

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

Interim SCIENCE COUNCIL

Report of the
First External Review of the Systemwide Programme
on Integrated Pest Management
(SP-IPM)

Interim SCIENCE COUNCIL SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

This report comprises:

- (a) Extract from the Record of Proceedings of the Annual General Meeting 2002, Manila, Philippines, October 28-November 1 2002.
- (b) Letter from iSC Chairman transmitting the Report of the First Review of the Systemwide Programme on Integrated Pest Management (SP-IPM).
- (c) iSC Commentary on the First Review of the Systemwide Programme on Integrated Pest Management (SP-IPM).
- (d) A Joint Response from IITA and the SP-IPM Steering Committee to the First Review of the Systemwide Programme on Integrated Pest Management (SP-IPM).
- (f) Transmittal Letter from Panel Chair to iSC Chair.
- (e) Report of the First Review of the Systemwide Programme on Integrated Pest Management (SP-IPM).

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August 2003



Consultative Group on International Agricultural Research (CGIAR)

CGIAR Annual General Meeting, 2002 (AGM02)

Discussions and Decisions on External Review of SP-IPM

(Excerpted from “Summary Record of Proceedings and Decisions, AGM02)

External Review (EPR) of SP-IPM¹

iSC Chair Emil Javier presented the main points of the Systemwide-IPM Program (SP-IPM) review. The Panel endorsed the effectiveness of a coordinated, systemwide approach to IPM, because constraints and challenges faced on a regional and global scale cannot be met by individual researchers or by individual Centers. The Panel urged the continuance of the program and made several recommendations to strengthen the impact of SP-IPM. The recommendations included calls for SP-IPM to:

- take a more outward-looking approach in seeking international assistance and co-operation;
- more thoroughly analyze its taskforces to expand their potential global relevance;
- explore the complementarity among other Systemwide programs and Centers not included in SP-IPM as well as outside research institutes including NARS and ARIs; and
- add socio-economic and policy research as a major component of its program.

The review urged the CGIAR to upgrade the status of SP-IPM, so that the program might function as a “virtual Centre.”

¹ Extract from the Record of Proceedings of the Annual General Meeting 2002, Manila, Philippines 30 October to 2 November 2002.

Consultative Group on International Agricultural Research (CGIAR)

Interim SCIENCE COUNCIL

Emil Q. Javier, Chair

7th October 2002

Dear Mr Johnson,

It is my pleasure to transmit to you the report of the First Review of the Systemwide Programme on Integrated Pest Management (SP-IPM). A two-member panel chaired by Dr. Andrew Gutierrez, USA conducted the Review over the course of the year 2001. The Panel Report was considered by the interim Science Council (iSC) at its 82nd Meeting held at CIP, in Lima, Peru, in April 2002. The panel chair and panel member Hermann Waibel, Germany addressed the iSC via a tele-conference call.

The Panel Report is accompanied by two attachments. The first contains the iSC commentary, which summarizes iSC's views on the Panel Report and on the joint response from the convening centre, IITA and the SP-IPM Steering Committee. The second attachment is the joint response of IITA and the SP-IPM Steering Committee to the Panel Report.

In the context of this Review, the Council wishes to affirm the critical importance of IPM in sustainable production systems. A systemwide IPM programme is essential to the enhancement of IPM efforts across the centres. Over the past 10 years the IPM approach has become increasingly 'mainstreamed' within the centres, a very positive development in the Council's view and one which the SP-IPM has certainly contributed to. The iSC believes the SP-IPM should be supported to further enhance research on and adoption and use of IPM practices.

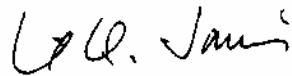
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Mr. Ian Johnson
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This is now the fourth systemwide programme reviewed by the iSC/TAC (SGRP, Ecoregional Approach and SLP were reviewed previously). Experience is now beginning to accumulate and suggests some lessons for ensuring success of these programmes, particularly those related to management structure. Indeed, like others within the Group, the iSC is considering how best to integrate and manage across the System centre core programmes, systemwide programmes and Challenge Programmes.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Emil Javier". The signature is written in a cursive, slightly slanted style.

Emil Javier

**Interim Science Council Commentary on the
First External Review of the
Systemwide Programme on Integrated Pest Management (SP-IPM)**

The interim Science Council (iSC) is pleased to accept the report of the first external review of the SP-IPM which was discussed at TAC 82/iSC in Lima in the presence of Dr. Peter Neuenschwander, SP-IPM Programme Leader and representative of the convening centre. The SP-IPM review panel chair, Dr. Andrew Gutierrez and panel member Dr. Hermann Waibel addressed the group through a teleconference call. The iSC wishes to thank Drs. Gutierrez and Waibel for undertaking this important review.

The iSC received a joint response to the review from IITA, the convening centre and the SP-IPM Steering Committee. A detailed report of a subsequent inter-centre IPM Working Group meeting in Quito, Ecuador has also been received. The iSC offers the following comments based on all three documents.

The iSC would like to re-iterate the following major points made by the panel and in the subsequent discussion which are timely and deserve highlighting in the context of this review.

- First, IPM is critical to sustainable production systems for human health, economic efficiency and NRM considerations. In its report, the panel has highlighted the increasing importance of IPM with respect to a number of developments worldwide, which are central to the CGIAR mission and strategy.
- Second, a systemwide IPM programme is very important to the enhancement of IPM efforts occurring in most centres. Over the past 10 years the IPM approach has become increasingly 'mainstreamed' within the centres, a very positive development in the Council's view and one which the SP-IPM has certainly contributed to.
- Third, in view of funding instability and uncertainty, a phenomenon experienced by many if not most of the SWPs, the iSC believes that core CGIAR support is critically needed for the SP-IPM to provide the "glue" to hold together the diverse activities of these highly effective systemwide programmes. This is discussed in more detail below.

The Council would also like to put on record its appreciation to the donors who have steadfastly supported this programme since its initiation in 1995, in particular the governments of Norway and Switzerland and to acknowledge the start-up funding from the CGIAR. There were many other donors that supported individual SP-IPM projects and activities.

The review report itself highlights some of the achievements of the SP-IPM to-date, underscores areas that need improvement and suggests a strategy for upgrading the programme for the future.

The panel has identified a number of positive results emerging from this systemwide programme, the most important of which is the improved communication among IARCs and their partners resulting in strengthened inter-centre cooperation in IPM research. The panel attributes much of this success to the dedication and commitment of the founding SP-IPM coordinator who helped foster good communication and collegiality among scientists from IARCs, ARIs and NARIs/NGOs. This, in turn, facilitated the process of developing a 'centre without walls', which is now apparent. The iSC believes these early initiatives reflect a commitment and a sincere desire for achieving SP-IPM objectives.

The panel also noted that some individual taskforces (the operational components of the SP-IPM) are operating well and was particularly impressed with the whitefly taskforce, citing this as an example of a model programme to achieve inter-centre leverage in tackling serious global pest problems. The Council concurs with this assessment although it would have liked to see a richer analysis and assessment of the activities, outputs and early impacts of this initiative². Although some outputs from this initiative are identified in the report, e.g., journal publications and book chapters, there are not many due to the limited duration of the project (initiated in 1997) and to the lack of procedures in place which identify the publications as those coming from the SP-IPM initiative. As such, the panel found it difficult to attribute specific research outputs to this or any other taskforce. The iSC recommends that in the future this be clearly designated.

While the report is generally very enthusiastic about IPM in general, there are several areas where improvements in the operation and management of SP-IPM are required. These relate to:

1. the specific objectives of the SP-IPM which only partially reflect the priorities laid out in the guiding principles and strategies adopted by the IARCs and the lack of a formal mechanism within SP-IPM for setting priorities;
2. insufficient attention to methodological questions;
3. the narrow disciplinary focus and, specifically, the lack of input from economists and other social scientists; and,
4. insufficient dialogue within and beyond the CGIAR - particularly in establishing and strengthening policy dialogue related to IPM.

While the panel attributes some of these shortcomings to the fact that the programme is just beginning and to the specificity of funding (a view confirmed in the joint response), the panel

² More generally, while the panel did address a number of important issues related to effective implementation of the SP-IPM in the CGIAR, there were specific TORs for this review which the iSC felt the panel had not addressed sufficiently. These are discussed in the Annex to the iSC Commentary.

has identified some major issues here as well. To some extent the panel's recommendations address these issues.

The iSC agrees with the spirit of Recommendation # 1 particularly on the need and relevance of SP-IPM in the future. Given the dimensions of the global pest problem and its likely increasing importance over time, an inter-institutional mechanism must exist to capture the latent complementarities across the various research, extension and development organizations focusing on IPM. The Council is pleased to note that the SP-IPM intends to build on its existing partnerships and to increase its visibility and interactions outside the CGIAR. This has recently begun with the inclusion of new members to the Working Group in their recent meeting. The iSC agrees that greater emphasis should be made for the development of methodologies and cross-cutting science at an inter-centre level and that scientific output and other services from SP-IPM should be made available to as wide a range of clients as possible.

The Council endorses Recommendations #2, #3 and #4 of the panel. The need to more thoroughly analyse SP-IPM taskforces with respect to the scope and extended problem definition is related to the need for greater focus, systematic priority setting and an appropriate strategy for implementation. The iSC is pleased to note that the SP-IPM has already taken steps to re-organize its taskforces into thematic groups away from fund seeking for special projects to more pro-active assistance in decision-making processes involving wider stakeholder groups, with sunset clauses to ensure continued relevance and viability. The number of individual taskforces within SP-IPM has also been reduced at the inter-centre meeting

The panel emphasised the need for more interaction between SP-IPM and other SWPs and particularly with IFPRI on policy analysis and ISNAR on managing policy change through partner institutions and, the need for greater expertise and use of GIS and modelling work. On the latter point, there is a need to enhance the technological basis of research and implementation in IPM at IARCs. This ties in to an observation of the panel about the quality of research outputs in the SP-IPM, The panel noted insufficient "research quality enhancement effect" through SP-IPM. While the Council is aware of research spillover benefits within the SP-IPM, e.g., the influence of the whitefly taskforce on approaches used in the other taskforces, it nevertheless urges the SP-IPM to focus more strongly on publishing the results of its work in high quality refereed journals jointly with key participating institutes wherever possible.

The Council agrees that the lack of input from economists in the research design and analysis stages and on broader policy related issues remains one of the weaknesses of the SP-IPM to-date. The panel has identified three specific areas where economists could play a key role in upgrading the capacity of the SP-IPM: in economic crop loss assessments, linked to re-assessing priorities for the programme; in policy analysis (effects of distortions in crop protection policy); and in impact assessment (and methodology development). The Council concurs with the panel's assessment in this area and also emphasizes an equally important need to bring in a stronger social analytical basis to IPM, particularly to address areas such as collective action--so critical to success in IPM.

The iSC agrees with the first part of Recommendation # 5, on the need to elevate and enhance IPM in the CGIAR, that it should be a more visible part of its agenda. With respect to the creation of a 'virtual IPM centre' for organizing and managing the SP-IPM for the future, the Council does not support the virtual centre as proposed by the panel. The current SP-IPM members have much of their interaction already in virtual mode and iSC encourages the programme to make more use of all available technology.

The iSC agrees that the SP-IPM programme leader and co-ordinator positions are crucial for the future development of SP-IPM within the CGIAR and its co-operation with non-CGIAR Centres and ARIs. However, given the systemwide nature of this programme and issues related to governance, the iSC recommends maintaining the programme leader and coordinator within the CGIAR system. Indeed, the panel was quite positive about the previous co-ordinator's ability to make genuine strides toward developing a 'centre without walls' and in fostering good communication and collegiality amongst scientists from the IARCs, ARIs and NARIs/NGOs. A consideration perhaps overlooked by the panel is the need to work within legal and operational mandates of Centres and their partners if policy changes and field-level implementation and impact are to be achieved.

While the iSC concurs with the panel's view on the need for making the SP-IPM work more effectively across centre mandate boundaries, helping focus systemwide IPM research priorities and facilitating the solution of regional and global pest problems, the panel does not provide compelling evidence that re-structuring alone can do that. If, for example, funding has been and remains the key constraint to more effective system-level research in the SP-IPM, moving the Secretariat outside of the convening centre structure will not make it any more effective. The iSC does not share the panel's view that the SP-IPM had limited visibility and effectiveness as a result of placing the SP-IPM Coordinator's position "deep within hierarchy of the convening centre". While IITA certainly gained from its involvement in SP-IPM, the same should be said of many other collaborators in the programme. Indeed, mutual gain is one of the main purposes of systemwide programmes. Furthermore, the largest effort in this systemwide programme, the whitefly global project, is led by CIAT and the newly emerged leaf miner project is led by CIP.

With respect to the future management structure of the SP-IPM, the iSC endorses the following structure proposed by the SP-IPM Working Group recently³:

- the chair of the SP-IPM Steering Committee would be a DG or DDG of one of the participating CGIAR centres, on a 2-3 year rotating basis;
- the SP-IPM Coordinator position would stay within the participating institutions as long as it remains a systemwide programme;
- virtual methods and coordination for communication with partners to be used to the optimal extent;

³ This should not be taken to mean the iSC endorses such a structure for all systemwide programmes, although some elements here may be relevant for other systemwide programmes.

- in order to ensure stability to the SP-IPM, minimum financial support to cover facilitation costs should be provided by the CGIAR on an on-going basis subject to performance review of the systemwide programme;
- the centres accept SP-IPM as a research partner with full partnership status in publications.

The SP-IPM shares several management structural problems with all systemwide programmes. The iSC suggests that budget line items for any CGIAR (core) support be shown as a separate line item in the coordinating centre budget and that any contribution to the SP-IPM be indicated in the budgets of each participating centre. The systemwide programme coordinator should present an aggregate annual budget and an aggregate rolling workplan as part of the normal MTP process. This would provide not only programme accountability, but greater visibility. And it would greatly enhance effectiveness of programme review and impact assessment.

Notwithstanding some of the constraints and limitations of the programme to-date, it is evident that the SP-IPM has accomplished a number of achievements thus far, chief of which appears to be the excellent rapport and working interactions amongst members of the SP-IPM. The iSC believes the essential groundwork has been laid for achieving complementarities and synergies amongst partners within this programme. As such, the iSC considers that SP-IPM continues to be an important systemwide programme and needs to be supported to further enhance adoption and use of IPM practices.

Finally, the iSC commends the partners for their rapid and very thorough response at the recent inter-institutional IPM Working Group meeting to a number of the key issues raised.

Annex

iSC Commentary on Additional Items in the Terms of Reference of the Review

While the panel had addressed a number of major issues in the report and covered some of the TOR quite adequately, the iSC noted that other specific elements of the TOR for this review were not addressed in enough depth, as discussed below. These are summarised for SP-IPM programme leadership action and for attention in future reviews.

While the panel has emphasized the need for greater internal coherence of the CGIAR research portfolio as a pre-condition for SP-IPM to perform its role effectively, the question of how effective SP-IPM has been in achieving a more coherent agenda for IPM in the

CGIAR is not clearly addressed in the report, nor what has been the added value in scientific terms, over and above what participants would have achieved independently. This, of course, relates to TOR 2.2 (a), which in the Council's view has not been addressed fully.

Further, the panel concludes that SP-IPM has been a useful concept for restructuring pest management research and implementation across the CGIAR. The Council would have liked to see more evidence of this in the report. While agreeing that the SP-IPM is a useful concept, it is not shown clearly enough that the SP-IPM has had a major impact--much less a restructuring effect--on IPM research in the CGIAR System at large. The report does not discuss the extent to which other IPM research being done by CGIAR and non-CGIAR centres has been influenced by or integrated into this programme.

While it is true that the limited time frame of its operation represents a constraint, it must be recognized that the SP-IPM has received funding since 1996 and any lessons that could be learned with respect to constraints in securing funding for a topic that is obviously of high priority would be extremely useful. While the panel mentions a failure to secure adequate funding for various reasons, those reasons are not identified in the report. The convening centre's response also highlights the atmosphere of very weak funding for SP-IPM but without indicating possible reasons why.

The treatment of governance aspects of the programme (TOR #4) and its overall effectiveness with respect to accountability, decision-making, reporting structure, etc., is extremely brief in the report. The iSC is pleased to see, however, that this was a topic addressed in considerable detail at the last inter-centre IPM Working Group meeting which has resulted in a more formal operational and governance structure. The iSC also endorses this new structure.

The analysis of the two taskforce projects, the whitefly and parasitic plant management, were handled quite differently. The whitefly project is treated very briefly, without a description of research activities undertaken, major objectives, critical results, etc. This is unfortunate since it is clearly the most successful of the taskforces and is perhaps in the best position to be documented and from which valuable lessons could be drawn. Even though there was little discussion, the panel considered this a model project. The discussion of the parasitic plant management project is descriptive, presumably because it is still in the early phases of implementation. While there were clearly some positive dimensions to this work, e.g., farmers were actively involved, there were also a number of weaknesses pointed out by the panel, e.g., data insufficient for rigorous analysis (p. 20), management issues (p. 27) that need attention. More generally, for either taskforce, there were no conclusions drawn out on the major benefits from using the SP-IPM concepts compared with other crop protection projects running in the Centres. This would provide the critical evidence for continuing with this concept in the future.



Headquarters

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28 March 2002

Dr. Emil Javier
Chair
Science Council
Consultative Group on International Agricultural Research
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Dear Emil:

Please find enclosed IITA's response to the Systemwide Integrated Pest Management External Program and Management Review. Comments from the 13 participating international centres (11 from the CGIAR) have been incorporated in the present response. Because of the limited time available to us since receiving the final report we have not been able to consult fully with all members of the Board. Therefore this response represents only the views of IITA management and their SP-IPM partners. The next meeting of the IITA Board only takes place in June 2002.

We will carefully analyze the various recommendations and suggestions together with the IITA Board and will ensure to make the best use of them. In this sense IITA's response (attached) represents only initial comments and responses to the recommendations.

We would like to take the occasion to thank the authors of the report, Profs. Andrew P. Gutierrez and Hermann Waibel, for stimulating discussions and challenging recommendations. We hope this review will help SP-IPM to better coordinate its activities and serve its clients, the producers, extension agents, and scientist colleagues in the national programs. But foremost, this review should help us to stimulate and orient research and implementation in IPM from the different CGIAR centres and other international research institutions, and to better link with the FAO Global IPM Facility, the IPM Forum, the Pesticide Action Network, and the Global Crop Protection Federation, which are all joined in the Inter-Center Working Group on IPM, which is led by SP-IPM.

We thank our colleagues who, at different levels, participated in the review and responded to various drafts, for their contribution, and to the CGIAR for organizing the review.

Sincerely

Dr. Peter Hartmann
Director General

Copy: Dr. Enrico Porceddu, IITA Board Chair

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**REVIEW OF THE CGIAR SYSTEM-WIDE PROGRAMME ON
INTEGRATED PEST MANAGEMENT (SP-IPM):
A JOINT RESPONSE FROM IITA AND THE SP-IPM STEERING COMMITTEE**

GENERAL COMMENTS

We have read and circulated the SP-IPM review report and consulted with members of the Inter Centre Working Group (ICWG/Steering Committee) of the SP-IPM to prepare this response. The response represents the common view of the convening Centre, IITA and the ICWG. We express our appreciation to the reviewers for highlighting the good progress made by the programme, providing advisory comments on IPM science and its application and suggesting an operational and governance mechanism of the programme. The SP-IPM will build upon the encouraging words by the reviewers to address the key issues raised in the report. Many of the details of the report are clearly reflective of the scientific backgrounds, interests and particular experiences of the two reviewers, the future growth of the SP-IPM will certainly benefit from their experiences. The operational shortcomings noted in the report are probably best viewed in framework of the proven ability of the SP-IPM to reorganize itself. The recommendations are stimulating and challenging, albeit with some factual errors and will guide the discussions on the best way to up-grade the programme and sustain a quality and cost-effective delivery system.

Certainly, many of the reviewers' suggestions on the future of SP-IPM go well beyond SP-IPM alone and, we look forward to feed back from the iSC on some of these issues. For example, we view the proposed concept of an "IPM virtual Centre" as alternative to the Challenge Programme approach, for which SP-IPM partners had recently submitted a concept note and pre-proposal for consideration. It is also important to stress that the body of the report acknowledges that the SP-IPM was established by the CGIAR as a mechanism to coordinate its own IPM research and outreach activities in partnership with other IARCs, ARIs, specialized global IPM implementation agencies and sub-regional/national agricultural development programmes. The CGIAR provides the resources, has the institutional and technical capacity, proven ability and appropriate linkages to coordinate collaborative partnerships required to meet the challenges in a far more effective, comprehensive and committed manner than would a "virtual Centre". It also makes excellent and cost saving sense to work within the institutional settings offered by memoranda of understanding between the Centres and governments/inter-governmental bodies than to initiate a "virtual Centre" at extra time and budgetary costs.

The reviewers wrongly believe that IITA profited through research gains on the SP-IPM and cite examples to partly justify their conviction that IITA has compromised its neutrality as a convening Centre of the programme. This conclusion is partly based on factual errors in the report. IITA remains an active partner in SP-IPM and has profited mainly by openly sharing information and technical resources to improve the quality of the programme and timely delivery of products and services. Similarly, other partners have profited by working together to achieve the SP-IPM goal through better collaboration.

In terms of upgrading the programme, we agree with the reviewers that the coordinator's position be paid by CGIAR funds and not from the special donor contributions as is presently the case.

We also advocate a professional reward system that fully recognizes valuable contribution of task force leaders/members/scientists.

SPECIFIC COMMENTS

Annexes 1 - 4 accompany the following responses to specific recommendations in order to correct some factual errors in the report about the structure of the SP-IPM task forces, projects and pilot site initiatives.

Recommendation 1

The Panel recommends that in view of the global challenges from pests and pest management issues there exists a strong need and a high relevance for SP-IPM in the future. In view of the changes that the CGIAR is currently undergoing, the Panel views advancements in the internal coherence of the CGIAR research portfolio as an important pre-condition for SP-IPM to perform its role effectively. The Panel recommends that in order to be successful in the future SP-IPM should go beyond its present focus of improving co-operation among Centres and should widen its scope and take a more outward-looking approach in seeking international assistance and co-operation.

Response

We fully agree with the panel that the overriding challenge for the SP-IPM partners is to continue to develop pest control strategies/tactics and to undertake consultative activities to influence the policy environment that favours IPM adoption. The SP-IPM would, however, not want to globalise the challenges at the expense of marginalizing the location-specific nature of IPM, especially as experienced by resource-limited farming communities and national organizations.

The SP-IPM, at its inception in 1996, realized that the CGIAR Centres couldn't do the job in isolation. At the time of the review, the programme already had a relatively impressive spread of partners. The ICWG list (Annex 1), for example, includes 10 CGIAR Centres, 3 other IARCs, the FAO Global IPM Facility, the Pesticide Action Network (PAN, representing NGOs), the Global Crop Protection Federation (a private crop protection industry) and the re-emerging IPM Forum (for information dissemination). Many of these groups are also key partners to plan and execute joint activities in collaboration with at least 30 national programmes (research, extension services and NGOs) and associated farming communities in the developing world. The need to broaden partnership is further met by the programme's de-facto membership on the Governing Board of the International Association for the Plant Protection Sciences (IAPPS), the independent umbrella organization established at the 14th International Plant Protection Congress (IPPC, in Jerusalem, July 1999) to address important work on international plant protection problems/questions and plan the IPPCs. Based on need, special projects of the SP-IPM attract a wide range of ARIs, e.g., the primary partners on the whitefly project include 10 ARIs from Australia, Denmark, Germany, New Zealand, the

United Kingdom and the United States. The mechanism to attract and collaborate with other key players exists.

The SP-IPM will build on these kinds of collaborative linkages and networking to further increase its visibility outside CGIAR research circles and encourage activities to gradually break down “exclusivity” walls that may surround some individual partners.

Recommendation 2

The Panel recommends that SP-IPM should more thoroughly analyse its taskforces with regards to scope and extended problem definition in order to expand their potential global relevance. In order to carry out this task the Panel sees a strong need for an independent and strong global research network on IPM and recommends that the CGIAR make the SP-IPM a more visible part of its strategy for achieving its stated objectives.

Response

We are in full agreement with the panel on the need to re-organize our task forces (Annex 2), especially to move the task forces away from fund seeking for special projects (as their major activities) to more proactive assistance to decision-making processes by national and inter-governmental on plant protection issues of common/growing concern. Some of the SP-IPM shortcomings cited by the reviewers can be traced to the failure to attract funds for crucial task forces covering cornerstone IPM topics, not linked with direct requests by our clients for solving specific pest problems. In an atmosphere of very weak core SP-IPM funding level, these task forces easily “disappear”. The long-term value of the programme would probably lie in the capacity of re-structured task forces to provide credible and objectively verifiable information on candidate problems/issues such as crop loss and IPM impact assessment methods, insecticidal transgenic crops, beneficial micro organisms, alien invasive species, novel IPM research and extension methodologies, PQ protocol and national institutional environments to integrate IPM in mainstream agriculture. Additionally, the task forces would encourage sub-regional collaborative research for technology development and minimize “more of the same” research to reduce farmers’ dependence on unsustainable plant protection options.

The SP-IPM will re-organize the multi-institutional task forces to include national programmes, universities and international specialist organizations and other similar key stakeholders with keen interest in IPM. The SP-IPM is obviously well placed to play the role of a “...strong global research network on IPM...” and we fully endorse the reviewers recommendation for the CGIAR to “...make the SP-IPM a more visible part of its strategy for achieving its stated objectives” and thereby further strengthen the foundation for leaving a legacy of ideas, processes and results.

Recommendation 3

The Panel recommends that in order to make full use of relevant disciplinary expertise, SP-IPM should more seriously explore the complementarities among programmes including different systemwide programmes and relevant Centres not included in the systemwide programme as well as outside research institutes be they advanced NARS or ARIs. To fully utilise recent advances in computer modelling and GIS that offer new

potentials for the transfer of site-specific research results SP-IPM should adopt these concepts as unifying part of its major research strategies.

Response

We agree that the combination of simulation modelling and GIS techniques offers hitherto little explored opportunities to integrate local results, thus allowing researchers to see the big picture and to communicate this to a wider audience. Partnerships between CGIAR Centres and ARIs already exist and should be strengthened to tackle specific problems that escape a solution through traditional, agronomy-type studies. We would, however, like to express caution on over expectations from modelling in IPM, as it can be difficult to attribute a practical success due to modelling. While we consider GIS techniques extremely useful, their exploitation would need more investment in extension and farmer training to guarantee monitoring and assessment of pest incidence and severity. This would generate the ‘ground truthing’ information, without which maps generated from satellite images are of limited use for other communities. This will also be in line with the Agenda 21 objective to “put IPM practices within the reach of farmers”. The task force on farmer participatory research can explore communication media and systems, additional to existing models on participatory learning in IPM, to promote the efforts to reach a large number of farmers simultaneously.

Recommendation 4

The Panel recommends that socio-economic and policy research be added as a major component of SP-IPM. There are at least three broad themes that deserve to be given more attention if the SP-IPM wants to make relevant and significant contributions to international agricultural developments, namely (1) economically defined crop loss assessment, (2) policy research in response to national crop protection policies and international trade issues, i.e. IPM and globalisation and (3) impact assessment that incorporates natural resource management aspects into social science research.

Response

We agree with the panel’s recommendation to engage in IPM policy and social research. The SP-IPM is exploring collaborative linkages with the IAPPS to undertake consultative dialogue with national governments and multi-stakeholder groups to develop/revise national plant protection plans with appropriate strategies and legislative policies to secure high and stable yields and increase user compliance of the protocols. The SP-IPM expects that the activities will emphasize the “do good” aspects of IPM and not simply re-focus attention on the “do no harm/pesticide control” aspects. The programme also expects to conduct the activities within the framework of agricultural development policies (where these exist) to create excellent opportunities for a holistic research approach on social and policy issues in food security demands. Some concerns to address would include a regulatory framework for the production, marketing, distribution and use of inorganic pesticides, biopesticides and insecticidal transgenic crops, institutional capacity and sustainability for research and education to evaluate pest problems, generate alternatives to unsustainable products/practices and enhance farm-level decision making. The World Bank Operational Policy 4.09 (cited by the reviewers; an internal bank document for project appraisal, monitoring and evaluation; under review) forms a background to build upon. In this regard the key collaborative partners in Sub-Saharan Africa, for example, will include the Inter-African Phytosanitary Council (Yaoundé,

Cameroon), the FAO Regional Plant Protection Office (Accra, Ghana) and international IPM development organizations).

Recommendation 5

The SP-IPM Review Panel recommends that the status of IPM be greatly elevated within the CGIAR and to be upgraded beyond the focus of the current systemwide programme. That SP-IPM in the future should be organized as a "virtual Centre" with minimal infrastructure but maximum linkages. The Panel views this as the best way to develop a global structure that has a fair chance to overcome the problem of rising crop losses from pests and the growing level of pesticide use world-wide. The co-ordinator position should serve as a liaison and "honest broker" between the Centres and other IARCs, donors, development organizations and the GIPMF on IPM issues. The co-ordinator position should be at the level of a Centre Director. Funding for the SP-IPM programme co-ordinator position should come from CGIAR core funds. The Panel recommends to establish the virtual IPM Centre either directly under TAC/SC or alternatively with any other research organization of international status in IPM to be determined through an open bidding process and to be coupled contractually to the CGIAR.

Response

We agree that the status of the SP-IPM needs to be elevated within the CGIAR, but not with the rest of recommendation #5 for a number of reasons:

- a) The SP-IPM currently has impressive membership and professional linkages; the CGIAR/IARCs and other international partners have memoranda of understanding with national governments and inter-governmental bodies. It makes far better sense to work within these institutional settings, at no cost to the SP-IPM, than to initiate a "virtual Centre" that may have to rediscover this wheel and at extra time and budgetary costs.
- b) The SP-IPM was established by the CGIAR as a mechanism to coordinate its own IPM research and outreach activities within the framework of its mission. The body of the reviewers report does not dispute the fact that the CGIAR provides the resources, has the institutional and technical capacity, proven ability and appropriate linkages to coordinate collaborative partnerships required to meet these kinds of challenges. It is doubtful that an independent/"virtual Centre", removed from the centres and from the daily challenge by local, rural and political problems, would be able to contribute effectively to the CGIAR mission to alleviate poverty. What the SP-IPM does is to harness plurality of IPM interests to serve its clients.
- c) The reviewers believe that IITA profited through research gains on the Africa cassava mosaic disease (ACMD), Striga (parasitic weed) and stem borers and cite these examples to partly justify the conviction that IITA has compromised its neutrality as a convening Centre of the programme and is now unsuitable to host the programme. However, the facts are very much to the contrary. The prior and on-going ACMD work by IITA in Africa added significant value to the SP-IPM global project on whiteflies and whitefly transmitted viruses (Annex 3) in many ways, e.g., existing NARS networks, IITA core research activities in East/Central Africa, funded special projects with trained national field staff. On Striga, the parasitic plant task force never got funded, but IITA went ahead and did much of the work with its own core scientist, in the spirit of the task force. Presently, the SP-IPM lead Centre for Striga/parasitic flowering plants is ICRISAT and not IITA. The only ongoing work on

Striga/parasitic flowering plants is limited to the SP-IPM pilot sites initiatives with ICIPE (Western Kenya), IITA, (Northern Nigeria) and ICRISAT (Mali and Burkina Faso) and ICARDA (Egypt and Morocco). The SP-IPM Coordinator plays a facilitation role in this initiative (which is not a task force). Furthermore, the only SP-IPM stem borer work is at the ICIPE pilot site. The reviewers erroneously equate the pilot sites initiative with the task force on parasitic flowering plants. The pilot sites were funded under a different mechanism specifically to promote the adoption of 'best bet IPM options' in cereal/legume intercrops with entry points Striga and/or stem borers, in Africa (Annex 4). The evolving pilot site initiative tries to pick up some good ideas from several sources to achieve stronger organizational partnerships, a more inter-disciplinary approach, including social sciences input, participatory methods and impact analysis. In fact, we believe that this pilot site initiative could be a better way forward for the SP-IPM than the existing task forces. We hope to expand/duplicate this concept around other pest problems and with other centres, collaborators and countries (see also response to recommendation 2). In fact, the stimulating interplay between core activities of the centres and their SP-IPM contributions and collaborative activities is the basis of SP-IPM.

d) The ICWG of the SP-IPM had recently had two opportunities to discuss management structure, but on both occasions the members did not express any strong desire to move the convening Centre from the CGIAR and for that matter from IITA. ICIPE had raised the need to rotate the Secretariat and offered to host the Secretariat, but the issue has received no echo from the general membership. A recent suggestion concerns the need to discuss programme management structure. This is more important in the event that the SP-IPM evolve into a Challenge programme. The ICWG will certainly re-visit the broader issue of SP-IPM management structure at its next annual general meeting in April 2002.

e) The key management issue relates largely to how closely the Programme Leader and Coordinating Secretary interact with each other and with the ICWG to promote activities by task forces, projects and special initiatives. The report indicates that the task of organizing and developing SP-IPM had been unevenly shared between the then Programme Leader and Coordinator/Secretary, with the latter taking on much of the duties. Our current description of a Coordinator is "a facilitator, advocate, consensus builder and day-to-day organizer", these elements of coordination focus mainly on people (building partnerships), things (provision of technical and material resources), processes (facilitation, programmatic issues) and money (budgeting and disbursement). The Programme Leader takes on the other roles of technical linkage with task forces to advise on scientific content, fund raising/donor relations and CGIAR relations. This is practically the "small team" advocated by the reviewers for the management of the virtual IPM Centre. In short, we think that the presently practised consultative interactions and sharing of roles between the Programme Leader and Coordinator and amongst partners is a better way forward for SP-IPM implementation than new structures, new locations etc.

f) The administrative position of the coordinator of the SP-IPM is the highest position possible in the organigram of the convening Centre, IITA, namely 'Project Coordinator'. The position is not 'deep within the hierarchy', this phrase, as stated in the report, gives an erroneous impression that the coordinator lacks the freedom to act. In terms of upgrading the programme, we agree with the reviewers that the coordinator's position be paid by CGIAR funds and not from the special donor contributions as obtains presently. We also advocate a professional reward system that fully recognizes valuable contribution of task force leaders/members/ scientists. Involving Centre DGs to formerly endorse institutional representatives on the SP-IPM could pave the way for appropriate reward systems (centre-specific) to the scientists.

Annex 1: Members of the Inter-Centre Working Group on IPM (* CGIAR Centre)

Asian Vegetable Research and Development Centre (AVRDC)

CABI Bioscience

Centro Internacional de Agricultura Tropical (CIAT)*

Centro Internacional de la Papa (CIP)*

Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT)*

FAO/World Bank Global IPM Facility

International Centre for Agricultural Research in the Dry Areas (ICARDA)*

International Centre for Research on Agroforestry (ICRAF)*

International Centre of Insect Physiology and Ecology (ICIPE)

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)*

International Institute of Tropical Agriculture (IITA)*

International Rice Research Institute (IRRI)*

International Service for National Agricultural Research (ISNAR)*

IPM Forum

Pesticide Action Network (PAN) representing NGOs

West Africa Rice Development Association (WARDA)*

Annex 2: The SP-IPM projects, task forces and special initiatives

Activity	Focal point	
	Institution	Contact person
1. Projects		
Whiteflies and whitefly transmitted viruses	CIAT	P.Anderson@cgiar.org
Farmer participatory research in IPM	CIAT	A.Braun@cgiar.org
2. Task forces		
Grain legume pests/thrips	ICRISAT	G.Ranga Rao@cgiar.org
Parasitic flowering plants	ICRISAT	D.Hess@cgiar.org
Soil biota	CIAT	A.Bellotti@cgiar.org
	ICARDA	K.Makkouk@cgiar.org
Beneficial micro organisms	IITA	A.Cherry@cgiar.org
Agro-Biodiversity	ICIPE	hherren@icipe.org
Impact assessment	CIP	A.Lagnaoui@cgiar.org
Quantifying losses & investment opportunities for IPM	CIMMYT	H.deGroot@cgiar.org
Biotechnology for IPM	IRRI	M.Cohen@cgiar.org
Farmer participatory research in IPM	CIP	E.vandeFliert@cgiar.org
3. Special initiatives		
Pilot sites initiatives for IPM learning/adoption	SP-IPM secretariat	B.James@cgiar.org

Annex 3: Sub-projects of the global project on whiteflies

Sub-project	Focal point	
	Institution	Contact person
<i>Trialeurodes vaporariorum</i> as a direct pest in the tropical highlands of Latin America	CIAT	C.Cardona@cgiar.org
<i>Bemisia tabaci</i> as a virus vector in mixed cropping systems of the Caribbean, Mexico and Central America	CIAT	F.Morales@cgiar.org
<i>Bemisia tabaci</i> as a virus vector in mixed cropping systems of Eastern and Southern Africa	ICIPE	Lisbeth@africaonline.co.ke
<i>Bemisia tabaci</i> as a virus vector in mixed cropping systems of S.E. Asia	AVRDC	p.hanson@cgnet.com
<i>Bemisia tabaci</i> as a virus vector in cassava and sweet potato in Sub-Saharan Africa	IITA	Jlegg@infocom.co.ug
Whiteflies as direct pests on cassava in South America	CIAT	A.Bellotti@cgiar.org
Project coordination	CIAT	P.Anderson@cgiar.org

Annex 4: The SP-IPM pilot sites initiative

Pilot site	Focal point	
	Institution	Contact person
East Africa: Mid-altitudes in Kenya	ICIPE	woverholt@icipe.org
North Africa: Irrigated ecologies in Egypt	ICARDA	K.Makkouk@cgiar.org
North Africa: Rain-fed ecologies in Morocco	ICARDA	K.Makkouk@cgiar.org
West Africa: Guinea savanna in Nigeria	IITA	A.Emechebe@cgiar.org
West Africa: Sahel in Mali and Burkina Faso	ICRISAT	O.Youm@cgiar.org
General facilitation	SP-IPM Secretariat (IITA)	B.James@cgiar.org

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Dr. Emil Q. Javier
Chair, Technical Advisory Committee
Consultative Group on International Agricultural Research
Institute of Plant Breeding
University of the Philippines at Los Banos
College, Laguna, 4031, Philippines

6 January 2002

Dear Dr. Javier,

On behalf of Professor Waibel and myself, I am pleased to submit to you the Report of System-wide Programme on Integrated Pest management (SP-IPM). The Panel reviewed, as requested, the research programme and management aspects of the programme making every effort to present an accurate account of the outputs, achievements and what is known about the impact of the programme.

IPM globally faces new challenge as it enters the biotechnology era in pest control, this without ever fully understanding fully the challenges of past technologies. The challenges for the CGIAR system are especially great if IPM is to flourish and take its proper role in the crop production research for developing countries and on the larger global scale. We have noted in this report the many strengths of the SP-IPM and its critical role in conducting research aimed at poverty alleviation, enhancing food security and sustaining the environment in developing areas around the world. The report also focuses on several areas that need strengthening, especially in the area of modern techniques of analysis, policy environment and the social science. Professor Waibel and I were of a common view that there are exciting opportunities for SP-IPM to exert leadership globally in IPM research and implementation – a role that it must vigorously pursue for the common good.

This review was, by all accounts, the most challenging assignment I have ever undertaken, but one that Professor Waibel and I feel is of utmost importance. I would like to take this opportunity to thank you for the opportunity to be of service in this arduous task and for providing the opportunity to work with Hermann Waibel - we worked exceedingly well together, with incredible energy and commitment and cemented a strong friendship. On behalf of Professor Waibel, I would like to express our sincere appreciation to the many CGIAR scientists whose enthusiasm lightened our burden and made us push through the many revisions – we sincerely hope this review strengthens their ability to do even more creative work. We apologise for going beyond our TORs, but it proved necessary to do justice to the future of IPM in the CGIAR.

We sincerely hope our report will be a useful instrument to CGIAR members, TAC and to the Centres.

Yours sincerely,

Andrew Paul Gutierrez, Chair
Herman Waibel

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

Interim SCIENCE COUNCIL

**REPORT OF THE
FIRST EXTERNAL REVIEW OF THE SYSTEMWIDE PROGRAMME ON
INTEGRATED PEST MANAGEMENT (SP-IPM)**

Panel: Andrew Paul Gutierrez (Chair)
Hermann Waibel

iSC SECRETARIAT
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
March 2002

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FOREWORD

This report deals with the evaluation of the Systemwide Programme on Integrated Pest Management (SP-IPM). This final version of the report has undergone a number of revisions for mainly three reasons. Foremost, earlier versions of the report led to misinterpretations by representatives of those agencies to which we saw important linkages with the SP-IPM and who interpreted our observations as an attack on the policies and procedures of their respective agency. Secondly, earlier versions of the report may have suffered from some repetitive statements and some lack of focus. Thirdly, we would like to submit that reviews of systemwide programmes are faced with a number of methodological challenges that are far from being solved. This particularly holds true for an overall encompassing programme like IPM which according to a recent review of the individual centres' IPM programmes exist at varying levels of sophistication and development in all the Centres⁴. This is probably why "CGIAR insiders" have repeatedly reminded us that our analysis overstepped the TORs given to us. The reason for that probably lies in the so far unmet challenge of how a comprehensive evaluation of a systemwide programme, in contrast to an individual centre programme, should be conducted. Based on the experience with this review and judging from the reactions to earlier versions of our report, we believe that the impact of a systemwide programme must be looked for not only in the participating Centres but also in those development organizations that deal with the very issues such a programme is trying to address. In the case of the SP-IPM it follows from one of its specific objectives: "...fostering public awareness of the advantages of IPM and a policy environment favourable to its wider implementation.."

It is clear that such objective can only be reached if SP-IPM goes beyond the boundaries of the Centres, because if otherwise, a global programme on IPM would simply be irrelevant.

There is also a need to say something about IPM up front: since IPM is so ubiquitous in the lexicon of government agencies, development organizations and chemical companies that there is a danger that its true meaning becomes blurred. If SP-IPM is to make an impact it must also be judged by its ability to foster that true meaning in the spirit of one of its earlier definitions:

"Integrated Pest Management (IPM) is ecologically based pest management that promotes the health of crops and animals and makes full use of natural and cultural control processes and methods, including host resistance and biological control. It uses chemical pesticides only where and when the above measures fail to keep pests below damaging levels. All interventions are need-based and are applied in ways that minimise undesirable side effects..."

The role of IPM in international agricultural development has become more complex with the emergence of modern biotechnology; in particular genetically modified (GM) crops. Most of the current GM crops in field trials and under commercial use are in the area of pest management. GM crops are widely touted as having an important role in fighting poverty and world hunger. For example, the outgoing Director General of the International

⁴ This also includes IFPRI and ISNAR who do have publications on IPM although they don't have IPM programs *per se*.

Food Policy Institute (IFPRI) and this years World Food Price winner, Per Pinstrup-Andersen, said in a recent interview with the respected German weekly DIE ZEIT⁵ upon the question, where he would see the major contribution of GM crops in food security: "... in providing small farmers with seeds resistant to specific pests!" While GM technology is at the centre of the debate on food security and poverty reduction, IPM in sharp contrast, hardly gets mentioned in this context, although many GM crops are nothing more but *a tool* in IPM. It is this incongruity that pops up in many of the CGIAR documents and those of other important development organizations that has prompted us to go beyond our TORs and ask a few simple but, as we believe, highly relevant questions. We are well aware that some may find such questions disturbing, especially at a time when "solidarity" among agricultural scientists is being widely demanded. We are nevertheless prepared to take the bureaucratic blows for this.

The report is build up in three parts. In part I, we set the scene for the SP- IPM. We look at major trends in pests with a world-wide dimension, results of studies of crop losses on the global level and overall trends in pesticide use and at the institutional and policy situation as it affects IPM. In part II we address the questions as formulated in the TORs. We do this to the best of our knowledge and under the constraint of a rather sparse data and in view of the relatively short period that SP-IPM has operated. Finally, in part III we purposely overstep our TORs and argue for a future structure of SP- IPM as a programme with a technical and a policy dimensions on the global level. We do it as an appeal of those who are seriously interested in a better connection between the science of IPM on the one hand and policy on the other. We apologise to those who feel offended by offering the old adage: "it is always easier to ask for forgiveness than for permission..."

Andrew Paul Gutierrez , Berkeley

Hermann Waibel, Hannover

5 January 2001

⁵ DIE ZEIT 45/2001: www.zeit.de/2001/45/wirtschaft/print_200145_kurzinterview.htx, 8 November 2001.

SUMMARY AND RECOMMENDATIONS

The systemwide Programme on Integrated Pest Management (SP-IPM) is one of the currently 15 systemwide initiatives of the CGIAR. The purpose of these systemwide programmes in general is to catalyse research, avoid duplication of efforts, enhance complementarities and reduce transaction costs of the overall research process in international agriculture. In this sense systemwide programmes are not simply an addition to the research programmes of the individual centres, but rather are designed to produce "added value" from well planned and targeted interactions among scientists across CGIAR Centres and their ARI and NARS partners. This also applies to the SP-IPM whose focus is on pest problems of large regional and/or global nature.

Relative to the other systemwide programmes, the SP-IPM is unique as IPM concepts and principles are already widely applied in the research and development activities of most International Agricultural Research Centres (IARC) regardless of their mandates. An impact assessment study of IPM in the CGIAR-Centres including AVRDC and ICIPE found that the benefits of IPM were well recognised within these centres and by the scientific community globally (CGIAR 2000). Also, pilot IPM programmes involving CGIAR Centres have shown remarkable economic benefits with the rate of return on investments in IPM being well in line with other investments in international agricultural research. The benefits of IPM are likely underestimated since, in addition to productivity enhancement and risk reducing effects, there are large non-market benefits in the area of human health and the environment. What then is the rationale of a systemwide programme on IPM? The answer is clearly that the constraints and challenges IPM faces on a regional and global scale cannot be met by individual researchers or by individual centres. To meet these challenges a co-ordinated effort is necessary to address two key issues: (1) the need to develop control strategies and tactics for pests (often man-induced) with a regional or global dimension; and (2) the need to create a policy environment that favours the adoption of IPM methods on a global scale.

As conclusions of its findings, the Panel offers five major recommendations:

- the Panel recommends that in view of the global challenges from pests and pest management issues there exists a strong need and a high relevance for SP-IPM in the future. In view of the changes that the CGIAR is currently undergoing, the Panel views advancements in the internal coherence of the CGIAR research portfolio as an important pre-condition for SP-IPM to perform its role effectively. The Panel recommends that in order to be successful in the future SP-IPM should go beyond its present focus of improving co-operation among centres and should widen its scope and take a more outward-looking approach in seeking international assistance and co-operation;
- the Panel recommends that SP-IPM should more thoroughly analyse its taskforces with regards to scope and extended problem definition in order to expand their potential global relevance. In order to carry out this task the Panel sees a strong need for an independent and strong global research network on IPM and recommends that the CGIAR make the SP-IPM a more visible part of its strategy for achieving its stated objectives;
- the Panel recommends that in order to make full use of relevant disciplinary expertise, SP-IPM should more seriously explore the complementarities among programmes including different systemwide programmes and relevant Centres not

included in the systemwide programme as well as outside research institutes be they advanced NARS or ARIs. To fully utilise recent advances in computer modelling and GIS that offer new potentials for the transfer of site-specific research results SP-IPM should adopt these concepts as unifying part of its major research strategies;

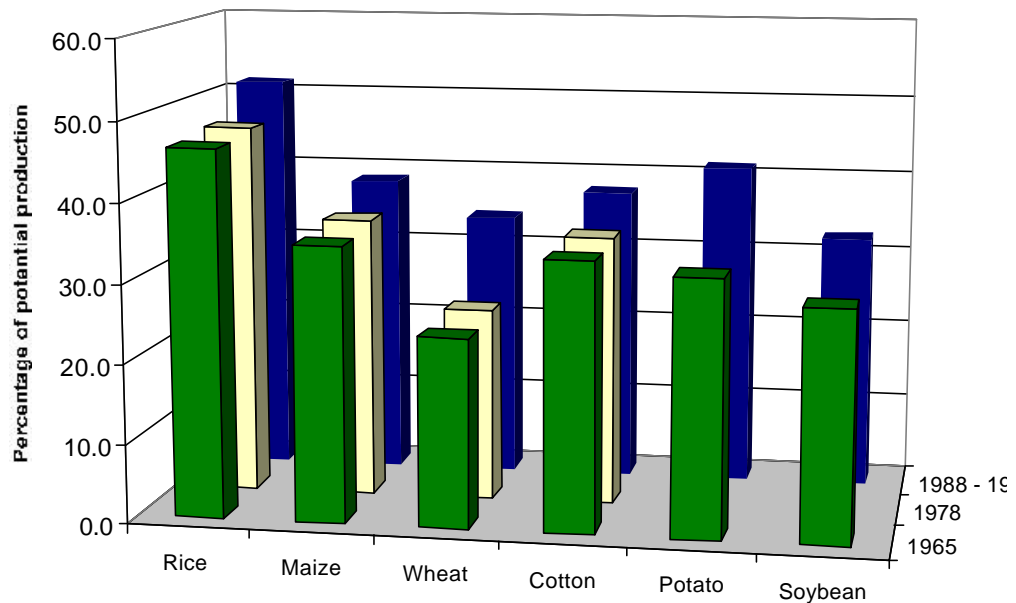
- the Panel recommends that socio-economic and policy research be added as a major component of SP-IPM. There are at least three broad themes that deserve to be given more attention if the SP-IPM wants to make relevant and significant contributions to international agricultural developments, namely (1) economically defined crop loss assessment, (2) policy research in response to national crop protection policies and international trade issues, i.e. IPM and globalisation and (3) impact assessment that incorporates natural resource management aspects into social science research; and
- the SP-IPM Review Panel recommends that the status of IPM be greatly elevated within the CGIAR and to be upgraded beyond the focus of the current systemwide programme. That SP-IPM in the future should be organized as a "virtual Centre" with minimal infrastructure but maximum linkages. The Panel views this as the best way to develop a global structure that has a fair chance to overcome the problem of rising crop losses from pests and the growing level of pesticide use world-wide. The co-ordinator position should serve as a liaison and "honest broker" between the centres and other IARCs, donors, development organizations and the GIPMF on IPM issues. The co-ordinator position should be at the level of a Centre Director. Funding for the SP-IPM programme co-ordinator position should come from CGIAR core funds. The Panel recommends to establish the virtual IPM Centre either directly under TAC/SC or alternatively with any other research organization of international status in IPM to be determined through an open bidding process and to be coupled contractually to the CGIAR.

CHAPTER 1 - CROP PROTECTION IN THE CONTEXT OF AGRICULTURAL DEVELOPMENT

1.1 The Global Crop Protection Situation

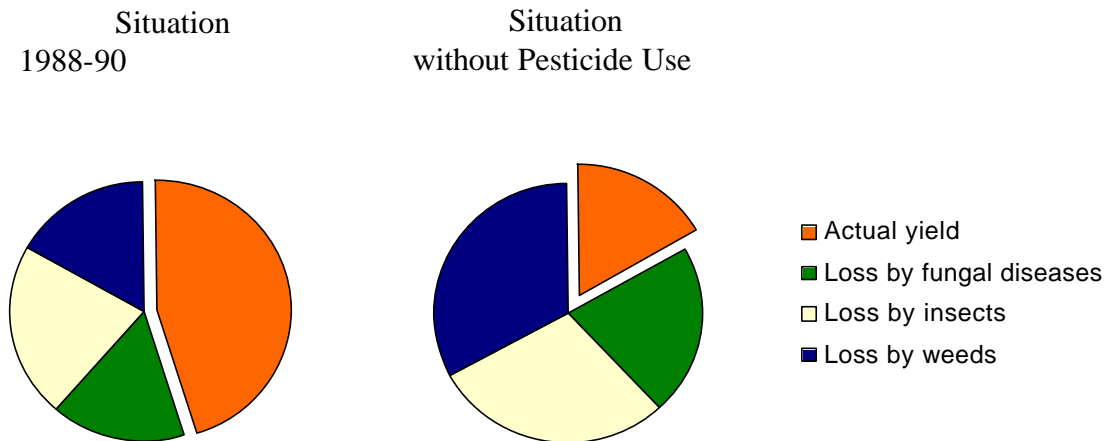
Pests are frequently mentioned as a major constraint to increased food production and higher agricultural productivity. On a global level pests were reported to take a significant part of the harvest. A comprehensive study by Oerke *et al.* (1994; 1999) analysing a huge volume of field trial data found that crop losses range from 25 to over 50% depending on the crop (Figure 1). While the productivity impacts of such high crop losses are significant, it is disturbing that over the past three to four decades, crop losses in all major crops have increased in relative terms. These data are widely cited also in CGIAR documents. For example, an IFPRI report on "Pest Management and Food Production" (Yudelman *et al.* 1998) reproduced these data and underlined the seriousness of pests as a major constraint to increase food production.

Figure 1: Development of crop losses in world crops from 1960 to 1990 in per cent



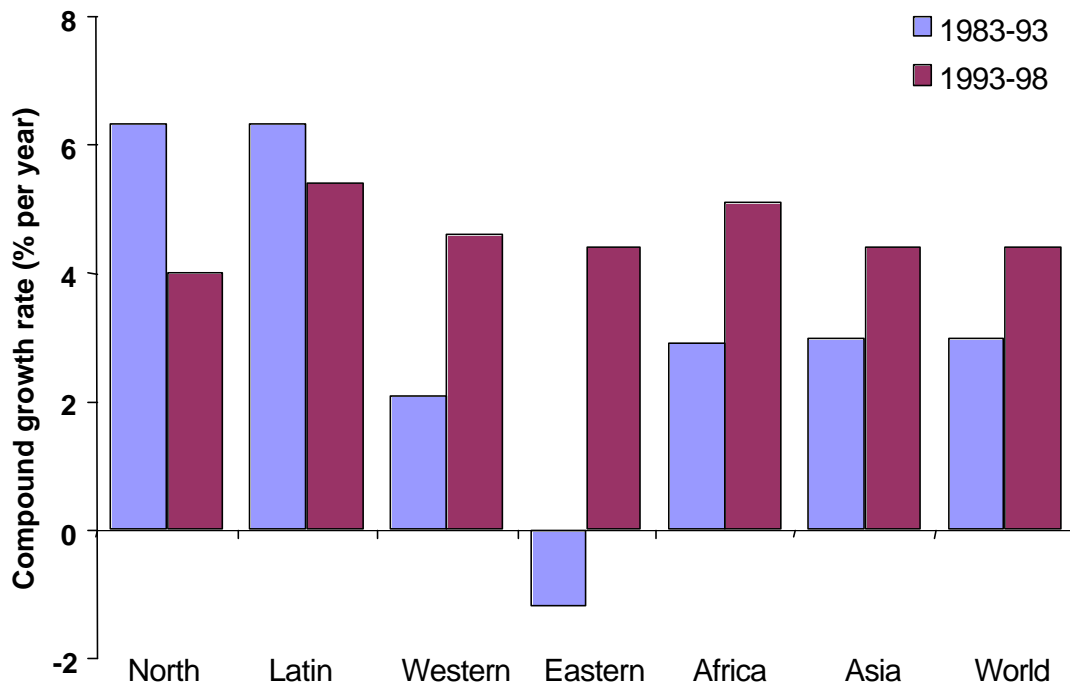
Source: based on Oerke *et al.* 1994.

To complement the analysis a closer look at the corresponding results for rice emphasises the serious implications of this situation. The amount of yield that is lost to pests, among which weeds are the major one, is more than the amount that can be saved by using pesticides. Figure 2 would suggest that on average overall effectiveness of pest control is only 33% and is lowest for insect pests.

Figure 2: Crop loss estimates in rice

Source: Oerke *et al.* 1994.

Interestingly, the increase in crop loss is accompanied by a growth in the rate of pesticides use (Figure 3). The average rate of increase in pesticide consumption world-wide during the period of 1993 to 1998 was in the order of 5% per year exceeding the earlier period, 1983 to 1993. In Latin America and Africa the growth rate of pesticides was above world average and came close to 6% per year (Figure 3).

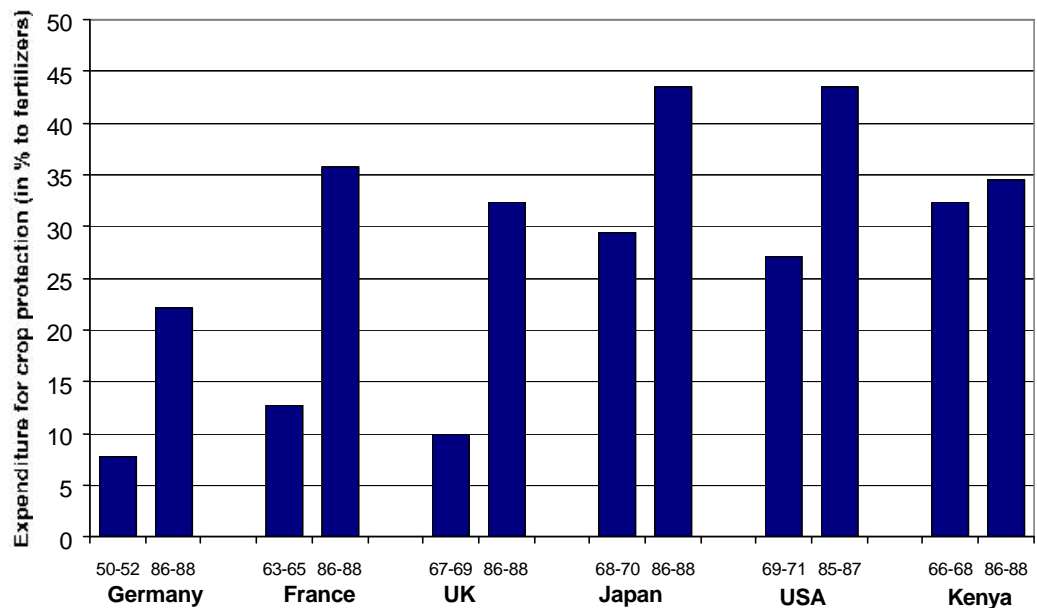
Figure 3: Growth of world pesticide consumption, 1983-98

Source: after Wood *et al.* 2000.

Another interesting observation was again provided by Oerke *et al.* (1994) and shown in Figure 4. The study compared the expenditures for fertiliser and those of pesticides and found that in selected developing and developed countries, pesticide expenditures increased faster than those for fertiliser.

While such a comparison leaves room for various kinds of interpretations it could be an indicator of a growing dependence on chemical pesticides, called the 'pesticide treadmill' by entomologists (e.g. van den Bosch 1976). After all, the increase in pesticides is hardly attributable to price effects, because output prices declined while pesticide prices generally did not. Also, the moderate rates in yield increase in the major world crops during recent years do not offer a strong case for such a high increase in pesticide use. This will still hold even when one takes into account the fair amount of change in the cropping systems of developing countries with an expansion of the fruits and vegetable sector. Despite of its relative strong increase these two groups of "pesticide-intensive" crops still only represent only around 10% of the total crop area (FAO 2000).

Figure 4: Pesticide expenditures relative to those of fertilizers



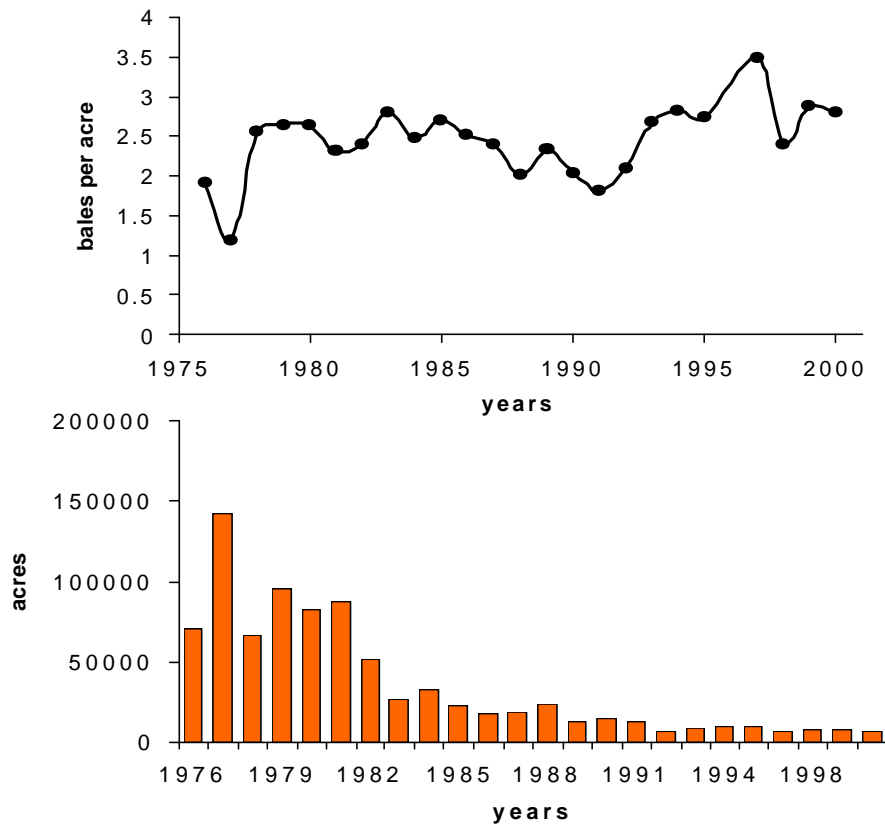
Source: Oerke *et al.* 1994.

Hence, as pointed out elsewhere (Yudelma *et al.* 1998; CGIAR 2000), in pest management, agricultural development is confronted with a paradox: "crop losses increase in relative terms alongside with the use of pesticides". If it is true, for example, that during the 1990s approximately 55% of rice yields were lost to pests (see Figure 2) despite the overall increased use of pesticides, then one wonders how effective such control has been. If, on the other hand, the existing published data are flawed, then it would be highly relevant and timely to determine the correct values for losses due to pests.

Five million tonnes of pesticide are applied annually in agriculture world-wide and there is ample evidence that pesticide use often aggravated rather than resolved pest problems

in many crops, e.g. increased whiteflies in many crops, bollworms in cotton and plant hoppers in rice, etc. All of these have been due to the disruption and destruction of natural enemies inducing pest resurgence, secondary pest outbreaks that often become more important than the original target pest(s) and pesticide resistance (van den Bosch 1978). As recent examples we cite both developing and developed economies. In India, outbreaks of pests include citrus black fly *Aleurocanthus woglumi* Ashby, cotton whitefly *Bemisia tabaci* (Gennadius), sugarcane *Pyrilla perpusilla* (Walker) and cotton bollworm *Helicoverpa armigera* (Hubner) (Singh 1999). Some of the pests such as rice leaf folder *Cnaphalocrocis medinalis* (Guenee), green leafhopper *Nephotettix spp.*, white backed plant hopper *Sogatella furcifera* (Horvath) in rice ecosystem and old world boll worm *Helicoverpa armigera* (Hubner) in cotton once had little economic importance but have now become serious pests where pesticides are used indiscriminately. Such use of pesticides has resulted in development of resistance to many pesticides in *H. armigera*, *Nilaparvata lugens* (Stal.), *Plutella xylostella* (Linn.), *Liriomyza trifolii* (Burgess), etc.

In cotton in the Imperial Valley of California cotton, pesticide use for control of pink bollworm (*Pectinophora gossypiella* Saunders) resulted in secondary pest outbreaks of bollworms (*H. zea*), budworms (*H. virescens* (F)) and whiteflies with the development of pesticide resistance in budworm leading to the collapse of the industry (Figure 5, Imperial County yield records). Induced pest levels caused declines in cotton yields and lint quality. Only the implementation of IPM strategies based on short season cotton in 1989 for pink bollworm control restored yields to prior levels and lint quality doubled - all with scant pesticide use. However, in 1999 transgenic Bt cotton was introduced adding considerable latent complexity to the system. Resistance to the Bt toxin is an acute problem and several target pests have different levels of tolerance or resistance and in addition the most important predators were adversely affected by feeding on Bt toxin laden prey. Results of system analysis of this problem incorporating the complexity of the ecological relationships and the genetics of resistance build up in pink bollworm, bollworm and defoliators such as *S. exigua* suggests that the technology was introduced without first demonstrating need for it (Gutierrez and Ponsard, submitted, Gutierrez *et al.* in prep.). In the South-eastern USA, variable control of *H. zea* and defoliators such as *S. fugiperda*, *S. exigua*, soybean looper (*Psuedoplusia includens* (Walker)) is being experienced in Bt cotton (Luttrell *et al.* 1999) and increasingly insecticides are being used to control *H. zea*, especially after flowering (Mahaffey *et al.* 1995) and when insecticide disruption of natural enemies has occurred (Lambert *et al.* 1996; Turnipseed and Sullivan 1999).

Figure 5: Acres and yields of cotton in the Imperial County, California 1976-2000

Source: Imperial County Agricultural Commissioner Reports 1976-2000.

These examples are merely hints of the complexity of such pest problems world-wide that will only be exacerbated as intensification of agriculture occurs in developing areas in the absence of sound policies for IPM.

The implications of this situation with regards to pests and pest control are well recognised by CGIAR researchers (Wood *et al.* 2000): “If such [crop loss] estimates are even broadly correct, the negative impacts of reduced pest control effectiveness on farmer income and consumer prices would be extremely significant”. Questions of these kinds have been answered by economists looking at pesticide use reduction scenarios in the US and in Europe. They used models that relied on expert judgements on crop loss to model the elasticity of supply in the context of Computable General Equilibrium models (e.g. Knutson *et al.* 1990; Schmitz und Hartmann 1993; Schmitz und Brockmeier 2001; Fransen *et al.* 2001) and a Trade and Environment Policy Simulation (TEPSIM) model (e.g. Hartmann 1993). In principle, these studies support the hypothesis of Wood *et al.* (2000) that a crop loss of 30 to 50% would have dramatic effects on outputs and prices.

In conclusion, the global situation on pest problems and the relative effectiveness of the methods used to control them strongly suggests that unilateral control strategies such as chemical pesticides are unlikely to provide sustainable solutions to pest problems. Such observations also provide a warning to those who put much hope on single biotechnology approaches. Therefore, the global situation with pests and the methods used to control them as evidenced in the literature as well as through casual observations in farmers' fields around the world, underlines the need to develop and implement IPM on the broadest possible level.

1.2 The Institutional Environment

A comprehensive overview of the global crop protection situation and of IPM needs to take into account the institutional environment that more often than not pre-condition pest problems and the choice of control methods. Therefore, to a large extent, these define the issues SP-IPM needs to deal with if it is to make a significant contribution to the solution of global crop protection problems.

Taking the standpoint of the CGIAR, we define institutional environment as "the rules, procedures and policies of those organizations that directly or indirectly influence the work of CGIAR Centres in the field of IPM". This includes all major development organizations that make decisions that indirectly affect the choice of pest control methods and the status of pests on a global level. Naturally, these are many but a few major ones need to be mentioned, e.g. the World Bank, the FAO, important bilateral donors such as USAID and DFID but also NGOs such as CARE and of course the chemical industry.

In a previous review of IPM in the CGIAR Centres, the opinion of these clients and partners of the CGIAR as regards the Centres' IPM efforts has been compiled through a questionnaire and extensive telephone interviews (CGIAR 2000). It was found that representatives of these organizations vary greatly in their assessments and expectations but generally, it can be said that the need for a co-ordinated and integrated approach to global pest problems was highly acknowledged. Therefore, it is useful to look briefly at some of the "major actors" and examine existing evidence as regards those IPM-related activities which we believe are of global relevance. At the risk of being accused of a selectivity bias, we include the FAO, the Chemical Industry and the World Bank, in the analysis of institutional environment relevant to global IPM.

The Global IPM Facility (GIPMF): The Global IPM Facility at FAO is multi-donor institution with the co-sponsorship of FAO, The World Bank, UNDP and UNEP. GIPMF has emerged out IPM field projects in Asia. Central to its approach to IPM implementation in pilot projects is to promote a farmer-centred method for the management of pests, called Farmer Field School (FFS). This model has become widely adopted by development projects not only in Asia but also increasingly in Latin America and Africa. FFS relies on a season-long experiential field training approach. This has implications for its costs relative to less intensive extension methods. Therefore, the approach has been questioned in the extension literature (Quizon *et al.* 2001). In fact, during the course of the review the Manager of Rural Development Research at the World Bank stated "the use of FFS for promoting IPM has a high risk being fiscally unsustainable if applied at the national level"⁶.

The question of how to reach as many farmers as possible in the shortest possible time has prompted IPM researchers to look for alternative means of getting IPM concepts to the farmers (e.g. Heong *et al.* 1998). Hence, while there is increasing agreement that in order to make IPM to become Farmer's Practice requires a participatory approach, much debate has been generated as regards the most cost-effective strategy for up-scaling. This has become a research question with a global dimension and therefore is of relevance for SP-IPM.

⁶ G. Feder, Manager Rural Development Research, personal communication, 21 February 2001.

Based on the recommendations of its mid-term review (Jiggins 2001) the GIPMF in the future is urged to play a larger policy role. For example, the mid-term review recommended that GIPMF adopt as a strategic objective the assessment of a world-wide tax on pesticide companies. This, in principle, could be a question with significant weight in international agricultural research in the context of a systemwide programme on IPM.

The Chemical Industry: The chemical industry has undergone radical changes during the past decade. There had been a series of mergers among companies leaving only a few remaining who still engage in research and development. The new so-called "life science companies" have readily embraced the rhetoric of IPM as this provides them with a leverage to advertise a complementary rather than an antagonistic role in the discussion on sustainable agriculture (e.g. Vorley and Keeney 1998). An example is the industry-initiated safe pesticide use campaigns where industry has been found to make inaccurate claims concerning the impact of these efforts (Murray and Taylor 2000).

In response to tightening regulatory requirements companies try to produce formulations that avoid the toxic side-effects of the older generation of pesticides. Nevertheless, large chemical companies not only exercise influence on agricultural policy in developed and in developing countries that favours the market potential of their products, but also play a pivotal role in shaping the research and information environment (Tombs 1993). As a consequence, the regard given to alternatives to "commercial solutions" to pest problems diminishes. Those groups who benefit from chemical pesticides (or lately from biotechnology) products in pest control tend to monopolise information, influence research and extension and thus generate a disincentive for the development of more localised non-chemical/non-GMO solutions.

However, it is important to point out that it is not only the big multinationals that are important players in pesticide policy but also the many new companies in developing countries who produce generics (Oudejans 1999). The producers of generics, have become an additional driving force in influencing agricultural policy in developing country because exporting pesticides becomes an argument e.g. against banning old chemical compounds. This applies in a similar way to the upcoming biotech industry, for example, in China.

Rising sales of generic pesticides, especially in countries in Africa and Latin America but also in some Asian countries, is often facilitated by weak regulatory control and the lack of an IPM oriented national policy framework. Liberalization of input markets, often labelled as successful market reform - as in the case of the pesticide market in Pakistan (World Bank 1997) - can lead to inefficient pesticide use and high external costs (Ahmad 2001).

One of the other negative economic consequences of a higher use of pesticides in developing countries is the loss of export opportunities for developing countries especially with horticultural crops as the OECD countries are tightening Maximum Residue Levels (MRLs). In turn, agricultural lobbyists in industrialised nations may exploit this situation and use environmental standards as non-tariff trade barriers.

Overall, the chemical (or life science) industry in both developed and developing countries are a factor but not a force in promoting global IPM. Since their objective is to sell pesticides and/or biotechnology products, IPM serves as a vehicle for reaching a 'greener image'. This is not to say that the pesticide industry should be put on the "hit list" of IPM stakeholders. On the contrary, the private sector is an important participant in the dialogue on

global pest management, but clearly, it will not be at the forefront when it comes to reducing excessive use of pesticide (or biotechnology) products. Unless private companies opt to sell, for example, “pest insurances” or entire crop management packages, IPM for them remains a non-marketable product whose rationale is to facilitate sales.

In conclusion, the latest developments in the private sector are likely to contribute to a policy environment that hampers the wide-spread adoption of IPM in developing countries. In this regard, SP-IPM, therefore, is faced with a rather sensitive but nevertheless important policy issue.

The World Bank and IPM: The World Bank is not only a major donor to the CGIAR system, it is also a major player in agricultural development with a mission to foster socio-economic development. This includes advice to developing country governments on agricultural policy matters. Hence, the Bank can play an important role in helping to create a policy environment conducive for IPM. The Bank funded a large-scale farmer training programme in Indonesia from 1993 to 1999 and produced a 1993 study "Pesticide Policies in Developing Countries: do they encourage excessive pesticide use?" The study found that an "important reason why IPM is not widely in practise in developing countries is that the current economic environment and government policies related to pesticides and to pest management in general, induce an excessive chemical pesticide use" (Farah 1993). Further World Bank documents on IPM (e.g. Schillhorn van Veen *et al.* 1997) highlight the importance of changing policy priorities, reversing the “pro-synthetic-chemicals” bias in crop protection and promoting a conducive environment for IPM. However, there is little current evidence to shows that IPM in the Bank is "high on the agenda" and is being implemented as part of a pro-active policy approach. For example, it is not clear what role the Bank’s new Rural Development Strategy places on IPM although it does get mentioned in the strategy document⁷. Is it treated as a technical matter, or following article 14 of the AGENDA 21, as a decisive component of a strategy to sustainable natural resource management in agriculture?

On the other hand, the Bank also mentions IPM in its Operational Policy 4.09 that requires all of its agricultural projects to "reduce reliance on pesticides and promote farmer-driven, ecologically based integrated pest management". However, outside reviewers evaluating the degree of implementation of Bank's pest management policies observed unsatisfactory performance in the implementation of the Bank's policy on IPM. For example, a review of project documents by the Pesticide Action Network North America (PANNA) found that only a few mentioned IPM (Tozun 2001). In project descriptions, the word “pesticides” was avoided and replaced by “agricultural inputs” or “agrochemicals”. In Sub Saharan Africa during 1997 and 2000, the Bank approved 24 agricultural projects, but the PANNA review found that: “Many of these projects focused on increasing farmer’s access to agrochemicals and nearly all sought to intensify productivity without acknowledging the potential for increasing pesticide use. Over 70% of these projects failed to mention IPM....” (Tozun 2001). Furthermore, the Mid-term review of the Global IPM Facility, an institution co-sponsored by the Bank confirmed the observation of "poor compliance of the Bank with its own pest management policy" (Jiggins 2001)⁸.

⁷ Email information provided by Jock Anderson, senior policy advisor, RDV, 16 November 2001.

⁸ In the mid-term review report, it is stated that the World Bank has actively opened the door to pesticide companies but no further evidence was provided for this claim.

Of course, one must be careful in judging projects based on "titles" and "labels", e.g. not everything that is labelled as IPM really is. The opposite can also be true, i.e. extension projects may follow IPM principles without this being mentioned in the project documents. In fact, Bank staff⁹ pointed to a number of research projects in Latin American (e.g. Ecuador, Colombia, Venezuela and others) that are explicitly focused on IPM, biological control or organic agriculture.

While it is not the purpose of this Panel to make judgements on the World Bank's agricultural sector policies, it is nevertheless important for a description of the SP-IPM's institutional environment to observe that evidence on the Bank's positive role in global IPM has not been well documented. In addition, organizations that also promote IPM view the Bank's role rather critically and this does not foster an enabling environment for the world-wide promotion of IPM.

In summary, the institutional environment for IPM on the global level has become more complex. Among other consequences this complexity raises are a number of policy research questions which, in addition to the agro-ecological trends mentioned in Chapter 1.1, pose a challenge to a systemwide programme on IPM.

There are at least two major questions. Firstly, the trend towards market liberalisation in the absence of specific policy frameworks has not always been supportive to IPM. For the pesticide market, liberalisation without effective regulations and adequate market-based incentives may lower the costs of supplying pesticides, but at the same time can increase the tendency for ineffective, inefficient and non-sustainable crop protection. Hence, the question of how an effective and efficient policy framework suitable to facilitate the sustainable management of pests could be designed poses a challenge for international agricultural research related to IPM.

Secondly, the question of cost-effective extension approaches to bring IPM to millions of farmers has been subject to controversial debates. These discussions were not always carried out on scientific grounds and sometimes were used as a vehicle of a controversy among different stakeholder for their different views on development. While different views for achieving development is neither new nor necessarily unproductive, there is a danger that in the case of IPM the situation can be exploited by pesticide companies that use IPM as a marketing instrument to maximise sales of their chemical pesticides and perhaps, in future, biotechnology products. Leaving such "internal conflicts" unresolved will be at the expense of farmers in developing countries and also consumers and the environment at large.

For a systemwide programme on IPM to make a significant contribution, the policy and institutional environment of global crop protection cannot be ignored.

⁹ Email information provided by D. Byerlee, senior research advisor, RDV, 15 October 2001.

1.3 IPM in the CGIAR

In this section a short review on the status of IPM within the CGIAR is given. This is necessary as part of the framing conditions within which SP-IPM has operated in the past, could face in the future and hence influence the impact one can expect from a systemwide programme.

In its mid-term 2000 meeting, the CGIAR adopted a new statement of its vision, goal and mission: Its vision is “a food secure world”, its goal to “reduce poverty, hunger and malnutrition by sustainably increasing the productivity of resources in agriculture, forestry and fisheries” and its mission is “to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities” (CGIAR 2001). Based on several overall reviews of the system and in accordance with discussions held by the “Change Design and Management Team” of the CGIAR, there is broad general consensus that the system need to move away from fragmented research efforts and needs to adopt a programmatic approach that facilitate focused efforts on large multi-institutional research programmes in addition to regular centre programmes. These new challenges faced by the CGIAR must be seen in the context of the recent discussion of Global Public Good (Sachs 2000; Kaul *et al.* 1999). While it has been argued that the CGIAR is in many ways a prime example of an International Public Goods provider, the CGIAR has not always acted in ways that suggests it is fully aware of this role. This may have occurred because its role as a public organization has forced it to respond to emerging needs and to the views of donors and advisors (Dalrymple 2001).

The total CGIAR investment in agricultural research world-wide is only between 0.4% (Anderson 1997)¹⁰ and 3% (Pardey 2001) of all public investment in agriculture. The scarcity of agricultural research funds within the CGIAR influences the priority given to investments in IPM relative to say, investments in genetic improvement. In this regard, private sector investments in the area of crop genetic improvement increasingly play an important role. There is an incentive for the CGIAR to capitalise on such private sector efforts because the benefits are demonstrable and occur in the short-term once the improved varieties are in the field where their impact can be easily shown in yield trials. A comprehensive impact study by Evenson and Gollin (2001) has demonstrated the tremendous benefits from genetic improvement activities of the CGIAR Centres and the NARS.

This may be different for IPM. First of all, some of IPM’s benefits accrue not only to farmers but also to other groups of the society. For farmers, very often the main benefit of IPM is the avoidance of uneconomical pesticide use. However, a large part of the benefits are reduction of externalities and therefore occur to other groups. This poses considerable measurement and valuation problems.¹¹

¹⁰ Email communication, October 2001.

¹¹ Paradoxically, in this regard, IPM is quite similar to modern biotechnology that is often promoted because of its potential to reduce chemical pesticides. Surprisingly, however, impacts of biotechnology are often simply assumed rather than proven.

Furthermore, as a research output, IPM is a “software” product unlike pesticides or seed that can be labelled as “hardware”. In theory, in addition to its positive environmental and human health effects resulting from chemical pesticide reduction, IPM practices can also help maintain the yield potential of genetically improved crops.

So far, the impact of IPM has been only demonstrated in pilot projects but not in large-scale programmes (CGIAR 2000).¹² Although pests in a broad sense fit very well into the notion of a public bad and therefore in theory should be high on the CGIAR's agenda, it is rarely mentioned in strategy papers on food security, poverty reduction and natural resource management. A possible reason for this could be that the realisation of benefits from IPM depends on a number of conditions beyond the control of research organizations. Complicating matters further is the well-demonstrated phenomena of man-induced pests as a result of misguided previous crop interventions. This means that in some cases CGIAR technologies may have been the problem rather than the solution. For example, pesticide problems were reported in early Green Revolution technologies in rice (Maredia and Pingali 2001).

As demonstrated in earlier studies (CGIAR 2000), almost all the centres have programmes on IPM, but rarely does IPM get mentioned in CGIAR policy level documents. Hence, there appears to be an implicit "under-rating" of IPM in the CGIAR's system that ultimately must generate internal demand for a systemwide programme on IPM.

1.4 Summary of the Pre-conditions for SP-IPM

In the first part of this report an attempt was made to present the larger picture of global crop protection. This "pre-view", although brief and incomplete, is believed necessary for a comprehensive evaluation of a programme like SP-IPM in the context of existing global challenges. An analysis of the framing conditions allows a better assessment of the results that can be expected from SP-IPM. It also provides some insight as to whether the programme's objectives formulated at the outset were realistic.

The aim of these introductory observations also was to show that in many ways IPM is different from some of the other systemwide programmes, most of all because of IPM's ubiquity in the CGIAR Centres. Because of this, a systemwide programme on IPM runs a high danger of becoming caught between "a rock and a hard-place", i.e. on the one extreme it may simply duplicate already on-going efforts while on the other it may be overwhelmed by the sheer dimension of a global challenge.

In summary, the challenges facing SP-IPM are the following:

- The paradox of the apparent concomitant increase in crop losses and of pesticide use in major world crops and the emergence of pests with a global dimension;
- The widespread disagreement among various actors in agricultural development as to what the role of IPM should be;
- The developments in the private sector "crop protection-technology-supply-industry" and the possible dominance of universal biotechnology solutions in the

¹² One of the exceptions is the project on biological control of the cassava mealy bug (Zeddies *et al.* 2001).

near future that are driven by private interests. This may lead to a repetition of the errors that were made with chemical pesticides;

- The unfavourable policy environment on national level that hampers rather than augments the widespread diffusion of IPM among farmers;
- The largely unresolved question of how participatory approaches in IPM implementation can be scaled up; and
- The difficulty in demonstrating the true benefits of IPM and to draw its links to higher-level problems such as food security and poverty reduction.

In the following chapter we pursue our evaluation of SP-IPM according to the TORs given us. We will then revisit the situation analysis in our conclusions presented in the last chapter.

CHAPTER 2 - ASSESSMENT OF THE SP-IPM ACCORDING TO TERMS OF REFERENCES (TOR) GIVEN TO THE PANEL

Here an attempt is made to assess goal, achievements and performance of SP-IPM according to the Terms of References given by TAC. A strong word of caution is necessary at the outset. First, many of the projects are regional and only some are truly global in nature. Second, data were sparse on the performance of most of the SP-IPM projects introducing considerable uncertainty and difficulty in reaching concrete conclusions concerning the success of specific activities of the programme. Nevertheless, we believed that we were able to reach consensus on the overall contribution of SP-IPM in terms of the process, i.e. whether or not the programme in its present form is likely to make a difference for (a) reducing transaction costs of inter-centre collaboration and (b) the extent to which it contributes to the solution of the global problems in crop protection as outlined in Chapter 1 of this report.

2.1 Assess the Relevance of the SP-IPM's Objectives, Priorities and Strategies to the Goals of the CGIAR, Including Evaluating the Mechanisms Used for Setting Priorities (TOR 1)

As stated in several of the CGIAR documents (e.g. SP-IPM Annual Reports) the objectives, priorities and strategies of the Systemwide Programme on Integrated Pest Management are at the vital centre of the mission of the Consultative Group for International Agricultural Research (CGIAR). The mission of the CGIAR was stated in the Summary. In pursuance of this mission and in full accord with the articles of UNCED Agenda 21 and the Convention on Biological Diversity, the International Agricultural Research Centres (IARCs that here includes the CGIAR Centres plus AVRDC and ICIPE), IPM as a system is recognized as contributing to productivity, prosperity and human well-being in an environmentally sound and equitable manner and that IPM has a key role to play in sustainable agricultural development. The IARCs therefore affirm that IPM is the preferred plant and animal health protection strategy and that, through their research and related activities, they will promote the adoption of IPM by farmers.

The following guiding principles for IPM were adopted by the IARCs (TAC 2001):

- IPM research is inter-disciplinary and pursues a holistic approach to management of agricultural and natural ecosystems;
- IPM maintains and utilises biodiversity as the natural foundation for pest management in the context of sustainable agricultural development;
- IPM development is guided by farmer participation, from problem diagnosis through component research to on-farm validation;
- IPM adoption depends on the ability of farmers to make informed decisions based on an understanding of ecological and economic principles. Farmer empowerment is achieved through participatory research and training methods that encourage the integration of traditional and 'science-based' knowledge; and
- success in implementing IPM is contingent on a favourable public policy environment.

As a strategy to promote IPM the IARCs have adopted the following:

- the IARCs will further develop their existing comparative advantages in researching pest problems, developing IPM components, implementing pilot projects and assessing impact;
- the IARCs will maintain and expand their effective partnerships with NARS, NGOs and other appropriate national, international and bilateral organizations to promote IPM research and implementation;
- in full-scale IPM implementation, the IARCs will play a supporting role to organizations such as national extension services, NGOs and IGOs;
- the IARCs will promote more effective communication between farmers, extensionists and researchers to ensure that research efforts are clearly focused on farmers' needs and provide direct support to implementation efforts;
- the IARCs will engage in direct dialogue with policy makers and provide information to the general public to raise awareness of the benefits of IPM and promote a policy environment more favourable for IPM implementation;
- the IARCs will collaborate with the private sector in developing bio-pesticides, semio-chemicals, drugs and other products that can be used in an economically sound and environmentally responsible way within an IPM framework; and
- the IARCs will explore the full potential of biotechnological tools (including tissue culture, marker-assisted selection, diagnostic tools and gene transfer) in developing IPM tactics. Genetically - engineered products will be evaluated for their non-target effects before deployment within an IPM framework appropriate to the biophysical and socio-economic environment.

The Systemwide Programme (SP) on IPM was created to ensure that "IPM principles guide all pest control efforts within the CGIAR System" and that IARCs should "strongly support research leading to its wider application". SP-IPM has defined Integrated Pest Management (IPM) as:

"an approach to enhancing crop and livestock production, based on an understanding of ecological principles, that empowers farmers to promote the health of crops and animals within a well-balanced agro-ecosystem, making full use of available technologies, especially host resistance, biological control and cultural control methods. Chemical pesticides are used only when the above measures fail to keep pests below acceptable levels and when assessment of associated risks and benefits (considering effects on human and environmental health, as well as profitability) indicates that the benefits of their use outweigh the costs. All interventions are need-based and are applied in ways that minimise undesirable side-effects."

Guided by the principles set out above, SP-IPM seeks to achieve synergies and greater impact in IPM research and implementation and to ensure that these activities are fully responsive to the needs of IPM practitioners. Its specific objectives were formulated as follows:¹³

- strengthen inter-centre collaboration;
- enhance communication and co-operation between IARCs and partners;
- provide a collective voice and focus on IPM issues;
- identify IPM opportunities and develop joint projects;
- support IPM implementation through research and training; and
- promote public awareness of CGIAR Centre IPM activities.

In pursuing these objectives it was envisioned that the SP-IPM would help to ensure greater impact of CGIAR IPM activities at the farm level by (a) encouraging farmer participation and the formation of effective collaboration with organizations primarily concerned with IPM implementation; and (b) focus attention of IPM activities on sustainability and human well-being.

The Panel fully endorses the relevance of the principles adopted by the IARCs in promoting IPM in relation to the global problems of crop protection as elaborated in the Summary. The Panel also endorses the definition of IPM adopted by SP-IPM and recognises the relevance of its specific objectives. The global challenge that emanate from pest problems and from the failure of past unilateral approaches to pest control with an over reliance on chemical pesticides demands co-ordination among the IARCs (and beyond) if IPM methods are to be widely adopted by farmers around the world. To promote public awareness of IPM in the CGIAR and to provide a collective voice as well as to enhance and strengthen collaboration and co-ordination among stakeholders, sound policy on IPM is a necessary, albeit not a sufficient pre-condition, to achieve significant improvement of the global crop protection situation.

In reviewing the wording and logic of SP-IPM's specific objectives, the Panel notes that they only partially reflect the priorities as laid out in the guiding principles and in the strategies adopted by the IARCs on IPM. For example, while it is recognised that success in implementing IPM is "contingent on a favourable public policy environment" and that the IARCs "engage in direct dialogue with policy makers and provide information to the general public to raise awareness of the benefits of IPM and promote a policy environment more favourable to IPM implementation", this is not clearly mentioned as one of SP-IPM's objectives. The Panel feels the SP-IPM approach is warranted for pest problems that are truly global in nature (e.g. whitefly/gemini viruses) and would be especially useful in the field of policy dialogue on IPM. Systemwide co-ordination is necessary if such dialogue is going to have impact and achieves the high level recognition required for a wide spread adoption of IPM.

The Panel was unable to identify a formal mechanism for setting priorities. SP-IPM's main mode of operation was through the organization of taskforces and subprojects for pest problems that were biologically diverse and often covered wide disparate geographic areas. Priority setting was developed though discussion at taskforce workshops, but the research and implementation priorities often appeared to be largely driven by funding opportunities. This

¹³ SP-IPM Annual Report 1998/99.

makes comparison of taskforce research and implementation areas difficult and qualitative at best. In general, however, the Panel observed collegiality and co-operation among collaborators at all levels and found a sincere desire to achieve SP-IPM group objectives. This has improved communication among IARCs and their partners and has strengthened inter-centre co-operation and hence the capacity of SP-IPM to meet its objective. Allied to this is that some progress was made in marshalling additional resources across centres to help achieve systemwide objectives, resources that in the past may not have been available.

The Panel notes that the individual taskforces seem to operate well, but the development of a truly holistic approach to solving pest problems on the global level is in its infancy. For example, the working group meeting on impact assessment in Nairobi 2001 showed that only minimal input from economists and that little discussion on the methodologies for impact assessment had occurred. Such inputs are crucial because of IPM's considerable informational contributions to the impact assessment debate and because of IPM's importance in natural resource management and community-based actions. For example, a mostly descriptive "soft-science" case study approach to impact assessment was adopted by the SP/IPM-Parasitic Plant Management project in its pilot sites work (see below). The study design did not foresee the "double delta principle" making it difficult to perform standard econometric analysis of IPM impact assessment (e.g. Fernandez-Cernejo 1997). This example suggests that SP-IPM priorities tended to be on operating taskforces that addressed specific pest problems, while the larger methodological questions have only recently been moved up on the agenda.

The Panel also suggests that SP-IPM actively engage in the establishment and strengthening of IPM policy dialogue within the CGIAR and beyond. To achieve this, SP-IPM is encouraged to strengthen its links within the CGIAR, especially with IFPRI and ISNAR and to develop intensive exchanges of ideas with "outside" institutions such as the Global IPM Facility (GIPMF) and development organizations such as especially the World Bank. These links are of utmost importance to the successful development of IPM's potential within the CGIAR and beyond. This will require more than an efficient paradigm for IPM research and implementation. Success will depend, as recognised in the overall IPM strategy adopted by the IARCs, on a favourable policy environment.

2.2 Assess the Effectiveness and Efficiency of the SP-IPM (TOR 2)

Achieving coherence in pest management related research across the CGIAR System and other stakeholders, especially NARs and NGOs;

- stimulating new directions in research which contribute to the System's overall IPM research agenda;
- adding value to the System's ongoing research, to the benefit of knowledge relevant to IPM, agriculture and ecosystem sustainability and human well-being¹⁴; and
- part of the question raised in TOR 2.2 was dealt with under Section 1.1. Here we review this TOR as it relates to the taskforces and projects of SP-IPM and more generally for SP-IPM.

¹⁴ In particular, see the guidelines endorsed for promoting IPM development and implementation as elaborated in the revised CGIAR Policy Statement on IPM.

The Panel notes that the very nature of SP-IPM was a novel undertaking within the CGIAR and world-wide for that matter. There is evidence that SP-IPM was instrumental in soliciting funds that stimulated innovative and problem-oriented research of global relevance. Twelve taskforce working-groups were proposed and some developed proposals¹⁵ that were submitted to donors for funding. The taskforce on whiteflies and gemini viruses in the tropics (SP/WF-IPM) began in 1997, while the taskforce on parasitic flowering plants management (SP/PPM-IPM) was funded at the end of 1999 as a \$300,000 grant from CGIAR central funds used for year-2000 IPM implementation activities. Switzerland funded a third taskforce on Farmer Participatory Methods. Some taskforces that did not get funding pursued limited objectives using extant resources and only a brief review is given of their current status. Appendix V summarises the most recent information on funding.

The subject areas and research entry points of the funded taskforces were quite different, with some viewed as "more of the same" while others show potential to upgrade the research programmes of the IARCs. One taskforce that fits into the latter category is the "whitefly taskforce" (SP/WF-IPM). It is global in dimension and initially emphasised pure research. The "parasitic plant management taskforce" (SP/PPM-IPM) was regional and sought immediate implementation of well-studied best-bet IPM options in farmer fields (against several pests) using FPR methods.

Table 1: The original taskforce working groups organized under the auspices of SP-IPM

CENTRES	SP-IPM Subject Areas
CIAT	(1) Whiteflies and Gemini viruses in the tropics*
CIAT	(2) Farmer participatory research *
CIMMYT	(3) Cereal stem borers in Africa
ICARDA	(4) Integrated management strategies for soil-borne pathogens
ICIPE	(5) Functional agro-biodiversity in the tropics
ICRISAT	(6) Grain legume pest management
ICRISAT	(7) Integrated management of nematodes
IITA	(8) Beneficial micro-organisms
IITA	(9) Parasitic flowering plants (i.e. pilot site studies)*
IITA	(10) Assess the farmer field school
WARDA	(11) Weed management in rice
IITA	(12) Weed management in the farming system
* Funded taskforces	

¹⁵ No list of these proposals was available to the Panel.

2.2.1 Whitefly Taskforce (Lead Centre: CIAT)

Available evidence of the potential to achieve inter-centre leverage in tackling serious global problems in crop protection occurred through the "whitefly project" co-ordinated by CIAT. Whiteflies and the gemini viruses they vector are increasing in importance world-wide. Whiteflies, at present, have reached pest status in numerous crops and over a wide range of geographic areas. Whiteflies have become pests in the tropical highlands of Latin America where they vector viruses in legumes and mixed cropping systems in the tropical lowlands of Central America, Mexico and the Caribbean. They are also vectors of viruses to vegetable and legume in mixed cropping systems in Eastern Africa, to mixed cropping systems in SE Asia, to cassava and sweet potato in Africa, cassava in South America and last but not least, they threaten glasshouse horticultural production in North America and Europe. The reasons for the emergence of whiteflies as a major pest remains in question, but links to pesticide overuse as a contributing factor are apparent. Whiteflies are an example of how a pest can become a "global public bad". Recognising the importance of this problem, the SP/WF-IPM was established as the first of the taskforces. The whitefly/virus problem also provided the pre-conditions where inter-centre co-ordination had demonstrable benefits and proved an example of a systemwide IPM approach to pest problem solving through IPM.

The development of SP/WF-IPM has been well documented and the stated goals are highly relevant for implementing extension programmes and policies for whitefly management across an array of horticultural crops. The overall whitefly/gemini virus problem was well conceptualised by the SP/WF-IPM team and the framework for the research activities clearly specified into four logical phases: (1) networking-diagnostic, (2) basic biological data, (3) development of IPM tactics and training and (4) impact assessment. SP/WF-IPM began operation in 1997 with the networking-diagnostic phase of the taskforce beginning in 1998 and completed during 2000. Phase one was designed to develop co-operative scientific networks and to characterise the WF-IPM problem using modern scientific methods. The second phase is just beginning and many of the funding issues appear to have been resolved.

By comparison, the other taskforces fall short of the SP/WF-IPM model for various reasons (see below).

2.2.2 Pilot Sites for Parasitic Plant Management (Lead Centre: IITA)

FAO estimates economic losses due to parasitic flowering plants of US\$ 4 billion per year affecting over 100 million people. Species of the parasitic flowering plants in the genera *Striga* in Africa and *Orobanche* in West Asia and North Africa pose growing constraints on maize and cereal production. In addition, stem borers and other pests cause significant additional yield losses in maize and other cereals in many areas and thrips, pod borers and other pests may attack the legume components that are important parts of the IPM best-bet solutions in different areas. Although there are multiple pests, we include in the taskforce name only the major pest common to all sites, namely parasitic plant management (PPM-IPM). SP/PPM-IPM was an attempt to roll several potential taskforces (e.g. Cereal Stem borers in Africa, Grain Legume Pest Management, Farmer Participatory Research, Weed Management in the Farming System, Assessing the Farmer Field School Approach in Kenya) into one taskforce.

Funding from the CGIAR Finance Committee arrived late in 1999 and taskforce members agreed to establish six pilot sites to implement *best-bet* technologies for the control of parasitic plants, maize stem borers and other pests as appropriate in different climatic zones. Sites were established for *Striga* in Mali (Sahel), Nigeria (West Africa Northern Guinea Savannah), Cameroon (Central African Humid forest), Burkina Faso (Dry Savannah) and Kenya (mid altitude) and for *Orobanche* in Morocco (North Africa: rain fed) and Egypt (North Africa: irrigated). These sites were selected as representative of the major cropping areas and in addition the pests of concern were well known to the affected farmers. The working IARC partners were ICIPE, CIMMYT, ICRAF and ICRISAT, as well as Kenya's KARI and MOA and other local NARS entities. ICRISAT provided rosette resistant groundnut varieties and IITA provided cowpea varieties appropriate for the area. ICRAF had experience working on improved soil fertility to suppress *Striga*.

The taskforce efforts to implement best-bet IPM options were unified using a multi-disciplinary learning-by-doing approach that employed common methodology across all sites. The best-bet IPM options were designed to suppress *Striga* using region appropriate leguminous fodder plants (e.g. *Desmodium sp.*) inter-planted between rows of maize or sorghum. The legumes cause suicidal emergence of *Striga*. In the Kenya pilot site, maize stem borers were suppressed using the push-pull strategy developed by ICIPE. *Desmodium* was used to repel stem borer (the push) and Napier grass planted around the periphery of the plots was used to attract them away from the cereals (the pull). The pull component of the strategy relies on the much higher preference of stem borer for Napier grass relative to maize and the fact that they develop very poorly on Napier grass.¹⁶

Expected outputs of this taskforce were:

- development of effective mechanisms to enhance the capabilities of NARSs/NGOs to develop, adapt and transfer best-bet IPM technologies and to increase communication of IPM advances among researchers, extension agents and farmers;
- the development of IPM technologies for adaptation/adoption by farmers in diverse socio-economic conditions; and
- the development and dissemination of extension materials.

Despite the fact that the sites had differing, social, biological and biophysical characteristics, Taskforce members agreed to establish a common model for encouraging IPM adoption of best-bet options for implementation. The basic experimental design agreed upon was not modified in any significant way allowing comparisons across sites. Lead farmers at each site were selected by project management and these farmers selected others farmers to participate in the study. The farmers were trained by local extension personnel about the details of the best-bet IPM options most suitable for their site. These and current practices were implemented by farmers who followed the field trials from planting to harvest. Farmers became research colleagues and extension agents by providing information to other farmers visiting their farms during field demonstration days and casually at other times.

¹⁶ This paradox of high preference and poor development of maize stem borers on Napier grass is an interesting problem in co-evolution.

Only the Nigerian and Kenyan PPM-IPM pilot sites were visited and are the major focus of this report. The reports presented by co-operating scientists during the 12-14 March 2001 SP-IPM working group meeting at ICIPE. Unfortunately, at the time of the review, some studies were still under way and others had not analysed their data. Hence, the assessment was based on the Panel's site visits.

The visits to three farmer participatory research trials in mid altitude sites in Kenya showed that the farmers interviewed were exceptional as they generally had a good level of education. They understood the biological bases of each of the best-bet options they were testing, enabling them to give clear interpretations of the experiments and the results. The farmers had preferences among the options and gave articulate explanations for their choices. When Kenyan farmers were asked if they would implement their preferred option on the rest of their land, farmers cited the lack of available *Desmodium* seed and/or credit to buy it as the major constraint although in principle it is easy to harvest and store this seed. On the other hand, there was anecdotal evidence that farmers at all sites are already beginning to experiment with the best-bet options, leading to local discovery and modification.

The Panel's observations suggest that further education of farmers concerning some of the components of the best-bet options is essential. This requires further testing and perhaps research on appropriate extension tools and supportive policy conditions that would facilitate a wider diffusion of the technology. The Panel notes that such questions were not build into the initial design of the research. Rather, the implicit purpose of these trials was to test a modus operandi of inter-centre and farmer participatory applied research. As processing and analysis of data was still on-going, the Panel feels it is not in a position to give a final assessment. What can be said though, based on the observations made in the field, is that the field experiments were well executed. In principle, the data collected would allow modelling of the biological interactions as a basis for assessing on-farm impact.

Only the Panel chair visited the West Africa Northern Guinea Savannah pilot site in Northern Nigeria. Farmers at this site had low levels of education, but the farmers were reasonable aware of the options and as with Kenyan farmer they had preferences among them. The conclusions reached from Kenya apply fully here, except that management was more top-down possibly hampering the execution of the trials and the future development of the work in the area. The data from this site were competently summarised and showed differences among best-bet option. However, the data are probably not sufficient for rigorous analysis at this time.

The Panel did not visit the other SP/IPM-PPM pilot sites and much of our information about them comes from the presentations made by pilot site scientists at the 2001 SP-IPM Nairobi workshop. At this workshop, the taskforce members agreed that greater effort would be made at the remaining sites to strengthen working linkages across sites, to strengthen farmer participation in the experimental design, to identify measurable indicators of impact, to improve methods of biological data collection, recording and analysis and to sharpen and harmonise participatory approaches across sites, make timely preparation and distribution of site reports in a standardised format. Furthermore, an increase in the exchanges among farmers and among scientists and extension staff of pilot sites to share expertise was emphasised. Also identified was the need to scale-up and enhance rapid spread of proven options.

The Panel views the critical self-appraisal of taskforce projects during the 2001 workshop and its recommendations to limit the number of sites and to improve FPR methods and linkages to appropriate groups, as an indication of strong group commitment to the goals and philosophy of SP-IPM. The Panel feels that in the future the overall SP/PPM-IPM project must concern itself with an analysis of the success of IPM implementation at all sites and hence the lack of economic input in the trials is a deficiency that needs to be addressed.

2.2.3 Farmer Participatory Research (Lead Centre: CIAT)

Much of the innovative work on Farmer Participatory Research in IPM (FPR-IPM) has been conducted by the GIPMF, NGOs and other groups outside the IARCs. CGIAR and NARS researchers generally have been slow to appreciate the value of FPR approaches in IPM. The FPR-IPM taskforce was designed to facilitate understanding, spread and adoption of participatory research processes in IPM. This taskforce is closely aligned with the Systemwide Programme on Participatory Research and Gender Analysis for Technology Development and Institutional Innovation (PRGA)¹⁷ hosted by CIAT. The PRGA Programme develops and promotes methods and organizational approaches for gender-sensitive participatory research on plant breeding and on the management of crops and natural resources. The 2001 Nairobi workshop asked FPR-IPM to:

- design outputs and products that enable project managers to integrate participatory approaches in project planning and execution;
- collate existing information and case studies on FPR methodologies for distribution to SP-IPM partners;
- expand the composition of the learning workshop to include representatives of selected SP-IPM pilot site partners;
- provide research planners/managers with guides to key participatory elements of successful IPM projects; and
- encourage the incorporation of elements identified in (4) into on-going and planned projects that serve the needs of CGIAR Centres and other SP-IPM partners with less experience in FPR.

The Panel views FPR as a key component of IPM implementation, but notes that no consensus exists within the IARCs about how and where FPR-IPM should be integrated in IPM R&D. And while it is premature to evaluate SP/FPR-IPM, it is apparent that its activities within SP-IPM could be better co-ordinated with those of SP-PRGA and GIPMF.

2.2.4 Non-funded SP-IPM Taskforces

Despite the fact that some taskforces were not funded, all organized workshops clearly demonstrate the need and desire for inter-centre collaboration. The progress of non-funded taskforces could be reviewed only on the basis of discussions held at the March 2001 SP-IPM workshop. Below is a summary of the workshop recommendations and of the Review Panel's discussion with various participants in the workshop (Table 2, see also Appendix II).

¹⁷ The PRGA Programme is not listed among the 15 System-Wide initiatives or programmes on the CGIAR homepage (www.cgiar.org, 20.07.2001).

2.2.4.1 Functional agro-biodiversity (Lead Centre: ICIPE)

Advocacy, mainly by developing countries, convinced the Convention on Biological Diversity (CBD) to include agricultural biodiversity in its agenda. Also recognised was the need of CBD to work directly with scientists (e.g. at CGIAR Centres) on focal areas such as pollinators, soil biodiversity, biodiversity that mitigates pests and diseases, crop and livestock genetic resource diversity, diversity at the landscape level and wild biodiversity in agro-ecosystems. The biodiversity represented by natural and classical biological control is a *keystone* of IPM¹⁸. ICIPE has taken the leadership in developing inter-centre participation on functional agro-biodiversity in line with specified CBD areas of interest. Efforts are under way to attempt to establish a taskforce on functional agro-biodiversity to be implemented within the framework of the CBD.

Table 2: List of SP-IPM taskforces reporting at the March 2001 SP-IPM Workshop

Taskforce/subject area	Co-ordinator (bold); other contact person(s)
1. Whitefly IPM (see above)	P. Anderson /CIAT; P. Hansen and S. Green/AVRDC
2. FPR-IPM	E. van de Fliert /CIP; A. Braun/CIAT
3. IPM adoption	B. James /SP-IPM Programme Co-ordinator
4. IPM impact assessment	A. Lagnaoui CIP; H. De Groote/CIMMYT
5. Parasitic flowering plants (Pilot sites projects)	D.E. Hess /ICRISAT; A. Emechebe/IITA; Z. Khan/ ICIPE
6. Agro-Biodiversity	H. Herren ; (B. Gemmill)/ICIPE; G. Goergen/ IITA; F. Nwilene/WARDA
7. IPM of soil pests and diseases	A. Bellotti / CIAT; K. Makkouk/ICARDA; L. Black/ AVRDC
8. Quantifying losses & investment opportunities for IPM	H. de Groote/CIMMYT; M. Loevinsohn/ ISNAR
9. Grain legume pests/thrips	G. V. Ranga Rao /ICRISAT; M. Tamo/IITAS Sithanathan, N. S. Talekar/AVRDC
10. Biotechnology for IPM	M. Cohen /IRRI; IITA
11. Beneficial micro organisms	A. Cherry /IITA for linkage with SIP/ICBD

¹⁸ It is widely accepted that biological and natural control are the backstopping processes for successful IPM implementation.

2.2.4.2 Beneficial micro organisms (Lead Centre: IITA)

IITA and CIAT are members of this taskforce and IITA, especially, has made considerable progress in developing biopesticides (e.g. Green Muscle® for grasshopper and locust control). None of this development was done under the auspices of SP-IPM, but this project provides an excellent model for future work by other centres on biopesticides relevant to regional pests.

The 2001 Nairobi workshop focused on regulatory aspects of biopesticides and their production and quality control. IITA and CIAT reported successes collaborating with the private sector on relatively small-scale commercial production of biopesticides and the meeting stressed the importance of such linkages by CGIAR researchers.

The SP/BMO-IPM taskforce is active within the Society of Invertebrate Pathology (SIP) and IITA is a full member of the International Consortium of Biopesticide Development (ICBD). The taskforce recognised ICBD as being crucial for the development and commercialisation of biopesticides. At the last ICBD meeting in Mexico, the participants decided to develop two concept notes: one for Latin America (CIP-led, in collaboration with ICBD) and the other for Asia (NRI-led). Because of the strong working linkage between the taskforce members with SIP and ICBD, SP/BMO-IPM is exploring the possibility of relinquishing the leadership of the BMO taskforce to SIP/ICBD. At the same time, other CGIAR Centres (e.g. CIP, CIAT and ICARDA) were encouraged to join ICBD. Recently, IITA in collaboration with Virginia Tech University and several NARSs completed an international workshop at Cotonou, Benin to develop a framework for biopesticide regulation in Africa.

The Panel commends this taskforce for the significant organizational and conceptual progress it has made in this important area of IPM.

2.2.4.3 Soil-borne pests and white grubs (Lead Centre: CIAT)

CIAT has developed regional linkages and contacts with other institutions working on white grubs and is in the process of placing a scientist at its centre to co-ordinate work in this field. The discussion during the workshop focused on the need for taskforce members to engage in further discussion of soil biota in general and plan for a taskforce workshop to formulate ideas to carry this work forward. Not much progress was reported on recommendations of the previous SP-IPM working group meeting of integrating the taskforces on soil-borne pests and white grubs into one taskforce on soil biota.

2.2.4.4 Rice weed management (Lead Centre: WARDA)

The workshop linked WARDA's planned work on rice functional biodiversity to the functional biodiversity taskforce and discontinued the rice weed management taskforce in its original form.

2.2.4.5 Biotechnology for IPM (Lead Centre: IRRI)

The Nairobi 2001 SP-IPM workshop discussed the uses of biotechnology in IPM (e.g. insecticidal plants) and concluded that the need for implementing such technologies must be demonstrated as technical and economic feasibility may not be sufficient criteria by

themselves. The recent IITA EPMP report urges caution in their adoption citing potential ecological disruption. Two excerpts specifically relevant to current SP-IPM activities from that report are given here.

(a) “Proposals for the use of transgenic Bt cowpea must consider the social and political acceptance of GMOs in the region, as well as the probability of evolving pest resistance to Bt.”

(b) “Transgenic Pest Control: The uncritical use of biotechnology to solve agricultural problems in developing countries was questioned by PHMD’s Markham and Neuenschwander (1999). They assert that the social and economic perceptions of the recipients should be considered, that greater emphasis should be placed on the sustainability of cropping systems and that its productivity should be examined from a systems perspective (see also Zadoks and Waibel 2000). A similar caution has been expressed by various NARS in SSA; likely because of the ongoing debate in developed countries. The issue is raised here as part of food security issues in SSA using the interaction of predatory mite *T. aripo* and cassava greenmite as a cautionary example. This predator feeds predominantly on maize pollen when greenmite numbers are low (S.J. Yaninek, Personal communication, 1999), hence, if Bt maize were to be introduced to SSA, even sub-lethal effects of Bt pollen on the predator’s vital rates might disrupt biological control of green mite and negatively impact cassava production. This cautionary note flags a known interaction that must be investigated in an interdisciplinary way before Bt maize is introduced to SSA.”

The Panel concurs with SP-IPM’s view on the need for exercising caution in the use of biotechnology in IPM. At the same time, the rapid adoption of biotechnology in some countries (e.g. *Bt*-cotton in China) requires that IPM give more attention to analysing the opportunities, the potential and actual impact of biotechnology in terms of improving the efficiency and sustainability of crop protection. The fact that the vast proportion of existing genetically modified crops is in the field of crop protection poses a special challenge for SP-IPM. Referring also to the observations made in the Summary the Panel sees a strong necessity to bring this issue into the centre of the dialogue on the policy environment of IPM.

2.2.4.6 Quantifying losses and investment opportunities for IPM (Lead Centre: CIMMYT)

SP-IPM working group members were cognisant that reliable data on crop loss assessment for use by scientists and policy makers is scarce and hence begun discussions for developing a crop-loss information database and methodologies for crop loss assessment. Information on yield losses due to pests is a necessary prerequisite for setting priorities and making IPM research investments, to measure the efficacy of current IPM practices, to develop policies at local/regional levels and to measure the need for future research in the context of agricultural change. Good examples of biological-economic analyses are those of the cassava/cassava mealy bug/natural enemy system are found in Neuenschwander *et al.* (1989), Gutierrez *et al.* (1999) and Zeddies *et al.* (2001), but none of this work was done in the context of SP-IPM. The Review Panel sees the need for increased efforts in this area.

However, the global figures of crop loss reviewed in the Summary still dominate the literature (e.g. Oerke *et al.* 1994). Such non-specific information can be counter-productive to IPM because it may encourage ad-hoc investment in loss-reduction measures often through indiscriminate pesticide use. So far, IPM researchers of the CGIAR have not validated Oerke *et al.* (1994) widely cited but rather general crop loss figures (Yudelman *et al.* 1998; Wood *et al.* 2000). If decision-making on strategies in the area of food security is based on crop loss data that do not reflect actual field conditions, such strategies are based on false premises. On the other hand, if these figure can be confirmed a discussion on the research priorities within the CGIAR seems warranted.

From a scientific point of view crop-loss assessment research must do more than demonstrate that pests can have destructive effects on yield. Instead, such research should lead to a better understanding of the factors that cause crop loss, i.e. factors that affect yield and yield variability and that ultimately lead to IPM solutions. Included in such efforts should also be the analysis of the external costs of loss prevention measures thus linking these questions to food security in the context of "resource security"¹⁹. In that sense, yield loss estimates need to be translated into economic loss before the necessary link between crop loss, IPM and food security can be established. Such a link also can help to lay the basis for developing a policy environment conducive for the adoption of IPM globally.

The Panel notes that unfortunately the SP-IPM has not ventured its conceptual thinking in this direction and it was not clear why no funding for an interdisciplinary crop loss assessment project was not solicited. The Panel encourages the SP-IPM to broaden its approach to crop loss assessment and establish links with socio-economists and food policy experts within IARCs and relevant ARIs.

As a summary statement for TOR 2, the Panel is convinced that the SP-IPM has chosen important relevant real world pest problems to research and operationalize as taskforces, some of which received additional external funding and others did not. The Panel feels that the subject areas chosen were tailored to the strengths and the needs of the respective co-ordinating centres. Hence, while there is little doubt that these "projects" are adding value to the System's ongoing research and they are vital to increasing food security, it is more difficult to assess how effective some of these undertakings have been in stimulating new directions in crop protection research within the CGIAR. Succinctly, however, are these initiatives sufficient to "elevate the game" for global IPM? The Panel submits that based on the review of the taskforce activities and outputs this is only partially the case. Some of these projects have good potential to advance the science of crop protection in the context of sustainable agriculture (PPM), others in solving important pest management puzzles (WF) and others in providing new technologies (BMO). However, the Panel is less optimistic as regards the wider impact of these projects, given the existing unfavourable policy environment for IPM as described in the Summary.

¹⁹ The term "resource security" was mentioned by F. Reifschneider, Director of the CGIAR Secretariat.

2.3 Building on the 1999 IAEG Study to Evaluate the Quantity and Quality of the SP-IPM's Outputs and Impact with Respect to Publications; Capacity Building; Methodologies; Technological Innovations; Research Achievements and Actual/Potential Impact To-date; and, Processes in Place for Monitoring/Enhancing Quality of Outputs/Impact (TOR 3)

The 1999 IAEG study (CGIAR 2000) adopted a four-stage assessment approach that allowed the build-up of a body of evidence for the analysis of the impact of IPM research in the CGIAR system. Soft and hard indicators were used in the context of four analytical steps:

1. a self-assessment process by IARC scientists;
2. an analysis of the quantity and type of material published;
3. a comparison of the perceptions expressed by the IARC scientists and the opinions of their clients and partners; and
4. a review of a sample of economic case studies in IPM.

In relation to TOR 3 the following results may serve as a point of departure for SP-IPM:

- IPM continues to be carried out in all centres. This also includes those that do not have specific IPM research programmes because even IFPRI and ISNAR have published on IPM topics (e.g. Yudelman *et al.* 1998; Loevinsohn *et al.* 1997).
- in general, centres allocate little of their core budget to IPM but most centres view IPM as a major research programme.
- the list of high-quality publications on IPM emphasises the high profile of this subject area within CGIAR Centres.
- the centres' relationships with the private sector are highly varied. However, a tendency was found that increasingly the plant-protection products of the private sector (e.g. biotechnology) are viewed as complementary to the development of the Centres' IPM technology. This was different in the past where IPM, which did not preclude appropriate use of pesticides, but was seen as an alternative to the private sector's emphasis to increase the sales of chemical pesticides.
- based on very few economic studies of IPM, past investments in IPM were found to be profitable, but investments were usually made when farmers were confronted with a crisis situation – either as the result of uncontrollable introduced pests, induced pest caused by excessive pesticide use, or where the pest-control technologies of the private sector failed or were unavailable.
- that in cost benefit analysis of IPM high rates of return must not necessarily be viewed as an indicator for a successful crop and/or pest management strategy. Quite the opposite can also be true, i.e. a handsome payoff may simply indicate that a cropping system has become ecologically disturbed. This would be analogous to a human being whose productivity depends on the continuous use of drugs (cf. Regev 1984).

To assess the "added value" of SP-IPM requires evidence on its specific outputs and their impact. This evidence is difficult to obtain, foremost because the "products" turned out by the SP-IPM are mostly "intermediate goods" which are inputs to the individual Centre's

research output. As mentioned at the outset, the purpose of systemwide programmes is to facilitate inter-centres co-operation and thus, in theory, reduce transaction costs. In quantitative terms, this is impossible to show for most SP-IPM taskforces because of their early stage of the programme development and implementation. At best, the institutional impact of the individual taskforces can be described. For example, the SP/WF-IPM has been in operation for a period of four years and was found to be well organized and has met nearly all research objectives outlined in its phase 1 project plan. WF-IPM could thus be a model for science management of other SP-IPM taskforces.

On the other hand, it is difficult to attribute specific research outputs to the SP/WF-IPM. At the beginning of the review, there are no publications specifically labelled SP-IPM although the SP/WF-IPM was preparing a book on phase one results and had published 11 papers, 2 book chapters, 1 proceeding and 11 abstracts of presentations. In addition, 4 papers have been submitted, 27 talks have been presented and 2 posters developed for display at scientific meetings. These outputs can be linked to taskforce research but it is not clear if these had not been produced in a counterfactual situation. Unfortunately, little evidence of a "research-quality-enhancement-effect" through SP-IPM could be observed as only two of the papers were published in high-quality journals.

The question may then be asked whether the SP-IPM has been instrumental in bringing about advancements in the methodological issues embodied in IPM research questions. Once more, the Panel maintains that this is difficult to say, firstly because of the interdisciplinary nature of IPM and secondly because of the impossibility to separate Centre research from systemwide research. What evidence exists is found primarily in the WF-IPM taskforce.

The question of the extent SP-IPM has helped to ensure greater impact of CGIAR IPM activities at the farm level by encouraging farmer participation and the formation of effective collaboration with organizations primarily concerned with IPM implementation is likewise not so clear. The Panel, in general, views SP-IPM's focus as being more inward looking, i.e. communication largely took place among collaborating Centres. Conversely, SP-IPM has been less visible in demonstrating its role in global crop protection to stakeholders of IPM outside the CGIAR and in this regard, SP-IPM at this point in its development has probably not been a strong force. These observations in principle may provide some answer to the question of whether or not SP-IPM has contributed to sustainability and human well-being. More precisely, this is impossible to say at this point in time.

To conclude, this is not to say that the SP-IPM has failed as regards the outputs phrased in TOR 3, rather our observations suggest that perhaps in terms of overall impact, the expectations were a bit unrealistic and SP-IPM's research and implementation priorities were not in full accord with its objectives (see 2.1).

2.4 Assess the Effectiveness of the SP-IPM's Governance, Decision-making, Organization, Accountability, Resource Mobilization and Allocation and Mode of Operation, Including Identification of Constraints in Implementing the Programme and Lessons Learnt (TOR 4)

SP-IPM governance structure largely depended on the founding SP-IPM co-ordinator Richard Markham who is commended for scientific vision in helping formulate the research and implementation agenda, for his dedication to organizing the many aspects of SP-IPM, for setting the tenor of management that allowed collegiality to develop and for the genuine strides made toward developing a Centre without walls. SP-IPM's founding management was effective in developing good communication and collegiality amongst scientists from the IARCs, ARIs and NARIs/NGOs and in developing a coherent research agenda within two of the active taskforces. For example, the discussions during the 2001 SP-IPM working group meeting held at Nairobi Kenya were open and constructive and should provide the basis for correcting identified shortcomings outlined for each taskforce and their projects identified in Section 2.2. Among these are management issues within PPM-IPM, co-ordinations of FPR-IPM with PRGA and GIPMF and others. The collegiality that continues to develop within SP-IPM increases the effectiveness of management and facilitated transparent decision-making for resource mobilisation and reallocation and for setting priorities within taskforces. The engagement of NARSs, NGOs, farmers and other stakeholders has been effective but needs improvement and scaling up to meet the implementation demands faced by all taskforce and projects. The Panel noted that socio-economic input in most phases of SP-IPM was lacking or inadequate possibly compromising future impact assessment efforts. Linkages between SP-IPM, SP-PRGA and GIPMF have been established but are not strong and obviously need attention. Many of the shortcomings are in part due to the relatively short time SP-IPM has been active and the failure of most taskforces to secure adequate funding for various reasons.

The programme leader/coordinator position(s) will be crucial for the future development of SP-IPM within the CGIAR and its co-operation with non-CGIAR Centres and ARIs. The Panel views the placement of the SP-IPM Secretariat outside of centre structures a possibility to maximise its coordinating/facilitating role in SP-IPM. The management authority of the Secretariat's position(s) should be increased to enable it to work effectively across centre mandate boundaries, to help focus systemwide IPM research priorities and to facilitate the solution of regional and global pest problem. A major challenge for the future of SP-IPM is that the leader/coordinator position(s) must be more actively involved in creating an environment conducive for IPM within the CGIAR system through effective dialogue with the major policy organizations concerned with international development. The Panel is concerned that important leadership changes were made in SP-IPM without awaiting the outcome of this review.

2.5 Evaluate the Effectiveness of IITA's Convening Role, Including the Relation Between the SP-IPM and IITA's Own Research Agenda (TOR 5)

IITA was asked to take the convening role in SP-IPM because it had extensive experience in IPM in Africa. IITA's role in governance was supportive but benevolent. However, its convening role enhanced its research agenda as additional scientific and logistical expertise from other IARCs and ARIs helped in the solution of crop production problems within its mandate areas of Africa. The greatest benefit of the collaboration likely occurred at the bench level where co-operating IARCs and IARC scientists had important

synergism, scientific exchanges that increased networking and the collegiality within and among the various taskforces.

From a disciplinary perspective, the interactions of the CGIAR Centres as facilitated by the SP-IPM were mutually beneficial. IITA's convening role enhanced its research agenda as additional scientific and logistical expertise from other IARCs and ARIs became available to help solve problems within its mandate (e.g. cassava mosaic disease, *Striga* and stem borers). The same could be said, but to a lesser degree, for the other co-operating Centres. All Centres benefited from the scientific exchanges and the collegiality that developed among the collaborating scientists and from varying amounts of funding. Appendix V was provided by SP-IPM and summarises the relative amounts and source of funding received by the various taskforces as of 2000/2001.

Although, leadership by IITA's Director General, in principle gave SP-IPM a high administrative profile, the challenging task of organizing and developing the programme fell largely on the SP-IPM programme whose terms of reference were those of a facilitator, advocate, consensus builder and day-to-day organizer. The placement of the co-ordinator position deep within the hierarchy of IITA limited its visibility and effectiveness for those outside of crop protection. Furthermore, insufficient personnel with a capacity, for example, to introduce a policy perspective to global IPM and to establish linkages to socio-economists within the CGIAR and to other development organizations, severely constrained the SP-IPM's ability in the area of socio-economics and policy.

Other complicating factors were Centre independence and perceived scientist self-interest, inadequate funding and the fact that the concept of a "Centre without walls" in practise is still foreign to the thinking in most IARCs. These issues made organizing and making SP-IPM functional a daunting task. The lack of initial buy-in to the concept of SP-IPM is reflected in the wide range of proposals initially put forth for funding; proposals that often reflected narrow disciplinary interests (Table 1, see also Appendix 2). Despite these problems, the programme co-ordinator was successful in organizing the SP-IPM taskforce working groups to develop their priorities and goals. The co-operation of ten CGIAR Centres, plus AVRDC, ICIPE, GIPMF and the IPM Forum was a *tour de force* given the meagre funding available relative to the size of the problems and geographic area. The progress made was due to the force of will of one individual and the hunger of IARC scientists for greater inter-centre collaboration.

The Panel commends former programme co-ordinator Richard Markham for vision, idealism and commitment to the goals and methods of IPM and for fostering by example the collegiality required to establish a Centre without walls in the CGIAR.

Unfortunately, at the beginning of the review, the programme co-ordinator left IITA; leadership of SP-IPM passed to IITA's Director of Plant Health Management and the co-ordinator position was filled as an IITA position. The Panel views these developments with concern and feels that halting this decision until the results of this review were available would have provided a more rational basis for leadership changes in SP-IPM.

Furthermore, the initially agreed upon mechanism of alternating the leadership role of SP-IPM was abandoned through an initiative from IITA. While all participating Centres did not object to IITA's continuing leadership role, recognising that IPM is present in practically all the Centres would suggest that changing this procedure was not necessarily for the benefit

of the "common good". On the contrary, it is strongly felt that in order to be responsive to the global challenges of crop protection, SP-IPM not only needs to have a high profile, but also as much as possible, it should be independent of the interest and strategies of individual Centres. Rotating leadership would enhance this operational principle. It is obvious that the mandate of IITA in Africa and its experience in IPM positions it well to lead regional IPM taskforces. However, the nature of the global challenges of crop protection raises questions as regards the comparative advantage of IITA in leading the CGIAR's global strategy in this area, especially if more emphasis is to be placed on dialogue with policy makers and the various stakeholders of IPM globally.

In summary of TORs 1-5, the Panel concludes that SP-IPM has been a useful concept for restructuring pest management research and implementation across the CGIAR – to foster the idea of Centres without walls and for exploiting the potential of IPM as an example of a global public good. However, the Panel was hindered in its evaluations by the lack of data on a complex programme whose existence was altogether too brief for a final analysis to occur. The shortcomings that were identified by the Panel must therefore also be seen as the result of a young organization organizing itself. The Panel maintains that given strong independent, proactive leadership and stable funding SP-IPM can and should make a bigger contribution to the goals of the CGIAR. In the following chapter the rationale and the strategy for upgrading the SP-IPM is presented.

CHAPTER 3 - ASSESS THE NEED AND CONTINUING RELEVANCE OF THE SP-IPM AND MAKE RECOMMENDATIONS AS TO ITS FUTURE ROLE, ITS ORGANIZATION AND FUNDING (TOR 6)

The Review of Systemwide Programmes with an Ecoregional approach (CGIAR 1999) has suggested three criteria that would have to be met if activities should be handled in the context of systemwide programmes rather than by individual centres: (1) the problem or opportunity is of major relevance; (2) no single Centre has a natural advantage in terms of its mandate; and (3) there exists a high potential for efficiency gains from combined efforts. In the following, an analysis of the needs and continuing relevance of SP-IPM implicitly considering these criteria is presented.

3.1 The Need and Continuing Relevance of SP-IPM

Is there a need and continued relevance for SP-IPM in the future? To answer this question in greater detail requires us to re-visit (a) the global crop protection situation described in Chapter 1 and, (b) to look at the IARC's guiding principles for IPM presented under TOR 2.

With respect to (a), a number of developments can be identified that strongly indicate that international IPM research requires more co-ordination. Firstly, trade liberalisation and globalisation is fuelling increased cross boarder movement of pests. The whitefly problem described in Chapter 1 is such an example. Hence, although international quarantine efforts may be stepped up, the overall pest damage potential can be expected to rise as the interchange of plants and plant products increase. Secondly, further specialisation and intensification of the world's cropping systems will foster the need for better pest damage abatement measures. As shown in Chapter 1 the reliance on pesticides is on the whole causing additional costs and is not likely to be a sustainable choice for the future, especially in developing areas. Increased application of modern biotechnology, which may finally happen in developing countries on the one hand may increase potential pest pressure because of more uniform cropping systems while on the other pest resistant transgenic seeds are crop protection products that may widen IPM options but may also introduce new problems. Here, again, better international co-ordination may avoid the repetition of the mistakes that have occurred with chemical pesticides. Thirdly, in the future the food industry is likely to become a strong driving force for global IPM. Consumers in developed countries increasingly demand environmental quality and high health standards for food products imported from developing countries. Hence, as exporters of food products developing countries can only compete with richer countries if they adhere to these standards and effectively communicate a positive image with regards to environment and health. Here, IPM may well become an increasingly important marketing argument.

While it is clear that these changes warrant more international collaboration, the question of SP-IPM's role and comparative advantage in these co-ordination tasks remains open. The answer to this question is closely linked to the role and importance of the CGIAR in international agricultural development. The CGIAR system is presently engaged in serious discussions on its future directions because it has realised that some aspects of the system limit its effectiveness as an instrument for the resolution of major development issues. As outlined, for example, in the document "Designing and Managing Change in the CGIAR"

presented at MTM 2001,²⁰ "there is an urgent need within the CGIAR to elevate the game by demonstrating the salience of its work in relation to key interests and concerns of the international community. The goal is to harness systemwide synergies to create a sum of activity that is greater than the parts working separately".

Hence, depending on how effectively the CGIAR will be able to overcome its internal problems and to what degree it will be able to generate a more coherent and globally relevant research strategy, will determine whether systemwide programmes can meet the expectations inherent in their charges. Until now, the CGIAR's research agenda is, in effect, the aggregation of 16 separate independent IARC research agendas. Currently, systemwide initiatives or programmes, of which the SP-IPM is one (see A-Table 2 in Appendix V), account for only 6% of CGIAR system resources. In the past, the Centres have tended to take from the "common good" of the CGIAR when there was something to gain, but market the results under the banner of the individual Centre. This is shown, for example, by the absence of joint SP-IPM publications. Hence, unless the rules for co-operation are clearly outlined and adherence to them monitored either through social pressure or financial penalties or incentives, there is a danger that the leadership of individual Centres will view systemwide programmes as a means to take rather than to give.

The Panel views advancements in the internal coherence of the CGIAR research portfolio as an important pre-condition for SP-IPM to perform its role effectively.

With respect to (b), the Panel submits that SP-IPM can only be successful in the future if it widens its scope and goes beyond its present focus on improving co-operation among Centres. In other words, it must adopt a more outward looking approach than it has taken in the past. While it may have been a necessary first step to find and test mechanisms of inter-centre co-operation in the area of pest management research and thus reduce transactions costs, this is not enough if the "game is to be elevated". One of the guiding principles adopted by the International Agricultural Research Centres (IARCs) is: "success in implementing IPM is contingent on a favourable public policy environment". In the past, SP-IPM has treated this principle as an assumption relying on others to work towards that end. However, as discussed under TOR 2 in Chapter 1 this did not really happen. For example, the divergence in opinion that exists among some of the major development organizations as regards effective mechanisms for IPM implementation (see Chapter 1), the neglect of the role of pests in assessments of food supply and food security are examples that call for internationally co-ordinated research and assessment. Another issue that needs attention from international SP-IPM is in the area of policy distortions that hampers the diffusion of IPM. For example, the various types of pesticide subsidies that exist in most developing countries (and in many developed countries as well) (e.g. Repetto 1985; Farah 1993; Agne *et al.* 1995; Fleischer and Waibel 1997; Poapongpasornng 1999) undermine efforts of IPM training and reduce the rate of return of investments in IPM. The rising level of pesticide use world-wide (see Chapter 1), its cause and its effects provide the basis for a broad research portfolio that SP-IPM, through linking with relevant CGIAR Centres and specific ARIs, should address in the future in order to be able to make major contributions to the efforts of implementing sustainable agricultural development.

²⁰ Cately-Carson, M. *et al.* 2001. Designing and Managing Change in the CGIAR. Report presented by the CDMT to the CGIAR at MTM 2001 in Durban, South Africa, May 2001.

The Panel recommends that in view of the global challenges from pests and pest management issues there exists a strong need and a high relevance for SP-IPM in the future. In view of the changes that the CGIAR is currently undergoing, the Panel views advancements in the internal coherence of the CGIAR research portfolio as an important pre-condition for SP-IPM to perform its role effectively. The Panel recommends that in order to be successful in the future, SP-IPM should go beyond its present focus of improving co-operation among Centres and should widen its scope and take a more outward-looking approach in seeking international assistance and co-operation.

3.2 The Future Role of SP-IPM and the Issues it Should Address

Given the challenges that emanate from the global trends in agriculture for pest management the Panel sees a strong need for an independent and a strong global research network on IPM. Hence, in as much as the CGIAR lives up to its own goal of significantly contributing to "sustainable improvements in the productivity of agriculture, forestry and fisheries in developing countries in ways that enhance nutrition and well-being, especially of low-income people", the SP-IPM must become a major component of the CGIAR's strategy towards achieving this goal.

3.2.1 Upgrading Existing Taskforces

At present the formulation of Challenge Programmes (CP) is shaping up as an effort for the CGIAR to play a more significant role in international agricultural development the aspects of efficient and sustainable pest management in principle fits well into all of the ten programmes listed as proposals²¹. Given the rising levels of pests, diseases and weeds in the course of crop intensification and in view of the increasing complexity of pest control interventions, CPs that do not include IPM components in a holistic manner may run the risk of failing to make significant contributions to poverty alleviation and improved food security in at-risk areas. Regardless of whether CPs are dealing with "climate", "water" or "mountainous regions", pests and the current methods to control them will be a significant part of the equation. For example, climate change will generate uncertainty with regards to the ecology of pests, pesticides are frequently major pollutants in the environment and agriculture in the cooler climates of tropical highlands is often characterised by pesticide-intensive horticultural crops. These examples suggest that perhaps IPM itself should be a CP that would service other CPs. We will address this question in the last chapter of the report. At this stage, we will briefly look at the global relevance of two of the currently existing and active SP-IPM taskforces and offer a few suggestions of how their role could be enhanced.

For example, the SP/WF-IPM taskforce, if put in the context of food security, sustainable management of natural resources and rural health, meets the CGIAR's new criteria of applying a programmatic approach. The projects of WF-IPM are building blocks that together respond to a major global challenge and which most likely are synergistically greater than the sum of the parts. Whiteflies are pests of global significance that cause direct damage and vector plant viruses to a wide range of high value crops in both developing and developed countries. To increase its effectiveness and relevance, the SP/WF-IPM should continue to

²¹ In December 2001 ten proposals for Challenge programs were listed on the CGIAR homepage [www.cgiar.org/...](http://www.cgiar.org/)

further improve the scientific basis that can effectively buttress control interventions²². There is, however, a compelling need to strengthen the socio-economic component of the project. This should include the analysis of the economic and political factors that pre-condition the growing whitefly problem and an assessment of the costs and benefits of alternative intervention strategies including those co-ordinated internationally. Biological control of whiteflies is an example requiring international co-operation.

The Parasitic Plant Management project (SP/PPM-IPM) is largely a regional project and therefore would not necessarily qualify for a systemwide project. On the other hand, the need for enhancing agricultural development in Africa and the lessons that can be learned from the consequences of agricultural intensification in other regions suggests that here too exist global implications. For example, the proposed CP on *Global Genetic Resources* states "effective solutions to previously intractable problems like *Striga* could be expected through genetic engineering"²³. Note, that the SP-IPM has developed an indigenous solution using the legumes that cause suicidal emergence of *Striga* and the use of native grasses such as *Napier* grass technology for the control of stem borers. Such IPM solutions could be compared to an externally provided technology like transgenic seeds. Furthermore, current efforts by major development organizations to intensify agriculture in Africa, the PPM-IPM project in the future, may be confronted with the ecological consequences of agricultural intensification. In fact, such developments may provide a major test case for a CGIAR programme on how negative externalities of agriculture could be prevented through a pro-active strategy. Again, in order to meet the challenge, a project which at first glance would seem to be of limited scope, shows a global dimension when put in a larger context. In view of this prospect, the Panel feels that in the future, the overall SP/PPM-IPM project must concern itself with an analysis of the success of IPM implementation in the context of other pest management options.

Similar conclusions could be reached for some of the other taskforces, in particular crop loss assessment and biotechnology. However, the two taskforces described above were chosen to demonstrate that if their scope were broadened and put into the context of a larger problem they could have significant global relevance. In the next section, we explore how to enhance SP-IPM's relevance and effectiveness by addressing issues jointly with other systemwide initiatives.

The Panel recommends that SP-IPM should more thoroughly analyse its taskforces with regards to scope and extended problem definition in order to expand their potential global relevance. In order to carry out this task, the Panel sees a strong need for an independent and strong global research network on IPM and recommends that the CGIAR make the SP-IPM a more visible part of its strategy for achieving its stated objectives.

²² For example, from its preliminary molecular studies with gemini viruses on tomato on the Indian subcontinent, AVRDC has established that almost each gemini virus isolated – even from closely adjacent geographic regions – is a distinct virus and that recombination among viruses is a common phenomenon (AVRDC 2001).

²³ www.cgiar.org/.../cpgene.pdf; traced December 2001.

3.2.2 Linkages of SP-IPM to Other Systemwide Initiatives

Sixteen systemwide initiatives (A-Table 2 in Appendix V) including SP-IPM are currently underway, eight of them to implement the so-called "ecoregional approach" and to strengthen specific areas of CGIAR research. The previous TAC review²⁴ (CGIAR 1999) of eight systemwide programmes (not including IPM) mentions two issues that seem to be of high relevance for SP-IPM. The complementarity among programmes, including different systemwide programmes and relevant Centres not included in the systemwide programme as well as outside research institutes and advanced NARS or ARIs, need to be explored. Secondly, recent advances in computer modelling and GIS offer new potentials for the transfer of site-specific research results. These observations, especially the second one, very much apply to SP-IPM.

For example, the affiliation of SP-IPM with the Consortium for Spatial Information (CSI)²⁵, which emphasises GIS, would appear to have the most immediate impact, in the context of food security issues, on up-scaling SP-IPM results that have produced identified ecological principles from site-specific research. In a similar way, SP-IPM could have a significant impact on at least four inter-centre initiatives: Integrated Natural Resources Management, Systemwide Initiative on Malaria and Agriculture, Rice-Wheat Consortium for the Indo-Gangetic Plains and the Systemwide Livestock Programme. The mechanism for the linkage to these areas is through the use of modelling and ecosystem analysis in the context of GIS. It must be recognised that relevant IPM analyses can be done effectively only using approaches that provide a thorough understanding of the biological and ecological dynamics of the cropping systems and hence methods must be used that are flexible and can incorporate the biotic and abiotic complexity observed in the field. Unfortunately and as observed by the Panel chair, IPM scientists in the CGIAR do not always have good notions of how to evaluate complex systems using methods that fall under the ambit of modelling and agroecosystem analysis. However, these methods provide the basis for achieving the holistic sustainable crop production/protection goals of SP-IPM. The models must be systems-oriented, comprehensive and be developed from solid field and laboratory research. The models must allow new accrued knowledge to be easily incorporated so that they become growing dynamic libraries of knowledge about the agro-ecosystem. The models must be driven by weather and abiotic factors and have the capacity to be implemented in real time and be independent of time and place. Members of IITA's PHMD and affiliated ARI scientists have made considerable progress in this area. Physiologically based plant models of growth and development of cassava (Gutierrez *et al.* 1988, 1999), maize (Bonato *et al.* 1999), stored products (Meikle *et al.* 1999) and cowpea (Tamo *et al.* 1993) have been developed that capture the effects of weather and edaphic factors on plant growth dynamics. Some similar plant modelling work is ongoing at ICRISAT and IRRI, but that work is beyond the focus of this review but has considerable relevance to SP-IPM. The cassava and cowpea models include the effects of pests and natural enemies. Other models are also available at other ARIs (alfalfa, apple, coffee, cotton, grape, rice, common bean and tomato) and still others could be developed that could be used to help the IARCs move beyond mandated crops. Modelling systems have an increasingly important role to play in assessing economic impact of pests, the efficacy of biological control agents and the role of transgenic crops in pest control. Physiologically

²⁴ Review of System-Wide Programmes with an Ecoregional Approach, TAC Secretariat, Rome, August 1999.

²⁵ CSI is not a System-Wide Programme.

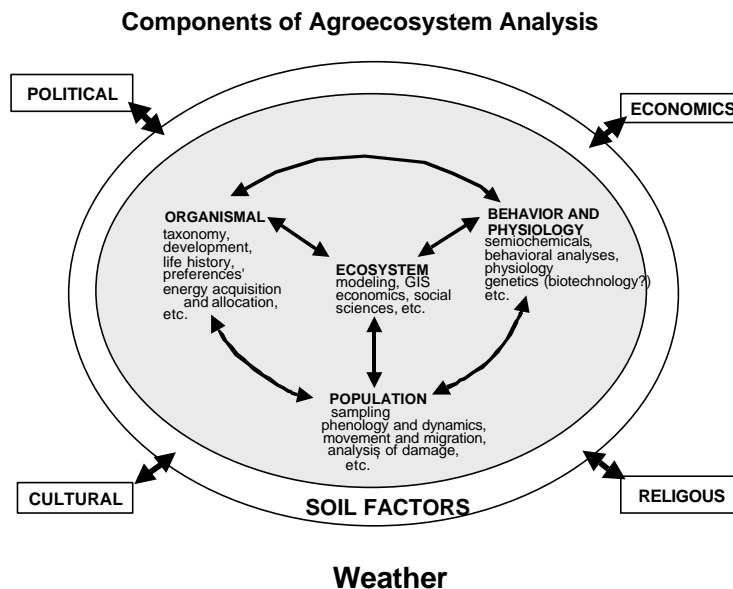
based models have the capacity to extrapolate across ecological zone²⁶ and may be used as production functions in economic models for analyses across wide geographic areas. Approaching problems from this perspective may require some Centres to recruit new scientists with appropriate integrative skills and of course there needs to be a greater degree of interdisciplinary research. Once developed, the models provide the capacity for rapid strategic responses to biological, ecological and sociological problems in agriculture in a time varying environment - for assessing the impact of IPM programmes. Such models would also position IARC scientists to examine the threat of unforeseen pest-climate-technology interactions, to run possible climate change scenarios concerning the effects of climate on crop growth rates and productivity and examine the frequency and seriousness of pest outbreaks (Rochat and Gutierrez 2001). To do this, the technological bases of IARC research and implementation in IPM must grow in sophistication.

3.2.2.1 IPM systems modelling

To further illustrate the previous points on the possibilities of systems modelling in IPM some additional explanation is provided. The research components of a typical IPM modelling application are found in Figure 6.

At the ecosystem level, the integrating technologies are modelling and GIS. Population models must be built up from the individual physiological and behavioural level and be driven by soil factors and weather. Policy issues must include social science components impinging on the agroecosystem structure and function.

Figure 6: Components of Agroecosystem Analysis



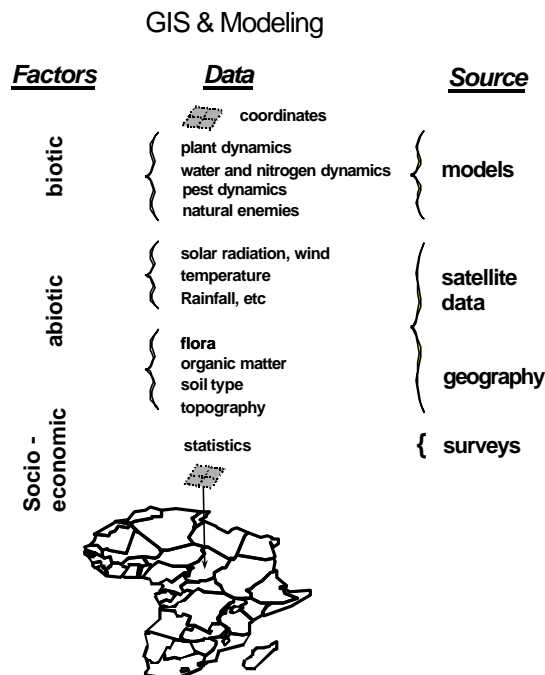
Source: CASA (2000) consultancy document.

²⁶ The concept of ecological zones has heuristic value, but it is more appropriate to view these zones as gradients. This is especially true in East Africa where rapid changes in elevation create micro-ecological zones.

The systems models described above can be implemented in GIS and used for site specific or regional analyses. Some of the components of a linked GIS/modelling system are illustrated in Figure 7. For example, the GIS system developed for the FAO Locust group using UNDP funds incorporates components dealing with weather from various sources (e.g. satellites, ground, etc.) that are essential components for implementing IPM models regionally. Several of the IARCs co-operating in SP-IPM are engaged in GIS development and some are part of the new CGIAR CSI initiative. Of these, CIAT, ICRISAT and CIMMYT appear to have the greatest experience and infrastructure for GIS work. Early CGIAR GIS applications in IPM include climate matching of different regions in the Americas and Africa to determine ecological homologues where natural enemies of the cassava mealy bug (CM) and cassava greenmite (CGM) might be found in the Americas. This exercise proved especially useful in the successful biological control of CM and in the ongoing efforts on CGM. GIS applications also have importance to studies on the effects of climate change on various aspects crop production and protection, biological control, IPM and regional economic analyses. SP/WF-IPM, SP/PPM-IPM's stem borer project and IITA's larger grain borer projects have ongoing GIS activities, but they are of a preliminary nature and need further development.

IPM applications across crop systems have many aspects in common; hence system-wide effort to develop a GIS should be co-ordinated among Centres and include planning for potential biological and economic applications early in the design stage.

Figure 7: GIS & Modelling



Source: Gutierrez 1996.

The Panel recommends that in order to make full use of relevant disciplinary expertise, SP-IPM should more seriously explore the complementarities among programmes including different systemwide programmes and relevant Centres not included in the systemwide programme as well as outside research institutes be they advanced NARS or ARIs. To fully utilise recent advances in computer modelling and GIS that offer new potentials for the transfer of site-specific research results SP-IPM should adopt these concepts as a unifying part of its research strategies.

3.2.3 Socio-economic and Policy Research

Distinguished researchers of pest management have come to realise that in future much of the advances in IPM will have to come from social science research (e.g. van den Bosch 1967; Zadoks 2000). The review of IPM in the IARCs (CGIAR 2000) has reached a similar conclusion. As described in Chapter 1 the SP-IPM did not yet internalise these recommendations. By and large it is still a natural science-driven research programme that leaves the pre-conditions and the incentive structure that invariably affects the adoption of IPM by farmers in the realm of external assumptions. This, of course, ignores that reality paints a different picture. Adoption rates of IPM even in a crop like irrigated rice in Asia - where significant investments and efforts did take place - is apparently still very low (Heong *et al.* 1998; Oudejans 1999; CGIAR 2000). This is perhaps not a unique situation for IPM alone. For instance, the Review of Systemwide Programmes with an Ecoregional approach (CGIAR 1999) has found a similar situation for Natural Resource Management (NRM) research in the CGIAR. Therefore, the recommendation of the Panel was that Centres undertake a special effort to strengthen the social science and policy aspects of NRM. As regards IPM, this Panel concludes that SP-IPM in the past has not been effective in contributing to an enabling policy environment for IPM, a guiding principle whose realisation is conditional to a successful implementation of IPM programmes at the field level.

Without establishing effective links to institutions involved in policy analysis and with experience in managing policy change, the natural scientists involved in IPM research will likely be unable to progress much on this front. Natural partners within the CGIAR are IFPRI for policy analysis and ISNAR for managing policy change through partner institutions in developing countries. However, involvement of advanced NARS and ARIs is also an option in case existing priorities of the CGIAR policy Centres²⁷ do not provide much room for IPM.

Regardless of the institutional arrangements the list of possible research topics on the socio-economic and policy aspects of IPM could be long but for brevity only a few shall be mentioned. First of all, clarification of the crop loss question could produce significant benefits in terms of global public goods provision. While SP-IPM has improved the concept of crop loss assessment beyond experiment station field trials and has included a farmer perspective, it has not made the connection to aggregate production, product quality, prices and costs, i.e. interpreting physical loss in terms of economic loss. Likewise the notion of conducting crop loss research in context of generating a better understanding of the factors that affect yield and yield variability has not yet been encompassed by SP-IPM. If the hypothesis of rising levels of crop loss in relative terms put forward in the studies cited in Chapter 1 can be confirmed, then the existing research priorities deserve re-assessment. In the opposite case, a re-thinking of existing pest management strategies is necessary.

²⁷ It should be noted however that ISNAR has been involved in SP-IPM in the area of impact assessment of Farmer Field School approaches to IPM.

Furthermore, to assess the impact of pre-and post harvest crop loss on household level food security, taking into account effective coping strategies has not been addressed and requires new and innovative social science research. Validated crop loss information can become an important input in forecasting world food supply. Here, the concept of incorporating pests in aggregate production functions by applying the damage function approach (Lichtenberg and Zilberman 1986) could produce valuable information.

Secondly, the analysis of the effects of distortions in crop protection policy is a necessary input for governments who want to implement national IPM programmes. As established in a World Bank study (Farah 1993) very often there various forms of price-based and institutional-types of pesticide subsidies exist that can discourage farmers to adopt IPM. Developing countries that want to compete in the agricultural markets of the OECD countries have to respond to changes taking place in international trade. Globalisation accompanied by international regulation pose challenges and opportunities for the agricultural sectors of exporting developing countries, e.g. for fruits, flowers, processed or specialised foods and fibre products. At the same time, national regulatory agencies in importing countries are imposing stricter standards on allowable product quality and lower tolerances for residue levels of pesticides in agricultural products. For example, the European Union in July 2001 has affected lower maximum residue levels for all imported commodities. From this, stricter basis in government regulations which are protected by WTO, more and more food processing companies and food retailers are developing new product lines that demand even stricter standards of production, including organic foods and fibres and products that are certified as being produced with minimum environmental impact and improved sustainability of agricultural resources.

It is in this area of policy research where SP-IPM can make an important contribution. In this connection it is also important that effective linkages are established to the Global IPM Facility (GIPMF) at FAO Rome. GIPMF as a multi-donor undertaking has been charged with implementing a farmer-driven and ecologically-based IPM approach. Its recently completed mid-term review has urged GIPMF to play a more pro-active policy role. GIPMF's Governing Board in its recent annual meeting²⁸ strongly endorsed this recommendation and hence, this is likely to stimulate demand for policy research in this field. A third research theme of social science research and IPM is in the area of impact assessment. Up until now only few analyses have been conducted that demonstrate the impacts of IPM in large-scale programmes. One of the exceptions probably is the project on biological control of the cassava mealy bug (Norgaard 1988; Zeddies *et al.* 2001).

One of the problems with impact assessment of IPM is that the realisation of its benefits depends on a number of conditions such as effective extension tools, the marketing activities of the pesticide companies and policy conditions like pesticide prices. Also, it has been demonstrated in crops world-wide (e.g. cotton, rice) that many pests are often man-induced due to misguided control interventions that can cause considerable negative externalities. Therefore, the benefits of IPM may much depend on the ecological conditions created by prior pest control interventions raising the question of defining benefits and costs. (One such problem may well be the global whitefly problem currently being addressed by SP-IPM.). Economists outside the realm of agricultural development in an article in the *Economic Journal* (Cowan and Gunby 1996) have identified IPM as a typical case for path dependence,

²⁸ This took place on 10-11 December 2001, at FAO /Rome.

explaining why IPM was not yet adopted widely despite of its economic advantage against unilateral chemical control.

The questions raised in relation to IPM impact assessment (see also Chapter 1) show the need for developing a methodology that is based on advanced methods of social science and, where links to say, Natural Resource Management programmes that face similar problems may be useful.

The Panel recommends that socio-economic and policy research be added as a major component of SP-IPM. There are at least three broad themes that deserve to be given more attention if SP-IPM wants to make relevant and significant contributions to international agricultural developments, namely (1) economically defined crop loss assessment, (2) policy research in response to national crop protection policies and international trade issues, i.e. IPM and globalisation and (3) impact assessment that incorporates natural resource management aspects into social science research.

3.3 The CGIAR With or Without SP-IPM?

The ultimate question that needs to be answered with all systemwide programmes is whether the costs are commensurate with the benefits that are expected to emanate from planned and co-ordinated inter-centre activities? There needs to be a comparison to a situation where Centres continue to perform IPM research activities in isolation and through occasional exchanges largely on the basis of personal contacts. Undoubtedly, this is a difficult question and until now all systemwide reviews basically have failed to answer this question. The report of the recent review of the systemwide livestock programme (SLP) stated: "...the answer in the case of SLP is highly judgmental as the full costs are tricky to measure and the benefits are impossible to assess well at this still early juncture. The Panel feels, however, that, overall the benefits will be commensurate with and will probably well exceed the costs"²⁹. Similarly, the review of Systemwide Programmes with an Ecoregional Approach (CGIAR 1999) concluded on the cost-effectiveness/value added question: "the Review Panel was unable to address this part of the Terms of Reference satisfactorily due to lack of hard data on both the costs and benefits".

Much the same can be said about the SP-IPM. Especially, the benefits in terms of global public goods provision largely remain unknown at this stage while the benefits of individual Centres participating in the programme are easier to identify. In an attempt to provide at least a partial and qualitative answer to this question we first describe the counterfactual situation without SP-IPM.

²⁹ The system-wide Livestock Program Centre-and TAC commissioned External Review, Rome 2001.

3.3.1 Without SP-IPM

Needless to say, that if SP-IPM will be discontinued there will still be IPM research in the Centres. The question however is what level of significance this research is likely to have. The results of the evaluation study that tried to assess the status of IPM at the IARCs (CGIAR 2000) may be helpful to describe the situation without SP-IPM:

IPM in most cases is almost as old as the Centres themselves. The definition and meaning of IPM differs widely among Centres. Dominant among the Centres is the technological paradigm of IPM, i.e. the technology transfer model. Only in some cases, this paradigm seems to be changing with and emergence of the participatory concept in IPM implementation, as well as in the development of component technologies:

- through IPM, research programmes in the Centres were made aware of the danger of relying on chemical pesticides as the only means of pest control. This is reflected in the high priority given to resistance breeding although initially this was not formally treated as a component of IPM in Centre programmes;
- for integration of IPM in the Centres' activities, it was found that little funding for IPM seems to come from the core budget. Probably because of its outreach character, IPM is largely a donor-driven programme;
- there is little evidence that IPM in the Centres has become the overall research philosophy in crop science. Yet, there seem to be some exceptions to this, notably among the Centres that do not have crop mandates;
- as regards the future of IPM, Centres generally seem to place much hope in the potential of biotechnology as the novel approach to IPM. However, a strategy of how biotechnology can be integrated in IPM does not seem to exist;
- helping NARS partners design national crop protection plans is rarely on the agenda of Centres although many of them engage in joint implementation of IPM pilot projects and training activities; and
- as regards research partnerships, overwhelmingly IPM in the Centres is still relying on 'backward linkages' with the input supply industry. Rarely do Centres establish co-operation with crop marketing institutions and the food industry.

These seven points indicate that in a situation without SP-IPM crop protection research in the IARCs will continue to be carried out following IPM concepts. On the other hand, it is likely that these isolated and routine research activities will perhaps just produce "more of the same". Relative to some ARIs, some of the larger NARs (e.g. Brazil and China) and especially relative to the private sector, individual Centres will be just too marginal to be a "force" and may not even be a "factor" when it comes to who determines the path of modern crop protection research. If SP-IPM is abandoned, the risk will increase that IPM research in the IARCs will become marginalised in the international scientific community. As a consequence, a brain drain will take place from the IARCs to other institutions engaged in the provision of pest management technology. Presumably it will be the private sector that will harbour the best brains of IPM. As mentioned elsewhere (CGIAR 2000) this process has begun already. Therefore, the Panel views the question on benefits of the SP-IPM not so

much as a question of "the value added" but much more as question of "survival" in a rapidly changing scientific community.

3.3.2 An Optimised SP-IPM

To provide a final assessment on the future role of SP-IPM, the Panel submits that one cannot base this judgement on past programme performance alone. In its initial phase, SP-IPM had to struggle largely with "domestic problems" (from the CGIAR viewpoint) of developing effective mechanisms for inter-centre collaboration.

At this level, the benefits of SP-IPM occur as gains to policy makers of unified approaches to problem solving and to donors that get greater returns for their investments and at the same time a decrease in the numbers of solicitations and proposals to review. Individual scientists gain professionally from collaboration on significant large-scale problems and become part of a global science team that also gives them protection should their findings threaten vested interests. Furthermore, NARSs/NGOs get a clearer path for scientific collaboration and implementation of IPM research results.

However, the future SP-IPM must reach beyond this level. The Panel wants to make it very clear, that it views the existing structure, conduct and performance of the SP-IPM no longer adequate if the challenges that lie ahead are to be met and if the CGIAR wants to continue to be a major player in the international scientific community that deals with crop protection.

Hence, there is no point to continue the SP-IPM in the way it was structured and in the way it has operated in the past. The situation is comparable to the one of a speeding airplane on a runway shortly before take-off: when the point of no-return is approaching, pilots either have to exert a full brake or take-off. The Panel thinks that the SP-IPM should fly and that the opportunity costs of not taking-off would be high. Of course, before take-off the destination should already be known.

In the previous chapters of the report we have given some indications what the scope of the "new SP-IPM" could be but we did not yet elaborate much on its operating principles. In the following the Panel offers its "vision" for an optimised IPM followed by suggestions for a non-conventional organizational structure. As a major guiding principle, an optimised SP-IPM must take a trans-disciplinary and an institutionally outward looking stand. Its main goal should be to identify and fill significant gaps in research that exist with regards to the underlying principles which need to be understood in order to identify and implement socially optimal combinations of pest management technologies in the spirit of the IPM definition adopted by the SP-IPM before (see Chapter 2). In more concrete terms, this means that SP-IPM should focus on pest problems and other pest control related questions with a global or at least a regional dimension. As regards global/regional pests, the obvious example is whitefly but the Panel could imagine other candidates such as weeds, bollworms in corn and cotton and diamond back moth in vegetables could be added to this list. Here, the ecological modelling concepts described in the previous chapter could become a more intensively applied tool to be developed further as a result of these efforts.

As regards global issues of pest management technologies the SP-IPM must deal with the problem of the pesticide spiral (threadmill) and make sure that the lessons learned from chemical pesticides are being applied in the implementation of modern biotechnology,

especially transgenic seeds for pest control. This means that a social science component has to be added to SP-IPM. Ultimately, SP-IPM could adopt the role of an "honest broker" in assisting international and national programmes to implement IPM at the farm level. Possible research topics were listed in the previous chapter. However, a "liaison function" would have to be added in order to effectively communicate research results and to make sure that its research at least will stimulate discussion if not induce change. In this regard, SP-IPM should liaise closely with the Global IPM Facility, especially in the field of designing IPM policies and in developing and evaluating adequate extension strategies for up-scaling IPM globally.

As regards its operational principles, the SP-IPM must explore new ways of effectively implementing rules for co-operation among participating Centres. Because of the unique role IPM plays among the IARCs, i.e. every Centre regardless of whether its main focus is on germplasm improvement, natural resources management or socio-economic and policy research does have IPM activities, there is no natural lead Centre for IPM. While IITA has played that role in the past (and other Centres have agreed to this³⁰) the Panel suggests adoption of an alternative organizational arrangement for the future SP-IPM. If the objectives of SP-IPM are broadened in their scope expertise is required that is outside the crop protection disciplines. Hence, the option of placing the Management and the Secretariat of the SP-IPM outside the jurisdiction of an individual Centre, i.e. creating a kind of virtual IPM Centre should be given serious considerations. The Panel sees two options for identifying a "home" for an "upgraded" SP-IPM secretariat:

1. the first option is to link the co-ordinator position to TAC (or Science Council in the future) with its base at FAO Rome. The rationale for the choice of location is the close vicinity of the GIPMF based at FAO's Crop Production and Crop Protection Division. Hence, there could be significant efficiency gains from bringing together global IPM research co-ordinated by the CGIAR and global IPM implementation convened by GIPMF at the same location. Both institutions, the SP-IPM and the GIPMF could benefit from such an arrangement also allowing donors to undertake better targeted investments in IPM; and
2. the second option would be to place the SP-IPM programme for bidding open to any research organization with sufficient competence in IPM. This would leave the question of where the secretariat will be based to the market. Bidders could be IARCs, ARIs or advanced NARS. Selection of offers should be done by TAC/SC based on specified criteria.

In both options the "virtual IPM Centre" should be responsible to the Science Council and the new Executive Council. To be able to work effectively the co-ordinator position should be synonymous with the former programme leader and be given the status of a Centre Director supported by a small staff. The Panel submits that such arrangement could serve as a model for selected other global issues of the CGIAR such as for example a common policy for Intellectual Property Rights (IPR). However, such arrangement would be different from other systemwide programmes or the new global challenge programmes. While the latter will address long-term global research problems, an upgraded SP-IPM programme in the form of a "virtual IPM Centre" would deal with global research questions in the natural and the social sciences and engage itself in communicating research results in order to influence policy. The Panel strongly believes that the issues of pests and pest management have scope that goes far

³⁰ Letter of Dr. Brader to participating Centres. 19 December 2000.

beyond the range of other systemwide programmes. The co-ordinating role of a virtual IPM Centre is of increasing importance in identifying regional and global IPM issues, enhancing research quality and productivity of the existing SP-IPM taskforces, facilitating rapid implementation of IPM best-bet options through other IPM institutions and in creating a conducive policy environment for IPM.

The co-ordinator position must provide intellectual leadership and this requires a person of excellent technical skills in ecosystem analysis, ecology and economics, with persuasive management and interpersonal skills and with physical and mental stamina. The virtual IPM Centre needs to play the role of a strong proactive advocate of the sciences that underpins IPM and the technologies that increase IPM research and implementation efficiency. Funding for the co-ordinator position should come from CGIAR core funds. The focus of the co-ordinating unit must be on systemwide issues if it is to foster rapid solutions to regional and global pest problems and hence it must be shielded from parochial Centre views. It also must have sufficient authority to work effectively across Centre mandate boundaries and to assemble taskforces of the best scientific talent across Centres and among IARCs when the high-level expertise is not available within the CGIAR. It should be able to establish co-operative research effort with IARCs via joint funding and binding research agreements. Such outsourcing arrangements have been used in the past, but greater emphasis on equal partnership mechanism is recommended to assure greater research efficiency, greater accountability, potentially lower donor costs and more rapid implementation of IPM technologies.

If there are perceived losers of the concept of a "virtual IPM Centre", it is the Centres and their Boards, which will loose influence in their handling of systemwide issues. However, the Panel thinks that such re-direction is in the interest of the common good and is largely in line with the restructuring efforts currently undertaken by the CGIAR. To put this arrangement into practise requires "political will" from the CGIAR leadership and a clear demonstration that co-operation means greater institutional stability through increased funding and reduced risk from loosing out in competition for the same resources.

In summary, the Panel observes that within the CGIAR the potential contribution of IPM to sustainable agricultural development has not been fully recognised. Such neglect bears a significant risk that the "pest-pesticide spiral" will continue to accelerate, negating the potential contributions of relevant advancements in biotechnology and information technology for an effective, efficient and sustainable management of pests. The fact that in the past IPM has not made it to the "upper echelons" of the agenda of study and analysis of food policy and food security (in the realm of socio-economic research) does not mean that it is a factor of secondary importance. The Panel points out that this may as well be due to the complexity that the incorporation of longer-term ecological processes on the one hand and of human behaviour in the context of community action into economic models will entail. However, the need for sustainable management of the natural resource base that underpins the long-term productivity of agriculture, issues that deserve more attention. For example, to clarify the relative roles of genetic improvement of crops (including traditional host plant resistance and biotechnology) in the sustainable management of pests requires economic models that include ecological processes so that the costs and benefits of new technologies are to be assessed correctly. Failure to recognise the connection between ecology and economy in the management of pests will lead to the development of unbalanced and unsustainable crop production technologies. In the Panel's view, the importance of plant breeding for increasing crop productivity is widely acknowledged within the CGIAR, but the role of IPM in enabling

the potential to be met has not yet been sufficiently analysed. However, with increasing intensification of agriculture in developing areas, the need for IPM in crop production and protection must increase if the goal of food security and sustainable management of natural resources is to be met. One needs to look no further than the pesticide induced outbreaks of rice brown plant hoppers in Asia during the green revolution and pests in cotton world-wide to appreciate the benefits of sound IPM. The recent solutions of the cassava mealy bug (CM), cassava green mite (CGM) and other pests in Africa are further positive IPM/biological control examples. Policy makers should be informed that natural and biological control are the backstopping mechanisms of sustainable crop protection and can increase the effectiveness of IPM.

The SP-IPM Review Panel recommends that the status of IPM be greatly elevated within the CGIAR and to be upgraded beyond the focus of the current systemwide programme. That SP-IPM in the future should be organized as a "virtual Centre" with minimal infrastructure but maximum linkages. The Panel views this as the best way to develop a global structure that has a fair chance to overcome the problem of rising crop losses from pests and the growing level of pesticide use world-wide. The co-ordinator position should serve as a liaison and "honest broker" between the Centres and other IARCs, donors, development organizations and the GIPMF on IPM issues. The co-ordinator position should be at the level of a Centre Director. Funding for the SP-IPM programme co-ordinator position should come from CGIAR core funds. The Panel recommends to establish the virtual IPM Centre either directly under TAC/SC or alternatively with any other research organization of international status in IPM to be determined through an open bidding process and to be coupled contractually to the CGIAR.

ACKNOWLEDGEMENTS

The Panel expresses its sincere thanks to the CGIAR and TAC for the opportunity to be of service in this most important area of agricultural research. We especially thank The TAC Secretariat, Drs. Shellemiah Keya and Timothy Kelley and their staff for their dogged patience and persistence in the completion of this review. The Panel thanks Directors-General Lukas Brader (IITA), Joachim Voss (CIAT) and Hans Herren (ICR) for facilitating access to information and their scientific staffs. The Panel wishes to express our sincerest thanks to the collaborating CGIAR, ARI and NAR scientists, extension service and NGO worker and the wonderful co-operating farmers who all willingly gave us access to their work and ideas, the hopes and difficulties of their work and the unbridled enthusiasm most had for their cooperative work. This high degree of collegiality across these levels made the severe difficulties of this review well worth the effort. The list of specific people requiring acknowledgement is long, but special thanks are due Richard Markham, Pamela Anderson, Brima James and Peter Neuenschwander for their extreme patience in organizing our visits, providing information, answering question and a collegial atmosphere. We apologize for any omissions in this list. Jock Anderson, Derek Byerlee, Gershon Feder and Gerd Fleischer from the World Bank and Peter Kenmore from the GIPMF provided invaluable insights and criticisms.

Last, the Chair wishes to acknowledge the tireless efforts of Professor Hermann Waibel who took the lead in formulating economic and policy issues and for my wonderful exposure to these vital areas of IPM.

COMPOSITION OF THE PANEL AND BIOGRAPHICAL INFORMATION

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Professor and Entomologist, Division of Ecosystem Science, University of California, Berkeley.

Expertise: Entomology, IPM-biological control, insect ecology, agroecosystems analysis, population ecology, plant-herbivore interactions, tritrophic modelling, agricultural economics, GIS.

Education: Postdoctoral studies, University of British Columbia, Canada (1970); Ph.D. (insect ecology/IPM/biological control), Univ. California, Berkeley (1968); M.S. (biological control/insect ecology), Univ. of California, Berkeley (1966); B.S. in Biology, Arizona State College (1962).

Experience:

Since 1972: Assistant Professor, Purdue University.

1968-70: Research Scientist, Commonwealth Scientific and Industrial Research Organization, Canberra, ACT, Australia.

Other relevant professional experience:

- Panel Member of the 5th EPMR of the International Institute of Tropical Agriculture (IITA).
- Member, Executive Committee and Associate Director National IPM project (Huffaker Projects).
- Associate Director, National IPM Project (Adkisson Project) and leader of systems analysis.
- Leader IPM cotton project, California, Co-leader — IPM alfalfa project, California.
- *Founder* of the University of California State-wide IPM Project, Chairman of State-wide UC/IPM Technical Committee, Appointment FAO Panel of Experts in IPM, Rome, Italy, Chair, Africa-wide Committee on Biological Control.
- Founding member of the University of California Centre for Sustainable Development.
- Founding member of the University of California Centre for Biological Control.

He has carried out numerous consultancies, some examples of which are: FAO/Cotton in Nicaragua, California Wine Advisory Board, FAO/Brazilian Government - Biological Control of Cereal Aphids. Examples of some honours and awards which he has received are: Member Third USA/USSR Scientific Exchange, Yalta, USSR (1978), US Representative and Member, Pest Management Network, International Institute of Applied Systems Analysis, Vienna, Austria (1978 to 1986).

WAIBEL, Hermann (GERMANY)

Professor of Agricultural Economics, Faculty of Economics at Hannover University; Chair of Agriculture, Environment and Development.

Expertise: Resource and Environmental Economics of Horticultural and Agricultural Systems; Development Economics; Economics of Integrated Pest Management; Economics of Organic Agriculture/Horticulture; Economics of Urban/Peri-Urban Agriculture; Impact Assessment of Development Projects and Agricultural Research.

Education: Ph.D. Agricultural Economics, University of Hohenheim (1984); M.Sc. Agricultural Economics, University of Hohenheim (1979).

Experience:

Professor of Agricultural Economics, Faculty of Economics at Hannover University; Chair of Agriculture, Environment and Development.

Director of International Affairs of the University of Hannover; Chairman of the University's Senate Committee on International Relation; Head of Institute of Horticultural Economics, Chairman of Inter-Governmental Association of Business Management in Horticulture in Germany.

Vice-Dean and Chairman student relations (Dean of Student Affairs), Faculty of Horticulture (until 10/2000).

Professor of Agricultural Economics, University of Göttingen (1991 – 1994); Head of Institute of Agricultural Economics, Faculty of Agriculture, Göttingen University (1993-1994).

Associate Professor of Farming Systems Economics, Asian Institute of Technology (AIT); (1988 – 1990), Bangkok, Thailand.

Project Economist, Thai German Project on Integrated Pest Management in Thailand (1984 – 1988), Bangkok, Thailand.

Associate Project Economist, Philippine German Project on Pest Surveillance (1980 – 1982).

Research Scholar of the German Academic Exchange Service (DAAD) in the Philippines (1979-1980).

**TERMS OF REFERENCE
FOR EXTERNAL REVIEW OF THE SP-IPM**

1. Assess the relevance of the SP-IPM's objectives³¹, priorities and strategies to the goals of the CGIAR, including evaluating the mechanisms used for setting priorities.
2. Assess the effectiveness and efficiency of the SP-IPM in:
 - (a) Achieving coherence in pest management related research across the CGIAR System and other stakeholders, especially NARIs and NGOs;
 - (b) Stimulating new directions in research that contribute to the System's overall IPM research agenda;
 - (c) Adding value to the System's ongoing research, to the benefit of knowledge relevant to IPM, agriculture and ecosystem sustainability and human well being.³²
3. Building on the 1999 IAEG study on the impact of IPM, evaluate the quantity and quality of the SP-IPM's outputs and impact with respect to:
 - publications;
 - capacity building;
 - methodologies, technological innovations;
 - research achievements and actual/potential impact to-date; and, processes in place for monitoring/enhancing quality of outputs/impact.
4. Assess effectiveness of the SP-IPM's governance, decision-making, organization, accountability, resource mobilization and allocation and mode of operation, including identification of constraints in implementing the programme and lessons learnt.
5. Evaluate the effectiveness of IITA's convening role, including the relation between the SP-IPM and IITA's own research agenda.
6. Assess the need and continuing relevance of the SP-IPM and make recommendations as to its future role, its organization and funding.

³¹ The SP-IPM was created to ensure that "IPM principles guide all pest control efforts within the CGIAR System" and that IARCs should "strongly support research leading to its wider application." The more specific objectives of the SWP-IPM were to:

- strengthen inter-Centre collaboration,
- enhance communication and cooperation between IARCs and partners, provide a collective voice and focus on IPM issues,
- identify IPM opportunities and develop joint projects,
- support IPM implementation through research and training and,
- promote public awareness of CGIAR Centre IPM activities.

In pursuing these objectives it was envisioned that the SP-IPM would help ensure greater impact of CGIAR IPM activities at the farm level by (a) encouraging farmer participation and the formation of effective collaboration with organizations primarily concerned with IPM implementation; and (b) focus attention of IPM activities on sustainability and human well-being. (Note: The objectives of the SP-IPM have evolved over the years--the current version of the goals, purpose and expected outputs are found in the attached file.)

³² In particular, see the guidelines endorsed for promoting IPM development and implementation as elaborated in the revised CGIAR Policy Statement on IPM.

**List of Persons Interviewed
or Part of Discussion Groups**

SP/PPM-IPM Pilot Site Visit, Zaria, Nigeria, 26 January 2001

Jacob P. Voh	Director, Institute for Agricultural Research (IAR)
T.K. Atala	Sociologist & Head, Department of Agricultural Economics and Rural Sociology
S.O. Alabi	Cotton Plant Breeder, IAR
I. Kureh	Plant Physiologist, IAR
S. G. Aolo	Maize Plant Breeder, IAR
M. Hussaini	Agronomist, IAR
A. Odunze	Soil Scientist, IAR
A. Danbaba	Sasakawa Global 2000 (NGO SG 2000)
Ayuba Shnew	Deputy Director, Kaduna State Agric. Development Project
Alhayi Iaris	KADP, Motts Barau, Zaria
Sale Ibrahim	KADP, Mangana Zone

SP/PPM-IPM, 10 March 2001, Meeting at ICIPE, Mbita Point (List of Participants)

George Odhiambo	KARI	Agronomist
B.O. Onyanho	DALEO/MOA&RD	DALEO
Peter Nyongeh	ICIPE	Farm/Estate Services
Eva Gachern	KARI/ICRAF	Weed Scientist
Bart Knols	ICIPE	Medical Entomologist
Bill Overholt	ICIPE	Scientist (Entomologist)
Peter Akango	AEP	Extention
Z.M. Magara	for PDALE-Nyanzs	DAO (District Agric. Officer)
Janny Vos	CABI	Scientist
Brima James	IITA	Scientist
Khaled Makkouk	ICARDA	Scientist (Virologist)
Hugo de Groote	CIMMYT	Scientist (Entomologist)
E.M. Minja	ICRISAT	Scientist (Entomologist)
Naboth Ochiel Ayugi	Farmer	
Lawrence Odek	Farmer	
Boaz Outta Nyateng	Farmer	
A.P. Gutierrez	SP-IPM Review Committee	
H. Waibel	SP-IPM Review Committee	
Z. R. Khan	ICIPE	Scientist (Entomologist)

H. A. O. Agengo	MOARD	DAV
H.B. Ndonga	MOARD	DEC
Matilda Ouma	MOARD	AHEO/GEM

SP/Whitefly-IPM Site Visit to CIAT - CIAT Staff interviewed:

Joachim Voss	Director General of CIAT
Aart van Schoonhoven	Director of Research for Genetic Resources
Jaqueline Ashby	Director of Research for Natural Resources
Alvarez, Elizabeth	(Pathologist) Cassava and IPM Projects
Anderson, Pamela	(Entomologist) Coordinator, SP-IPM Whitefly Project
Bellotti, Anthony	(Entomologist) IPM Project (Leader)
Calatayud, Paul	(Entomologist) IRD Research Fellow
Calvert, Lee	(Virologist) Rice Project (Leader) and IPM Project
Cardona, Cesar	(Entomologist) Bean Project (Leader) and Forages Project
Cooke, Simon	(Crop Biologist) Land Use Project (Leader)
Hyman, Glenn	(Geographer) Land Use Project
Jones, Peter	(Modeller) Consultant
Kelemu, Segenet	(Pathologist) Forages and IPM Projects
Mahuko, George	(Pathologist) Bean Project
Morales, Francisco	(Virology) Virology Laboratory (Head)

SP-IPM Workshop Participants, 15-17 March 2001:

Abou Thiam	PAN-Africa
Bellotti, Anthony	CIAT
De Groote, Hugo	CIMMYT-Kenya
Douthwaite, Boru	IITA
Gallagher, Kevin	IPM Facility
Gutierrez, Andrew	CGIAR Reviewer
Hedlund, Roberts	USAID-EGAD
James, Braima	SP-IPM
Khan, Zeyaur	ICIPE
Kimani, Martin	CABI-Kenya
Lagnaoui, Aziz	CIP
Loevinsohn, Michael	ISNAR
Makkouk, Khaled	ICARDA
Markham, Richard	SP-IPM

Minja, Eli	ICRISAT-Kenya
Neuenschwander, Peter	IITA
Nono-Womdim, Remi	AVRDC
Nwilene, Francis	WARDA
Overholt, William	ICIPE
Roling, Neils	Wageningen, Netherlands
Sherwood, Steve	(IPM Facility/CIP)
Van der Fliert, Elske	CIP
Verchot, Louis	ICRAF
Vos, Janny	CABI-UK
Walker, Tom	CIP
Waibel, Hermann	CGIAR review
Whitaker, Mike	GCPF
Youm, Ousmane	ICRISAT

SP-IPM WORKSHOP 13 March 2001 (Visit to ICIPE R&D facilities)

Peter Njagi	Chemical Ecology Scientist
S. Sithanatham	Vegetable IPM Scientist
F. Onyango	Animal rearing and Quarantine
S. Raina	Apiculture and Sericulture Scientist

Visits to the CGIAR Secretariat, Washington DC

J. Reifschneider	Director CGIAR
M. Lantin	Science Advisor
S. Ozgediz	Management Advisor

Visits to IFPRI

M Rosegrant	Research Fellow
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Visit to USAID

B. Hedlund
E. Simmons

Visits to the World Bank

G. Feder	Manager in the Economics Research Department
P. O'Connell	Consultant in Natural Resource Economics
S. Ganguly	Manager Rural Development Department

E. Terry	Crops Advisor
E. Pehu	Research Advisor Biotechnology
G. Fleischer	IPM Policy Specialist

Visit to the Global IPM Facility, ROME/FAO

K. Gallagher	Scientist
P. Kenmore	Head

CGIAR SYSTEMWIDE PROGRAMMES

A-Table 1:

Systemwide Programmes Undertaken by the CGIAR to Implement the Ecoregional Approach
<p>Sustainable natural resources management options to arrest land degradation in the desert margins of sub-Saharan Africa (DMI/ICRISAT)</p> <p>The warm humid and sub-humid tropics of sub-Saharan Africa (EPHTA/IITA)</p> <p>The humid and sub-humid tropics of Asia (IRRI)</p> <p>On-farm water husbandry in West Africa and North Asia (WANA/ICARDA)</p> <p>Sustainable rice/wheat based cropping systems in the Indo-Gangetic Plain (RWI/CIMMYT)</p> <p>Enhancing agricultural research effectiveness in Tropical America (CIAT)</p> <p>Alternatives to slash-and-burn agriculture (ASB/ICRAF)</p> <p>Sustainable mountain agricultural development (CIP)</p>
Systemwide Programmes to Strengthen Specific Areas of CGIAR Research
<p>Water management (SWIM/IWMI)</p> <p>Agricultural research indicators (ISNAR/IFPRI)</p> <p>Soil, water and nutrient management (SWNM/CIAT)</p> <p>Integrated pest management (SP-IPM/IITA)</p> <p>Genetic resources (SGRP/IPGRI)</p> <p>Livestock research (SLP/ILRI)</p> <p>Collective action and property rights (CAPRI/IFPRI)</p> <p>Participatory research and gender analysis for Technology Development and Institutional Innovation (PRGA/CIAT)</p>

SP-IPM Taskforces and level of funding (2000/2001)
(Provided by SP-IPM)

A-Table 2: SP-IPM Taskforces and level of funding (2000/2001)

Taskforce	Lead Centre	Collaborating Centres	Received SP-IPM support*	Received external funds**
Cereal stem borers	CIMMYT	ICIPE, ICRISAT, IITA	Yes (2)	
Insect pests of grain legumes	ICRISAT	AVRDC, IITA, ICIPE	Yes	
Whiteflies and gemini viruses	CIAT	AVRDC, CIP, ICIPE, IITA	Yes	Yes (Denmark, USA, NZ, UK Australia,)
Parasitic flowering plants	IITA	CIMMYT, ICARDA, ICRISAT	Yes	
Weeds in rice	WARDA	CIAT, IRRI	Yes	Yes (UK, limited)
Tsetse and trypanosomiasis	ILRI	ICIPE		
Farmer participatory methods	CIAT	CABI, CIP, GIPMF, IITA, IRRI, SP-PRGA	Yes (major)	Yes (Switzerland)
Functional agrobiodiversity	ICIPE	CABI, CIAT, ICRAF, ICRISAT, IITA, IPGRI, WARDA	Yes (2)	
Soil-borne pathogens	ICARDA	AVRDC, CIAT, CIMMYT, ICRISAT, IITA, INIBAP	Yes	
Impact assessment methodologies	CIP	to be determined	Yes	
Multi-host diseases	IRRI			
Agroforestry pests	ICRAF-ICIPE	to be determined		
Biotechnology in IPM	CIP	to be determined		
Beneficial microorganisms	IITA	CIP, CIAT, ICIPE	Yes (very limited)	

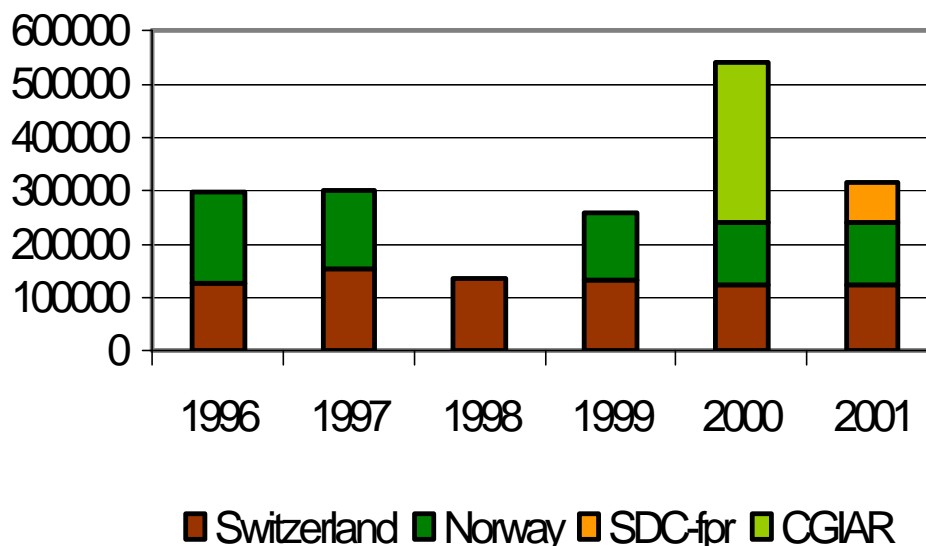
A-Table 3 (cont.): SP-IPM Taskforces and level of funding (2000/2001)

Taskforce	Lead Centre	Collaborating Centres	Received SP-IPM support*	Received external funds**
New approaches to loss assessment	IRRI	AVRDC, CIAT, CIMMYT, CIP, ICARDA, ICIPE, ICRISAT, IFPRI, IITA, ISNAR, WARDA	Yes	
Whitegrubs (and other soil pests)	CIAT	to be determined	Yes (very limited)	
Nematology	ICRISAT	CIP, ICARDA, ICRAF, IITA, IRRI, WARDA	Yes (very limited)	
Weeds in the farming system	IITA-WARDA	ASB, EPHTA, ICRAF	Yes (2)	
Partnerships for IPM adoption (pilot sites) initiative	SP-IPM	CIMMYT, ICARDA, ICIPE, ICRISAT, IITA	Yes (major)	Yes (CGIAR Finance Committee)

* Funds allocated by the SP-IPM were usually at the level of ‘seed funding’ of approximately \$30,000 to \$50,000 to organize an international workshop and prepare a substantial project proposal. Where funds allocated were at a lower level (for instance to allow the intended Taskforce co-ordinator to attend a conference and canvas opinion) this is indicated as ‘limited’ or ‘very limited’. Where sufficient funds were allocated by SP-IPM to support two international workshops, this is indicated by parentheses. Where a higher level of support was provided, this is indicated by the word ‘major’.

** Donors contributing additional external support are indicated in parentheses.

A-Figure 3: Sources of funding for SP-IPM



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GLOSSARY OF ACRONYMS

ARI	Agricultural Research Institute
AVRDC	Asian Vegetable Research and Development Centre
BMO	Beneficial MicroOrganisms
Bt	Bacillus thuringiensis
CGIAR	Consultative Group on International Agricultural Research
CGM	Cassava Green Mite
CIAT	Centro Internacional de Agricultura Tropical
CIMMYT	International Maize and Wheat Improvement Centre
CIP	Centro Internacional de la Papa
CM	Cassava Mealy bug
CMD	Cassava Mosaic Disease
CP	Challenge Programme
CSI	Consortium for Spatial Information
DFID	United Kingdom Department for International Development
EPMR	External Programme Management Review
FFS	Farmer Field Schools
FPR	Farmer Participatory Research
GIPMF	FAO Global IPM Facility
GIS	Geographic Information Systems
GMO	Genetically Modified Organism
HPR	Host Plant Resistance
IARC	International Agricultural Research Centre
ICARDA	International Centre for Agriculture Research in Dry Areas
ICBD	International Consortium of Biopesticide Development
ICIPE	International Centre of Insect Physiology and Ecology
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
IPM	Integrated Pest Management
IPPM	Integrated Production and Pest Management
IPR	Intellectual Property Rights
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Research
KARI	Kenya Agricultural Research Institute
MFAT	Ministry of Foreign Affairs and Trade
MOA	Ministry of Agriculture

MRL	Maximum Residue Level
NARS	National Agricultural Research System
NGS	Northern Guinea Savannah
NRI	Natural Resources Institute
NRM	Natural Resource Management
OFDA	USAID Office of Foreign Disaster Assistance
PANNA	Pesticide Action Network North America
PCR	Polymerase Chain Reaction
PHMD	IITA Plant Health Management Division
RCMD	IITA Resource and Crop Management Division
SG2000	NGO Sasakawa Global 2000
SIP	Society of Invertebrate Pathology
SLP	Systemwide Livestock Programme
SP/BMO-IPM	Systemwide Taskforce on Beneficial Micro Organisms
SP/PPM-IPM	Systemwide Taskforce on Parasitic Plant Management
SP/WF-IPM	Systemwide Taskforce on Whitefly IPM
SP-IPM	Systemwide Programme on Integrated Pest Management
SP-PRGA	Systemwide Programme on Participatory Research and Gender Analysis
SSA	Sub-Saharan Africa
SWP	Systemwide Programme
TAC	Technical Advisory Committee of the CGIAR
TOR	Terms of Reference
USAID	United States Agency for International Development
USDA/ARS	United States Department of Agriculture/Agricultural Research Service
WARDA	West Africa Rice Development Association
WB/ERD	World Bank/Economics Research Department
WB/RDV	World Bank/Regional Development Vision