the participants.

I wonder whether the determination of the injury level which was extensively discussed should be given such a high priority as no standardization of threshold has yet been devised. Practical application and economic aspects are perhaps more important. It was aptly emphasized that socio-economic factors should always be taken into account along with cultural aspects which seem to be at the basis of the acceptance of technology by the farmers.

From the thorough discussions which took place during the symposium, I believe that surveillance or forecasting and associated problems such as injury level and threshold are fundamental for the implementation of control programs in crop protection, particularly if the socio-economic and technological conditions along with the awareness of the farmers are being considered. However communication of information from the observer in the field to the person who takes action is often difficult and should be improved. Also the infrastructure and organization of plant protection at every level should be reinforced and centered on a multi-disciplinary approach aiming at the coordination of the various activities particularly at the farmer's level. I was very much interested by the concept of grouping of pest complexes within an area according to the weather conditions and the seasons, as suggested by the Indonesian participants. Such method is a useful parameter for the development of an effective IPM system.

It was also pointed out that the farmers should always be actively involved in any of the rural development programs. In this regard the role of farmers' organizations is certainly important for pest management as the farmers should be consulted at each stage of the program, from the onset.

Emphasis was often placed on the use of resistant varieties, although multiple resistance cannot be readily achieved by the breeder. Moreover crop resistance tends to vary depending on the area and the insect. Nevertheless, the use of resistant varieties is a sound approach to achieve higher yields at least temporarily so long as insect attacks do not reach outbreak proportions.

There was considerable discussion on the transfer of technology to the farmer. It appears that the gap in information on plant protection between researchers and extension workers is often wider than the gap in transmission of information to the farmers. Technology should be relevant to the needs of the farmers so as to be easily adopted and followed by them.

The problem of pesticides banned in one country and moving to another country was often taken up. There is obviously a need for the harmonization and cooperation between countries for the regulation of pesticides.

Mention was often made of the importance of training field workers and farmers for the implementation of IPM. I believe that the training should be practical, dynamic and field-oriented whereby the trainees themselves practise what they are being taught. Free and open discussions of the problems encountered should be actively promoted.

I would like once more to refer to the socio-economic aspects of plant protection. Indeed in our approach to pest management problems one should realize that the small farmers in the rural areas are often uneducated and very poor. Inputs are not available to them and information does not reach them. Self-reliance is also extremely important and I believe that each program should aim at the development of self-reliance at the extension worker and farmer level. In this connection there was considerable discussion on subsidies. In fact in most of the developing countries plant protection started with subsidies. Presently some countries have withdrawn the subsidies while others continue to assist poor farmers through credit and banks.

Mention should be made of the fact that farmers in some countries like Malaysia and Thailand can obtain high yields of rice without using too many pesticides. The reasons for such achievements should be clarified through further research and investigations.

With regard to integrated pest control (IPC) or integrated pest management (IPM) itself, in several instances the beneficial effect of the use of resistant varieties and natural enemies was pointed out. I was very much impressed by the way IPM is being implemented for sugar cane in Okinawa. Usually there are very few areas where IPM is actually practised, particularly in the developing countries where the existence of a large number of small farmers who cultivate a variety of crops has to be taken into account. As for the use of resistant varieties, one should be careful in recommending the cultivation of one resistant variety over large areas. Indeed if it becomes attacked by a new insect race or biotype, extensive damage is likely to take place. As regards the natural enemies, the major problem is to determine how to combine their use with other measures.

These considerations bring us back to the main question, namely what exactly is IPM. Is it a combination of factors such as the use of natural enemies, resistant varieties, agricultural practices along with chemical control? If so, the practical application of these measures remains very difficult for the farmer.

The role and usefulness of the demonstration plot was also discussed during the sessions. One may wonder whether the scale of a pilot project is large enough to determine whether IPM actually works when insect movements and farming systems are taken into account. The agro-ecosystems should be considered as a whole for pest management practice.

A problem which was brought out by many speakers is that, as far as the farmer is concerned, so far the control measures adopted consist chiefly of the use of pesticides. However it is difficult in practice to apply selective pesticides whose development is costly and takes a long time. Theoretically, it would be desirable to use broad-spectrum and specific pesticides only when necessary.

I wonder whether some of the participants would like to make any comments.

Kim, K.C. (U.S.A.): IPM as a technology should be based on the interrelationships of component factors and techniques or synergistic relationships of components rather than on a fragmented aggregation of different techniques. IPM development should have both system development (research) and implementation from the onset and should be adapted to suit each country. IPM program should be practical, realistic and should include environmental protection as an integral part of the system. Plant protection specialists should try to impress the policy makers of each country upon the importance of IPM program.

Kiritani, K. (Japan): Yesterday Dr. Kenmore mentioned that all the cases of brown planthopper (BPH) outbreaks in the tropics had been associated with the introduction of high yielding varieties of rice as well as with the use of insecticides whereas in Japan the long record of BPH outbreaks parallels a long history of whale oil insecticide use. I would like to refute the last point. In Japan application of whale oil was only practised in a limited number of paddy fields when a severe outbreak occurred because only a few farmers could afford such an expensive insecticide. In addition, in Japan as well as in other temperate areas, the intensity of outbreaks of BPH depends primarily on the density of immigrant adults in the early summer and secondarily on the time of invasion and weather conditions during the growing season of rice.

Ishikura, H. (Japan): The recent increase in the population of hoppers in general seems to be related to the introduction of high-tillering-type varieties of rice and dense planting which in Japan became feasible through mechanical transplanting. The number of panicles per unit area is increased as well as the luxuriance of the rice plant canopy. According to Dr. Suenaga there appears to be a positive and close correlation between hopper outbreaks and the luxuriance index which can be estimated by the determination of canopy components (number of leaves and stems, length of leaves). The increase in canopy luxuriance could be an important cause of the increase in hopper population. In addition, owing to the presence of a luxuriant canopy, the control of hoppers is less effective as insecticides do not reach the basal part of the plant where the insects can usually be found.

Chairman: In connection with the brown planthopper outbreaks, several factors should be considered such as the use of insecticides, the modification of cultural practices along with the cultivation of certain crop varieties which cause microclimatic changes and act as a barrier. For example it has been reported that when short-stemmed high yielding varieties are cultivated, the stem borer population decreases in contrast with the situation where local *indica* varieties are cultivated. On the other hand, in Bali, brown planthopper outbreaks became very serious with the introduction of high yielding varieties whereas few insecticides were being used at that time. I would like once more to state that so far emphasis has been placed chiefly on irrigated rice although rainfed rice accounts for 70% of the cultivated zone. Unfortunately, in these areas production and yields have not experienced any significant increase.

Mochida, O. (Japan): I would like to point out that although Japan has been able to develop a high level of technology in the field of pest control in establishing the forecasting system and in spite of the fact that appropriate amounts of insecticides are available for application and that a large number of entomologists have been engaged in studies on the planthoppers for more than 70 years, the brown planthopper problem has not been solved and infestations still remain very serious at present.

Kiritani, K. (Japan): I believe that this symposium shows clearly that there seems to be a difference in the approach to IPM between Japan and the developing countries. This difference could be ascribed to the fact that in the Southeast Asian countries there is an organizational approach to IPM rather than a research-oriented approach which corresponds to the on-line system orientation of the Japanese community. I wonder which approach is preferable for the implementation of IPM.

Yoshimeki, M. (Japan): The existing agro-ecosystems have all been created by us through the introduction of sophisticated technology over a long period of time. Therefore I am confident that in the future technological progress will enable us to further improve the ecosystems and to devise an effective and successful IPM system.

Chang, P.M. (Malaysia): Dr. Mochida mentioned that in spite of the exhaustive research carried out in Japan the brown planthopper still remains a problem. Although this shows that there are still gaps in our knowledge, we in the developing countries cannot afford to wait for full information before implementing IPC programs. We have to identify our own problems in each country, work on them and develop our own systems. Also more research should be conducted to find out what are the reasons for the pest problems in our respective countries. The brown planthopper is indeed a major problem for rice in the tropics. The factors which are at the basis of the increase of outbreaks may be related to the use of insecticides, the introduction of high yielding varieties or the weather conditions, such as prolonged drought or heavy rains which may interfere with the activity of the natural enemies.

Sadji, P.(Indonesia): I agree with what Dr. Kiritani said. In Indonesia we are concerned with the implementation of IPM at the farmer's level on the basis of an organizational system rather than on research. In the developing countries IPM is not so much a package of techniques on how to control a particular pest but a matter of coordination of all aspects of agricultural development at the farmer's level over large areas so as to involve groups of farmers working in cooperation.

Chairman: As I said before, IPM is essentially a matter of getting more information and practices and putting them together. It is a good means for coordinating various factors and it is a concept which can be understood at the administrative and governmental level. Our objective is to increase production under conditions which are advantageous to us but at the same time we want to preserve the environment for the future generations. As regards research, we should try to identify problems, study them and take advantage of the results so as to improve the conditions of the farmers. The nature, quality and quantity of research should be carefully assessed.

Sanchez, F.F. (the Philippines): Everybody has spoken about the serious problem with the brown planthopper. However I would like to call the attention to our experience with the brown planthopper in the Philippines, as for the last two years or so we have not had any major outbreak of brown planthopper. Perhaps people should take a look at what happened in the Philippines and learn something that might be useful in containing the brown planthopper menace. The widespread planting of resistant varieties may be one of the important factors in the decrease of the outbreaks.