Sustainable Pest Management: Achievements and Challenges

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ABBREVIATIONS AND ACRONYMS

AFD	French Development Agency *(Agence Française de développement)*
AfDB	African Development Bank
AFR	Africa Region (WB)
AFTES	Environment and Sustainable Development Division, Africa Technical Department
ARD	Agriculture and Rural Development
ASP	Africa Stockpiles Program
ASSP	Agricultural Support Services Project
AVRDC	World Vegetable Center
Bt	Bacillus thuringiensis
CAN	Conservation Agriculture Network
CAS	Country Assistance Strategy (WB)
CDD	Community Driven Development
CGIAR	Consultative Group on International Agricultural Research
CGIAR SP-IPM	CGIAR Systemwide Program on Integrated Pest Management
CIRAD	French Agricultural Research Centre for International Development *(Centre de coopération internationale en recherche agronomique pour le développement)*
DECRG	Development Research Group (WB)
DFID	Department for International Development, UK
EAP	East Asia and Pacific Region (WB)
EC	European Commission
ECA	Europe and Central Asia Region (WB)
EU	European Union
EUREGAP	Euro-Retailer Produce Working Group—Good Agricultural Practices
FAO	Food and Agricultural Organization of the United Nations
FFS	Farmer Field School
GATT	General Agreement on Tariffs and Trade
GTZ	German Development Agency
ICIPE	International Centre of Insect Physiology and Ecology
ICM	Integrated Crop Management
IDB	Inter-American Development Bank
IFAD	International Fund for Agricultural Development
IFAP	International Federation of Agricultural Producers
IFC	International Finance Corporation
ILO	International Labor Organization
IPM	Integrated Pest Management
ISR	Implementation Status and Results Report (WB)
IVM	Integrated Vector Management
LCR	Latin America and Caribbean Region (WB)
MNA	Middle East and North Africa Region (WB)

MRL	Maximum Residue Level
NAFTA	North American Free Trade Agreement
NEDA	Netherlands Development Assistance
NEPAD	New Partnership for African Development
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
OED	Operations Evaluation Department
OPN	Operational Policy Note (WB)
PAD	Project Appraisal Document
PAN	Pesticide Action Network
PANNA	Pesticide Action Network North America
PIC	Prior Informed Consent
PMP	Pest Management Plan
POP	Persistent Organic Pollutant
PRSP	Poverty Reduction Strategy Paper
PSR	Project Status Report (WB)
QACU	Quality Assurance Control Unit (WB)
SAI	Sustainable Agriculture Initiative
SAR	South Asia Region (WB)
SPS	Sanitary and Phytosanitary Standards
SSA	Sub-Saharan Africa Region (WB)
SWAPS	Sector Wide Approaches
UNEP	United Nations Environment Program
UNDP	United Nations Development Program
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
WB	World Bank
WBI	World Bank Institute
WHO	World Health Organization
WRI	Water Resources Institute
WTO	World Trade Organization

Weights and Measures

Metric system

EXECUTIVE SUMMARY

The management of pests and weeds is an essential part of agriculture and public health and an important tool in the maintenance of power lines and roads. Chemical pest management is a common tool and has helped to reduce losses in agriculture and to limit human exposure to disease vectors. However, if mismanaged, most pesticides[1] can lead to crop losses and pose a risk to human health and the environment. This includes the costs incurred due to pesticide clean-up (such as those of obsolete stocks), costs related to human health and costs incurred due to increase in pesticide resistance in insects and disease vectors and destruction of natural enemies of pest species, that may result in lost value in agricultural produce.

In the past, investments in agricultural intensification were often associated with increase in external inputs, such as fertilizers and chemical pesticides. More recently, new investments are more economically, socially, and environmentally based. Within this context, the World Bank with several other development agencies considers Integrated Pest Management (IPM)[2] and Integrated Crop Management[3] (ICM) to be sound agricultural practices that help reduce farmers' yield losses to pest damage while protecting the health of producers, consumers, and the environment. However, the uptake of IPM globally has been slow due to many factors, including the knowledge intensive nature of IPM, making it difficult and quite expensive to diffuse among farmers, limited technical capacity to promote IPM technologies in the agencies, lack of priority among the actors in the sector as well as low demand by smallholder farmers. But there are also positive trends strengthening the enabling environment and technical options for IPM. New policy tools to reduce reliance on hazardous chemicals are emerging, especially the phase out of the Persistent Organic Pollutants under the recently adapted Stockholm Convention. Stricter food standards and recent technological breakthroughs in agro-chemical industry producing pesticides of lower toxicity as well as some of the transgenic approaches for pest management is reducing reliance on chemical pesticides.

The objective of the study is to: (a) review World Bank's pest management activities during 1999–2004; (b) assess those in view of the changes in the external and internal contexts; (c) identify appropriate opportunities of engagement on pest and pesticide issues; and (d) suggest means to further promote sound pest management in the World Bank operations.

National Policies. The importance of sound pest management for sustainable agricultural production is being recognized by many developing countries. Many countries have adopted sound pest management and IPM policies authorizing plant protection services to coordinate the promotion of good practices. These policies provide the institutional framework for the planning and implementation of pest management. However, these local policies often suffer

[1]Pesticides = Substances intended to repel, kill, or control any species designated a "pest" including weeds, insects, rodents, fungi, bacteria, or other organisms. The family of pesticides includes herbicides, insecticides, rodenticides, fungicides, and bactericides. www.nsc.org/ehc/glossar1.htm

[2]IPM = IPM refers to a mix of farmer-driven, ecologically based pest control practices that seek to reduce reliance on synthetic chemical pesticides. It involves (a) managing pests (keeping them below economically damaging levels) rather than seeking to eradicate them; (b) relying, to the extent possible, on non-chemical measures to keep pest populations low; and (c) selecting and applying pesticides, when they have to be used, in a way that minimizes adverse effects on beneficial organisms, humans, and the environment. Source: World Bank Operational Policy OP 4.09.

[3]An approach to farming which aims to balance production with economic and environmental considerations by means of a combination of measures including crop rotation, cultivations, appropriate crop varieties and careful use of inputs. Source: Dataservice. http://dataservice.eea.eu.int

from lack of enforcement. The development community, including the World Bank, has an opportunity here to strengthen national capacity on safeguard policies and pesticide production, handling and use.

However, **it is important to note that agricultural and trade policies** may act contrary to sustainable pest management. Subsidies in agriculture and health may either encourage pesticide use (some countries still subsidize agrochemical use), may fail to promote the development of alternatives to pesticide use or shield farmers and industry from the full costs of negative externalities of pesticide use. Agricultural subsidies may also promote mono-cropping and reduce mixed farming systems and may thereby indirectly increase the reliance on chemical control.[4]

Increased trade can affect pest management and pesticide use. International trade carries the risk of introducing new pests and diseases, and international markets tend to demand standards (such as perfect appearance of produce) that often require chemical control. On the other hand, consumers in developed markets are increasingly concerned about food safety issues leading to the need of exporters to comply with often stringent food safety standards, such as maximum residue levels, and labeling requirements, both of which promote application of sound pest management among other criteria. Awareness of health and food safety issues among developing country consumers is also increasing, resulting in higher demand for organic and pesticide free produce.

Similarly, ***codex alimentarius*** **and private sector programs** can promote sound pest management and IPM. Many private sector representatives, such as associations concerned with the interests of the food processing industry, national farmers' associations, representatives of food retail and supply-chain industry, crop protection companies, and biotechnology companies, are actively involved in promoting sound pest management practices through stewardship programs for best practice in manufacture, marketing, use and disposal of pesticides; farmer training on pesticide use and IPM; certification schemes and harmonization of standards for IPM and minimized pesticide use.

New Chemistry and genetically modified crops. Progress in the plant science industry is providing new approaches towards sustainable pest management. These new tools range from improved application technologies to chemicals with low mammalian toxicity as well as semiochemicals[5] and biopesticides, and lastly to genetically modified crops resistant to pests. The benefits of these new technologies to improve agricultural production have been demonstrated in many cases, including recent economic and environmental impact studies of genetically modified crops. However, in terms of chemical pesticides one needs to recognize that high toxicity, broad spectrum pesticides against several pests and longer persistence in the environment are still attractive in view of short-term economic goals in some production systems thereby retaining a demand in the marketplace for the older, more persistent pesticides.

International donor community. Regional Development Banks exert considerable leverage on national policies through their lending programs. They have experience in funding projects including pest management and IPM practices, providing policy and strategy support to countries, as well as carrying out farm level training in pest management and IPM. Other international organizations, such as OECD, CGIAR and FAO, have diverse mandates and different experiences ranging from harmonization of the policies and standards in member countries to generation and information sharing on new IPM

[4]Abate et al. 2000 and FFNZ 2002.

[5]Semiochemicals (Gk. *semeon,* a signal) are chemicals that mediate interactions between organisms. Semiochemicals are subdivided into allelochemicals and pheromones depending on whether the interactions are interspecific or intraspecific, respectively. Source: Flint and Doane 1996.

technologies. FAO has also been instrumental in linking different stakeholders to promote sound pest management policies and practices through co-founding of the Global IPM Facility in 1997 to assist governments and NGOs in developing national and local IPM programs. Bilateral assistance agencies support sound pest management mainly through funding research, field project implementation, guideline development, and support to regulatory reforms. In 1993 the EU facilitated the formation of IPMEurope, a network that operates mainly through donor harmonization of pesticide policies and IPM among the donor agencies of its members and through partnerships and policy influence in international fora. The globally active civil society organizations working in the field of pest management include the Pesticide Action Network and the Water Resources Institute that advocate for reduction in pesticide use and increase in the use of sustainable and ecological alternatives to chemical pest control.

Status of sustainable pest management in the World Bank. Since the early 1980s, the World Bank has been one of the pioneers in developing pest management policies to address the ever-increasing pest management needs in its rural development and health projects. However, the implementation efficiency of these policies has occasionally been questioned internally (Schillhorn Van Veen et al. 1997) and externally (Tozun, 2001; Pincus, 2002; Hamburger and Ishii-Eitemann, 2003a, b). Recognizing the importance of promoting economically sound pest management practices and of managing health and environmental risks associated with the use of agricultural chemicals, the World Bank instituted an Operational Policy Note on pesticides in 1985 (OPN 11.01) and a safeguard policy for pest management in 1998 (OP 4.09, 1998). The purpose of the safeguard policy on pest management is to ensure good practice in World Bank financed projects.

The World Bank promotes a holistic approach in rural development. The World Bank seeks to enhance agricultural productivity through efficient application of agricultural technology, to improve the livelihoods of the rural poor, and to foster an environment conducive to sustainable rural development (See Reaching the Rural Poor: A Renewed Strategy for Rural Development and Agriculture Investment Sourcebook[6]). The mainstreaming efforts of IPM through the analytical work on pest management carried out in the Agriculture and Rural Development Department and in the regional operations appear to have had a relatively good impact as is evident in the Country Assistance Strategies and especially in the Poverty Reduction Strategies. Review of 366 World Bank projects and other documents revealed that implementation of the World Bank's own pest management policy and safeguards is good, but has been somewhat slow to adapt to internal changes, whether in new lending modalities (Development Policy Based lending, Community Driven Development projects, etc.) or in internal World Bank management (i.e., erosion of technical skills, limited attention in project supervision). Some erosion in agricultural technical know-how and skills of the staff during the past decade has taken place, mainly due to retirement of skilled staff and tendency to hire generalists.

Pest management integrated in the project components. There are very few World Bank projects dealing exclusively with pest management. Interventions in pest management are always treated as good agricultural practice within larger projects—addressing capacity to meet client needs on certification and regulatory frameworks, introduction of sound pest management and IPM technologies, research, extension, and training, and elimination and prevention of obsolete stockpiles. Overall project compliance, and particularly that of rural/agriculture projects, with the World Bank's safeguard OP 4.09 improved during the review period (1999–March

[6]World Bank 2004a. http://www-esd.worldbank.org/ais/

2004). About one-third of all agriculture projects during the review period 1999–2004 included a pest management plan, and compliance (across the regions) was 58–100% by the end of the review period. In short, monitoring of pest management activities and compliance with safeguard 4.09 has improved since 1999, but challenges remain in the capacity and resources to monitor and supervise the field level activities (See chapter 4).

Conclusions. In order to allocate resources efficiently, and to enhance the impact of policy dialogue and investments in sound pest management/IPM, a more targeted strategy may be considered by development agencies, such as the World Bank. The World Bank could further improve its performance both in the arena of "do no harm" (i.e., environmental safeguards) and in "do good" (i.e., policy advice and lending). However, the World Bank may have to be more selective by focusing on a few specific issues using measurable outcome (e.g., pesticide use; adoption of IPM) and impact (health, environment) indicators. The use of simple indicators should help to draw the attention of policy makers (including World Bank country directors) to the importance of pest management issues. Such indicators will also be useful to task teams during project design and subsequently in monitoring impact during supervision.

Such selective, targeted approach may concentrate on those areas where either the risk from pesticides is high or where the opportunity for IPM adoption is high, such as in:

a. Countries with high use of the most risky pesticides; or
b. Systems or conditions where the risk of human and/or environmental exposure is high (i.e., removal of obsolete pesticide stock); or
c. Countries where the likelihood of IPM adoption is high (e.g., strong regulatory enforcement or special markets for pesticide free products).

Technical support and training. To improve compliance with the pest management policy and to assure quality, greater financial and technical resources are needed to help identify, design and supervise the projects requiring pest management assistance. Technical specialists and timely training would greatly improve pest management practice in World Bank funded projects. Similarly, specific manuals for Bank and project staff on pest management that relate to specific and pertinent issues (i.e., pest management in non-agricultural sectors such as health, energy, and transport or related to specific lending instruments) and simplification of the pesticide procurement process would be useful. More attention should be paid to training, especially

a. Training of concerned task team members and special training in pest management for World Bank staff in country offices;
b. Training of borrower staff in pest management and the preparation of pest management plans; and
c. Training of safeguard reviewers including a mechanism for periodic retraining/skill updating of staff.

The World Bank's Role in the global policy dialogue. The World Bank continues to engage various pest management/IPM interest groups in the development community in a dialogue to promote a favorable policy environment for expedition in IPM adoption. It uses all opportunities to create a platform to contribute to the development of the global policy framework. As in-house expertise in the World Bank in pest management is very limited, there is a need to further enhance partnerships with expert organizations in IPM (e.g., System-wide Program on Integrated Pest management, the Global IPM Facility, the Plant Protection Service of the Food and Agriculture Organization, the CABI Biosciences, the International Center for Insect Physiology and Ecology and the World Vegetable

Center). These partnerships can create a stronger platform to facilitate exchange of mutual interest, and particularly enhance technical expertise, local buy-in and balanced view of the dynamic pest management field. Strengthening the partnership between the CGIAR and the World Bank, for example, can effectively link the World Bank's leverage on national policies and the wealth of technical expertise of the CGIAR. In addition to cooperation with public sector organizations, cooperation in pest management with civil society organizations, and private industry would also be beneficial. This could include developing IPM approaches to improve food safety as well as to monitor pest management practices and pesticide residues in food products. See box ES1.1 for a summary of global and World Bank trends in Pest Management.

BOX ES1.1. GLOBAL AND WORLD BANK TRENDS IN PEST MANAGEMENT—GENERAL CONCLUSIONS

Global trends:

Policy—Despite the debate on the impact of agricultural subsidies and the nearly universal understanding of the fact that direct donor subsidization of pesticides is morally and economically unacceptable, indirect subsidization of pesticides by developing country governments is still prevalent. However, a positive change is brought by the recently adopted Stockholm convention that bans the use of the Persistent Organic Pollutants (POP). But there are also other trends. International trade in agriculture has expanded to high value products that may also carry the risk of introducing exotic pests and increased dependence on chemical pest control. On the other hand, compliance with international food safety standards provides incentives for adopting sound pest management practices and requires that many developing countries have to upgrade their policies, regulations, enforcement and infrastructure. Similarly, authorities and consumers in the developing countries have become more aware of the pesticide residue levels in their food and pesticide- and other food-related- poisonings, indicating a need for vigilance by exporters in developing countries. Requirements of the food industry regarding pesticide residues have become a major force that encourages developing country governments' to support banning the use of the POPs and the adoption of sustainable practices. In some industrialized countries both commercial and non-commercial pesticide users need to obtain a license after being trained and accredited in pesticide use and IPM.

Technical—A variety of new developments are changing the outlook in pest management and associated risk assessments. Considerable research on IPM and biological control, availability of non-toxic and biodegradable agro-chemicals and biocontrol agents, and developments in biotechnology have greatly increased the options farmers have, in concordance with the fact that "popular" but very toxic agrochemicals are being removed from the market.

Institutional—The international donor community has also exerted considerable leverage on national policies through their lending programs, research, policy and strategy support to client countries. A clear trend is to facilitate donor harmonization of pesticide policies, standards and regulatory reform and frameworks among the donor agencies and client countries through partnerships and policy influence in international fora.

Trends in the World Bank:

World Bank policies—The World Bank has played an important role in focusing attention on proper pest management policies. The creation of the safeguard compliance unit had the objective to improve the oversight of and compliance with the World Bank safeguard policies. World Bank's pest management policy in lending is guided directly by the pest management safeguard O.P 4.09 and related policy and implementation documents. A substantial number of papers on agricultural pest management issues and IPM have been published by ARD and the discussion is gradually being integrated into the regional policy documents.

World Bank lending in pest management—The World Bank implements its pest management policy through various instruments, ranging from national pesticide policy support to implementing IPM at the project level. The review of the lending portfolio revealed that about one-third of all projects in the rural, health, energy and transport sectors include activities or issues related to pest management. Of the projects with pest management activities or involving pesticide use, 30 and 46%, respectively, included a pest management plan. Supervision of the projects, in terms of pest management activities remains a challenge. Options, such as decentralizing the safeguard compliance to regions, and partnering with local and international expert organizations, could be further explored. These two options as well as the lack of capacity (within the Bank and within partners) for proper supervision is a concern that needs to be addressed. Often country systems have the needed policy environment (i.e. signatory to the international conventions and agreements) but do not have the capacity nor personnel assigned to implement the regulations.

World Bank skills and training—The World Bank has improved its staffing to oversee the pest management policy compliance, as well as the implementation of IPM in general by acquiring a full-time technical specialist, starting staff training on safeguards (an average of about 5% of staff trained each year), and out-sourcing expertise from the IPM facility and the CGIAR. Currently some regions employ technical staff familiar with pest management issues whereas others rely on the specialist in the Safeguard Unit. Some erosion in agricultural technical know-how and skills of the staff during the past decade has taken place, mainly due to retirement of skilled staff and tendency to hire generalists.

Source: Authors.

CHAPTER 1. INTRODUCTION

The management of pests and weeds is an essential part of agriculture and public health and an important tool in the maintenance of power lines and roads. Chemical pest management is a common tool and indeed has helped to reduce losses in agriculture and to limit human exposure to disease vectors. However, most pesticides can be harmful and their uncontrolled use can threaten the sustainability of agricultural production and pose a risk to human health and the environment (e.g., destruction of natural enemies of pests and contamination of soil and water). Sustainable pest management has been part of the World Bank's rural development agenda since well before Integrated Pest Management (IPM) obtained a prominent place in international policy debate, as defined by the Agenda 21 in the 1992 Rio Earth Summit. Sustainable pest management practices in World Bank's rural portfolio have been implemented to varying extent, as pointed out by various evaluations of the World Bank investments, whether by the World Bank and its affiliates[7] or by outside agencies.[8] A number of recent developments (e.g., the IPM extension methodology debate, Stockholm Convention, development of pest management policies internationally as well as in the World Bank) have drawn a renewed interest in IPM in the World Bank.

The objective of the study is to: (a) review World Bank's pest management activities during 1999–2004; (b) assess those in view of the changes in the external and internal contexts; (c) identify appropriate opportunities of engagement on pest and pesticide issues; and suggest means to further promote sound pest management in the World Bank operations.

[7]See Farah 1994; Lele 2003; Scheriff and Fleischer 2005; Schillhorn van Veen et al. 1997; Sorby et al. 2003.

[8]See Hamburger and Ishii-Eitemann, 2003a, 2000b; Pincus, 2002; Tozun, 2001; Yudelman et al. 1998.

Before examining the World Bank's performance it is important to understand the recent trends in pesticide use. Parallel with the policy debate in the development community, use of pesticides has increased in some developing countries and decreased in others during the last decade. For example, countries in South and Central America showed significant increase in the use of pesticides, including the use of insecticides, considered to pose the greatest risk to human health and environment (See table 1.1). Decreases were seen in countries such as Romania, Jordan, and India. These changes in the developing world occurred at a time when

Table 1.1. Change in Insecticide Use during 1995–2000 in Selected Countries

	Average annual use (MT)	Change (%)	Average ann. use (kg per ha)	Average ann. use; kg per rural inhabitant
Brazil	18,159	34%	0.07	0.56
Colombia	7,306	201%	0.16	0.69
Costa Rica	3,191	50%	0.61	1.75
Ecuador	1,187	268%	0.15	0.25
Honduras	1,019	296%	0.31	0.30
India	32,456	–32%	0.18	0.04
Bangladesh	1,466	65%	0.16	0.01
Pakistan	9,670	106%	0.36	0.11
Thailand	6,785	–24%	0.14	0.14
Korea	8,896	–3%	4.54	1.04
Jordan	184	–56%	0.16	0.14
Turkey	14,464	–7%	0.37	0.89
Romania	2,260	–66%	0.15	0.23
Greece	2,520	–47%	0.28	0.59
Germany	1,369	–66%	0.08	0.13
France	5,506	–24%	0.18	0.39
US (1995–1998)	114,123	—	0.27	1.13

Source: FAOSTAT; World Bank Rural Development indicators 2002 (selection largely based on availability of complete data).

pesticide use in the developed countries declined, either in absolute terms or because of the use of more concentrated products and more precise application. The decline in the use of pesticides, especially the more toxic insecticides in Europe and other developed countries, has been driven mainly by consumer awareness and concerns about the environmental effects.

Heightened environmental awareness has, in turn, resulted in tighter regulation (such as EU rules on application and on-farm storage of pesticides) and efforts to include negative externalities in pesticide prices (See Sheriff and Fleischer 2005). There have also been a few cases of farmer licensing and compulsory training in pesticide use in the developed world. For example, some states in Australia have implemented compulsory licensing and safe pesticide use training for both commercial and some non-commercial entities.[9] Examples of government initiated licensing systems of pesticide users can also be found in Denmark and Norway. At the same time, research and commercial development of non-chemical control methods, and in some countries the availability of insect-resistant transgenic crops (See section on Technical Developments in chapter 2), have provided farmers with alternative choices in pest management. Although most of the commercial production of transgenic crops takes place in a few developed countries, the production in developing countries is expanding rapidly—in 2004, about 7.4 million small producers in developing countries were growing transgenic crops, covering about 34% of the total land area under transgenic crops.[10]

During the past decades, many organizations have promoted alternative pest management methods, especially IPM. Many examples have clearly demonstrated that reduced use of chemical pesticides does not have a detrimental effect on yield[11] and that IPM has played a role in agricultural productivity increase as well as in improving public health among farm workers.[12] Hans Herren, in his foreword in the book "Integrated Pest Management in the Global Arena" (Maredia et al. 2003) argues that although considerable advances have been made in research, IPM has not been well evaluated and documented for its role among disciplines that contributed to the Green Revolution and to agricultural productivity in general.

Despite the potential benefits associated with IPM, adoption of IPM has remained low in most of the developing world.[13,14] Although success has been demonstrated in selected areas in Asia,[15] 35 years after the introduction of IPM, no convincing evidence can be found for large scale changes in pesticide use in Asian farmers' rice[16] or cotton[17] fields. Adoption is limited due to various reasons including technical, institutional, social, cultural, economic, educational, informational, and policy constraints.[18] Morse and Buhler (1997) argued that implementation of IPM among resource poor farmers is problematic, as they may not be able to grasp the extensive ecological knowledge of pests and often site-specific factors that influence pest populations. Dedicated applied ecologists have often been frustrated in their attempts to translate experimental results into farm practice. For example, with irrigated tropical rice it has taken about twenty years for proven IPM practices to reach about 1% of Asia's 300 million rice farm-

[9]Licensing systems are typically administered by the individual states' departments of primary industries (e.g., www.dpi.vic.gov.au).

[10]ISAAA 2004; FAO 2004.

[11]See for example Pincus 2002 (rice); NRI 2000 (cotton).

[12]Maredia et al. 2003.

[13]Norton et al. 2005.

[14]Gutierrez and Waibel 2001.

[15]Dasgupta et al. 2004; Kenmore 1991; Pincus 1996; van de Fliert 1993.

[16]Waibel and Pemsl 2000.

[17]Way and Emden 2000.

[18]Norton et al. 2005.

ers.[19] Integrated pest management is considered to be labor intensive, rather costly and difficult to diffuse and sustain.[20] Moreover, the impact assessment methods nor the impact indicators are not yet widely agreed on. Orr (2003) argues that the problem lies less with the supply side factors, such as lack of appropriate extension, training, or technology, but with the demand for IPM in smallholder farming systems under current conditions, where the main production problem facing smallholders is not crop losses from pests but from low average yields.

The objective of sustainable pest management is to enhance pest management systems that do not threaten the sustainability of agricultural production and farmers' incomes nor pose danger to human health or the environment. However, as evident from the discussion above this cannot solely be achieved by promoting sound pest management/IPM technologies, but requires other supportive policies, such as the Rotterdam and Stockholm conventions, that deal with transport of chemicals and phase-out of Persistent Organic Pollutants (POP), respectively and sound national pesticide policies and their effective enforcement.

In addition to growing awareness on environmental issues and food safety in general as discussed earlier the issue of sustainable pest management has also received increased attention with the increase in global trade.[21] The increasing numbers of countries that join the World Trade Organization (WTO) are striving to comply with the *Codex Alimentarius*[22] that defines maximum residue levels (MRL) in a variety of commonly traded agricultural products. Currently, many countries aim to develop both nationally and internationally accepted set of Sanitary and Phytosanitary Standards (SPS). However, these standards have proven costly for those (developing) countries experiencing refusal of their products and produce in lucrative international markets, often because of excessive pesticide residues. Hence, there is considerable interest, especially among middle-income countries exporting niche products, to invest in better detection capacity and surveillance to assure that pesticide residue levels of exported products do not exceed acceptable standards. At the same time large food retailers via coordinated supply chains and contract farming compete for both global and national market shares by trying to meet suppliers' and consumers' preferences by product certification schemes. Often the private-sector specifications are more demanding than public-sector requirements of food safety and quality.[23] In part because of these new developments, there is a renewed interest in sustainable pest management.

At the same time the World Bank has gained further experience with the implementation of its pest management policies, adopted in the later nineties. Currently, the World Bank promotes sound pest management in various ways, ranging from policy dialogue to investments in IPM (See box 1.1 for a summary and chapter 4 for further details).

[19]Way and Emden 2000.

[20]An extensive debate includes Feder et al. 2004; Pincus 2002.

[21]World Bank 2004b.

[22]The Codex Alimentarius Commission was created in 1963 by FAO and WHO to develop food standards, guidelines and related texts such as codes of practice under the Joint FAO/WHO Food Standards Programme. The main purposes of this Programme are protecting health of the consumers and ensuring fair trade practices in the food trade, and promoting coordination of all food standards work undertaken by international governmental and non-governmental organizations. Source: http://www.codexalimentarius.net/web/index_en.jsp

[23]van der Meer 2004.

BOX 1.1. EXAMPLES OF RECENT WORLD BANK PROJECTS THAT SUPPORT SUSTAINABLE PEST MANAGEMENT

The Bank has used a variety of approaches to promote sustainable pest management. Recent approaches include:

(i) *Policy dialogue* (for example in Mali) and help in drafting of the policy or plant protection laws. For example in the Kyrgyz Republic: Agricultural Services Project (ASSP), Tunisia: ASSP and Turkmenistan during preparation of Crop Protection and Animal Health Project (CPAH);

(ii) *Improvement in diagnostics,* such as investment in detection of pesticide residues—Ghana: ASSP; Tunisia: ASSP; also the Colombia: Agricultural Transition Project;

(iii) *Investment in IPM research*—India: Karnataka Watershed Development Project; India: National Agricultural Technology Project; Turkey: Agricultural Research Project; Romania: ASSP; Uganda: National Agricultural Advisory Services; Peru: Agricultural Research and Extension Project; Madagascar: Rural development Project; and Tunisia: ASSP;

(iv) *Support for biological control*—Uzbekistan: Cotton Sector Improvement Project; pilot of Turkmenistan CPAH.

(v) *Investment in safe handling of pesticides*—Uganda: NAAS; and Uzbekistan: CSIP;

(vi) *Investment in IPM implementation through farmer training*—see list and summaries in Sorby et al. 2003; and

(vii) *Investment in clean-up of obsolete pesticide stock*—Yemen: Surdud cleanup pilot; and Africa region: Africa stockpiles program.

Source: Authors.

CHAPTER 2. CHANGING PEST MANAGEMENT POLICY AND TECHNOLOGY WORLD-WIDE

Since the mid nineties a number of important developments, especially in agriculture, have emerged that have or can have an impact on pest management policies and tools. These developments are diverse and cover a variety of sectors and issues. Broadly, they can be divided into policy issues and technical developments. Some of these new developments provide new opportunities but also generate new concerns.

POLICY DEVELOPMENTS

At the policy level the four main issues that seriously impact agriculture and consequently pest management are: (a) changing views on agricultural subsidies; (b) global trade; (c) new developments in the pesticide industry; (d) national policies for the promotion of exports and emerging dominance of supermarket chains in food retailing globally; (e) policies regarding the use of genetically modified organisms; and (f) the recently ratified Stockholm convention.

AGRICULTURAL SUBSIDIES AND NATIONAL PESTICIDE POLICIES

The impact of agricultural subsidies on farming, environment and human health has been widely debated. Sheriff and Fleischer (2005) state that a free market may make farmers less inclined to adopt management practices with reduced pesticide use. Farmers often bear only the direct costs, (i.e., the purchase of pesticide and labor costs), whereas the hidden costs, such as damage to farm workers' health and productivity and the sustainability of the farm ecosystem are borne by society. Government policies that are aimed at raising farm incomes distort relative prices and lead to excessive use of pesticides. These policies must be eliminated in order to change the bias away from pesticide use. Such policies include preferential exchange rates, explicit price interventions, sales tax exemptions, agricultural credit, low import duties, and foreign aid donations. In addition, actions that do not directly impact prices but result in lower costs associated with pesticide use, such as chemical-oriented research and extension, reforms of other market distortions without due consideration for other sectors, and ineffective regulation, can be as harmful. A rational pesticide policy would include prices for pesticide inputs that reflect their true social cost coupled with sufficient regulatory system and education and research efforts on alternatives to chemical pest control.

With respect to developing countries these views on subsidies have led to a nearly universal understanding of the fact that direct donor subsidization of pesticides is morally and economically unacceptable. Most donors have now refrained from their earlier donations of pesticides, or from promoting subsidized use. Implementation, however, is complicated by requests from developing countries for emergency assistance, such as outbreaks of vector borne diseases in the human or animal population, locust swarms or other vermin control. It has been observed that pesticides intended for emergency assistance are often diverted and used inappropriately for regular pest control.

Although farmers worldwide have proven to make rational decisions in managing their crops, indirect subsidization by developing countries' governments is still prevalent and promotes pesticide use. In only a few countries, whether developed or developing, are the full negative externalities included in the price. As demonstrated by Sheriff and Fleischer (2005), price subsidies of pesticides may be the result of

macro-economic policies, (i.e., distorted foreign exchange rates, tariffs and duties, taxation as well as direct subsidization). Costa Rica and Ecuador, for example, which are high users (See table 2.1), supported pesticide use through credit subsidies, favorable import duty, and favorable sales tax.

In many developing countries farming is often mixed (crop-livestock-fish, agro-forestry, and inter-cropping). Such systems may require different labor, equipment and other inputs, and have different pest management needs. Most developed countries have a 50-year history of chemical pest control, and their farming systems have adapted and evolved into a predominantly monoculture-type of agricultural production systems. When farmers move to monocultures, there is a risk of increased pesticide use,[24] leading to serious negative impacts on the environment. Such impacts led the EU to bring new reforms to the Common Agricultural Policy in the nineties. A major reform, known as the McSharry reform, acknowledged the environmental damage caused by the chemical inputs in intensive agriculture and compensated farmers engaged in environmentally friendly agriculture as part of the move away from price support to direct income payments. One of the spillovers of this policy is a

[24]See Faeth et al. 1991; Pingali, 1998; Reardon et al. 1999.

Table 2.1. Percentage Changes in the Export of Selected Commodities and Pesticide Use from 1997 to 2002

	Soybean export	Potato export	Fruit export	Vegetable export	Insecticide use	Herbicide use	Fungicide use
Argentina	298%	–62%	neg	neg	nd	nd	nd
Brazil	357%	>1000%	n/a	50%	34%	55%	31%
Chile	neg	136%	55%	111%	–38%	–41%	33%
Colombia	neg	–15%	161%	38%	201%	226%	393%
Ecuador	>1000%	–97%	–80%	>1000%	268%	362%	184%
Paraguay	85%	n/a	neg	neg	0%	0%	0%
Peru	neg	1212%	neg	neg	38%	86%	nd
Uruguay	>1000%	nd	neg	neg	90%	143%	–39%
C. Rica	neg	34%	–72%	39%	50%	179%	293%
Dominican Republic	neg	nd	–7%	70%	–55%	25%	–9%
Guatemala	114%	26%	>1000%	215%	nd	nd	nd
Honduras	neg	42%	>1000%	>1000%	nd	–77%	nd
Germany	223%	–38%	137%	46%	–15%	3%	–3%
Greece	>1000%	–90%	>1000%	>1000%	69%	24%	83%
Hungary	633%	nd	706%	19%	0%	0%	0%
China	–26%	316%	456%	32%	nd	nd	nd
Malaysia	110%	48%	–64%	–19%	nd	nd	nd
Thailand	199%	913%	64%	186%	–23%	–8%	–35%
Vietnam	–36%	nd	>1000%	>1000%	0%	0%	0%
Korea	855%	–16%	–58%	–54%	–3%	0%	10%
Egypt	neg	–45%	>1000%	82%	nd	nd	nd
Jordan	neg	35%	–49%	55%	nd	nd	nd
Kenya	neg	–42%	–17%	34%	nd	nd	nd
Senegal	neg	neg	–99%	neg	11%	15%	55%
S. Africa	>1000%	93%	370%	–54%	–100%	30%	nd

Source: FAOSTAT. Neg= negligible(less than 1000 MT); nd = no data.

slow shift in production systems (from large commodity production to more mixed production systems) and a re-evaluation of the costs and benefits of reliance on chemical pest control.[25]

Global Trade

With increasing adoption of international trade agreements, such as the General Agreement on Tariffs and Trade (GATT), North American Free Trade Agreement (NAFTA) and Lome/Cotonou agreements, international trade in agricultural products has changed. Earlier trade was limited to major commodities, such as grain, oilseed, and cotton, whereas now trade has greatly expanded to various niche products, including fruits, vegetables, and cut flowers partly due to greater demand and availability of air freight. For example, cut flower imports from Latin America into the US doubled between 1990 and 1999; flower importation into the EU from Kenya, Zimbabwe, Uganda and Zambia increased five fold between 1990 and 2000. On the positive side, new livelihood opportunities for farmers and rural workers have been created, however, a negative outcome is that cut flowers and many other high-value crops have increased demand for pesticides.[26] Similar trends are observed with respect to vegetable exports from developing countries, largely fueled by seasonal demand and increasing sophistication in the market place requiring perfect external quality of the produce.

Although the increased trade in cash crops has considerable economic benefits, it also carries a number of risks that include: (a) the risk of introducing exotic pests. Developed countries are increasing their vigilance and often require chemical control to keep such introduction to a minimum. Although such protection is legitimate under WTO rules, exporting countries find it more difficult and expensive to comply with the increasing protective regulations; and (b) the increase in export to developed countries, and their demand for esthetically attractive produce as well as the regulations under (a) have led farmers to increase dependence in chemical pest control. Dramatic increases in pesticide use have been observed in South and Central America where pesticide use increased more than 100% associated with increased exports of soybean, flowers, bananas and other fruits and vegetables, and coincided with the NAFTA and Mercosur agreements (See table 2.1). This increase has already had a detrimental effect on farm workers' health.[27]

On the other hand, increased trade can also improve farmers' pest management practices. The participation of developing countries in international trade requires adherence to food safety (as well as quality) rules in the recipient country, many of which have fairly strict standards on chemical residue levels in food. Excessive pesticide residues are among the major reasons for rejection of shipments of agricultural products. In order to be able to comply with international food safety standards (public and particularly private standards), many developing countries have to, or are in the process of, upgrading their policies, regulations, enforcement and infrastructure on pest management. According to a recent World Bank study on food safety and agricultural health standards,[28] evidence indicates that in many instances the benefits of compliance with standards exceed the costs.

Pesticide Trade

One of the major developments in the last decade is the increase in pesticide production and trade in developing countries with the associated insufficient regulation of the negative externalities of pesticide use. Especially India and China

[25]See Altieri and Nicholls 1999; FFNZ 2002.

[26]Palán & Palán 1999.

[27]See Penagos 2002 on health effects among banana workers, and de London et al. 2002 on the health and other effects on women. One of the high priority issues of women farm workers in CDD projects in Latin America is to reduce reliance on chemical pesticides (Matthew McMahon, World Bank, personal communication).

[28]World Bank 2004b.

that have well developed chemical industry depend less on imports and in fact have become major exporters of pesticides. Figure 2.1 indicates that imports of pesticides grew in many developing countries from 1995 to 1999, and subsequently eased off. In China and India this decline was mainly a result of increased local production capacity. The export (in dollar terms) of pesticides from China, India and Thailand increased 52, 64, and 68%, respectively, from 1997 to 2002.[29] At the same time, exports from Europe and North America remained the same. Much of these exports from the developing countries comprise of older pesticides and/or reformulations, some of which are banned in many developed countries.[30] Pesticide trade from large developing countries[31] has raised concerns about the quality of their products, the stewardship level by the manufacturing or formulating agro-chemical companies and about a further risk of accumulating stockpiles.

Liberalized trade may have serious negative implications if effective regulatory measures are not in place. Most developing counties do neither have the rules, the skilled staff nor the infrastructure to provide for adequate oversight over local pesticide trade and use. Therefore, special attention should be paid to enhance information services, improve access to quality inputs, and support pesticide packaging and application methods designed in such a way that the exposure of consumers and farmers and their families is minimized. Recently, The International Finance Corporation (IFC) of the World Bank Group developed a set of performance standards related to the production and use of POPs (See box 2.1 for details).

Policies Related to Genetically Modified Organisms

Technical advances in biotechnology (see below under technical developments) have led to extensive public discussion about the ethics, use and commercialization of bioengineered agricultural products.[32] Supporters hail such products as

[29]Source FAOSTAT.

[30]APO 2002.

[31]Feder et al. 2004.

[32]Plant Biotechnology is defined as the application of knowledge of biological process and technologies to develop plants with special traits or for specific use. This broad definition includes also plant tissue culture and molecular tools used in plant breeding. These are generally accepted techniques. The focus of societal interest is in transgenic crops, which have been developed by inserting foreign DNA into the plant genome using advanced molecular techniques.

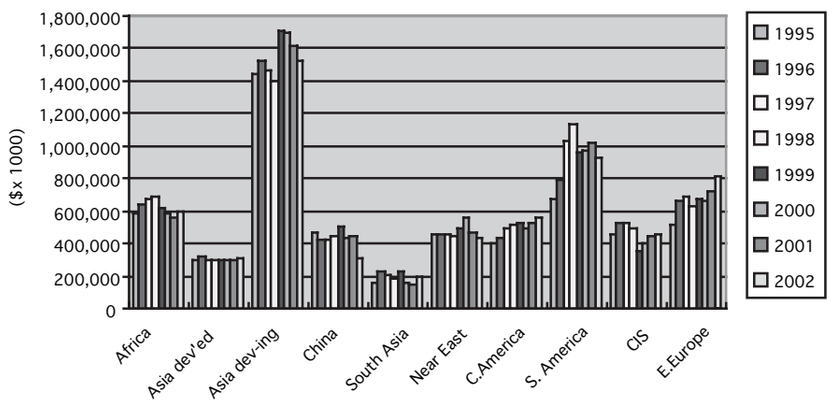

Figure 2.1. Import (Value) of Pesticides by Region 1995–2002.

BOX 2.1. IFC GUIDANCE NOTE ON POLLUTION PREVENTION AND ABATEMENT OF HAZARDOUS CHEMICALS

The IFC Performance Standard on hazardous chemicals takes a clear stand against the manufacture, trade and use of active ingredients included in Annex A and B of the Stockholm Convention on Persistent Organic Pollutants and in Annex III of the Rotterdam Convention on the Prior Informed Consent. Given the hazardous nature of these chemicals, these provisions apply irrespectively of whether the project is located in a country that is party to the above-mentioned conventions. The Performance Standard also requires that the Client not manufacture, trade, or utilize products that fall in World Health Organization Recommended Classification Classes 1a and 1b (extremely and highly hazardous) or formulations of products in class II (moderately hazardous) if the Client lacks restriction on their distribution and use and if they are likely to be accessible to lay personnel or others without proper training, equipment, and facilities to handle, store and apply these products properly. The standard refers to the Food and Agriculture Organization's (FAO) International Code of Conduct on the Distribution and Use of Pesticides (FAO, 2003) for proper management of pesticides.

Source: IFC Performance Standards and Guidance Notes (in preparation).

essential in addressing food security and malnutrition in developing countries as well as to reduce the environmental impact of selective pesticides. Opponents warn that lessons should be learned from earlier promised "silver bullets" (often using the example of DDT) and that unbridled release of engineered crops and animals can have adverse effects on the environment, change power relations within the industrial sector and reduce small farmers' choice of inputs. The full debate is beyond the context of this paper but a number of aspects are relevant:

a) Some genetic modifications offer the possibility of reducing the use of certain agricultural pesticides, and may also improve the efficiency of the use of fertilizers and other soil improvement methods; and

b) The scientific assessment of the environmental and health impacts of the release of genetically engineered plants and animals is still at an early stage. Decisions about such use should be made on a case-by-case basis.

INTERNATIONAL CONVENTIONS AND THE WORLD BANK

Although much attention has been given to IPM—including in the World Bank's safeguard policy—a major policy development likely to have a significant impact on pest management in developing countries has been the Stockholm Convention. The convention went into force in May 2004 and aims to phase out the POPs, including some of the most hazardous pesticides (often referred to as the "dirty dozen"). It is likely to change the behavior of some donor countries that until recently considered donation of pesticides an appropriate tool in poverty reduction. It may also provide an opportunity for policy debate and investments. A number of World Bank policy and project interventions have been developed in support of this convention, including the Africa Stockpiles Program and the Demonstration of alternatives to Chlordane and Mirex in Termite Control Project in China.

The World Bank refers to the list of active ingredients included in Annex A and B of the Stockholm Convention on the POPs to ensure that no chemical formulations are manufactured, sold or used in the World Bank-financed projects, unless an exception is granted as noted in Annexes A and B of the Stockholm Convention. The World Bank refers to the lists included in Annex III of the Rotterdam Convention on the Prior Informed Consent to ensure that the appropriate procedure is followed in disclosing information about the hazards of these chemicals to the host governments and obtaining the required consent. Given the hazardous nature of these

chemicals, these provisions should apply irrespectively of whether the project is located in a country that is Party to the above-mentioned conventions. Earlier, the World Bank initiated a number of technical assistance and project interventions to phase out methyl bromide in support of the Montreal Protocol. See box 2.2 for further details on the relevant protocols.

Technical Developments

Biocontrol

At the technical level, a variety of new developments are changing the outlook in pest management and risk assessments. Considerable research on IPM and biological control, availability of non-toxic and biodegradable agrochemicals and biocontrol agents, and developments in biotechnology have greatly increased the options farmers have, compatible with the fact that "popular" but very hazardous agrochemicals are being removed from the market (in order to comply with the Stockholm conventions) (See box 2.3 for an example on biocontrol). With respect to IPM great strides have been made in better understanding pest behavior, control options and risk. In their recent summary, Maredia et al. (2003) describe the current understanding of the pest ecology and control options as well as the development and implementation of IPM in different regions and countries of the

Box 2.2. Pest Management-related International Conventions

The Stockholm Convention on Persistent Organic Pollutants (POP) is a global treaty to protect human health and the environment from the chemicals that persist in the environment for extended periods of time and tend to accumulate in living tissues of various organisms. Being at the top of the food chain, humans tend to absorb the greatest concentrations of these POPs, resulting in serious disruptions of the endocrine system, suppression of the immune system, disruption of reproductive function, and various developmental abnormalities. In its initial phase, the Convention lists twelve chemicals to be phased out from production and use, among which nine are pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex and toxaphene) and three non-pesticides (dioxins, furans and polychlorinated biphenyls). The Convention came into force in May 2004 upon the 50th ratification.

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade is a global treaty adopted in 1998 to limit the potential risks posed by the production and trade in hazardous chemicals and pesticides. Countries lacking adequate infrastructure to monitor the import and use of such substances were particularly vulnerable. In the 1980s, UNEP and FAO developed voluntary codes of conduct and information exchange systems, culminating in the Prior Informed Consent (PIC) procedure introduced in 1989. The new Convention replaces this arrangement with a mandatory PIC procedure. PIC requires exporters trading in a list of hazardous substances to obtain the prior informed consent of importers before proceeding with the trade. As of 24 February 2004, the Rotterdam Convention entered into force after the 50th ratification.

The World Bank refers to the list of active ingredients included in Annex A and B of the Stockholm Convention on Persistent Organic Pollutants to ensure that no chemical formulations are manufactured, sold or used in the Bank-financed projects, unless an exception is granted as noted in Annexes A and B of the Stockholm Convention. The Bank refers to the lists included in Annex III of the Rotterdam Convention on the Prior Informed Consent to ensure that the appropriate procedure is followed in disclosing information about the hazards of these chemicals to the host governments and obtaining the required consent. Given the hazardous nature of these chemicals, these provisions should apply irrespectively of whether the project is located in a country that is Party to the above-mentioned conventions.

Montreal Protocol on Ozone Depleting Substances is an international treaty, adopted in 1987, to eliminate the production and consumption of chemicals that deplete the ozone layer. Principal among these chemicals is Methyl Bromide, widely used in agriculture as a fumigant for soil-borne pests and diseases, stored grains pests, and quarantine pests in fresh produce (fruits and vegetables, flowers). The World Bank as an implementing agency helps client countries in planning, policy formulation and implementation of projects to meet their objectives within the framework of this treaty.

Source: Buccini 2004.

BOX 2.3. AN ALTERNATIVE TO SPRAYING: BOLLWORM CONTROL IN SHANDONG

Farmers in Shandong (China) have been using "innovative" methods to control bollworm infestation in cotton when this insect became resistant to most pesticides. Among the control measures implemented were:

1. The use of pest resistant cultivars and interplanting of cotton with wheat or maize.
2. Use of lamps and poplar twigs to trap and kill adults to lessen the number of adults.
3. If pesticides were used, they were applied on parts of cotton plant's stem rather than by spraying the whole field (to protect natural enemies of the bollworm). These and some additional biological control tools have proved to be effective in controlling insect populations and insect resistance, protecting surroundings and lowering costs.

Source: Bin Xiao Kefu Xue, 1998.

world. There is an inevitable trade-off between the ecological benefits of narrow spectrum (short persistence/lower toxicity) pesticides and the short-term economic benefits of broader spectrum (longer persistence/higher toxicity) pesticides. The latter is often the focus of pesticide users while government regulations tend to press for the former.

There has been a substantial increase in commercialization of biocontrol products, such as beneficial insects, cultivated predators and natural or non-toxic pest control products. Biocontrol, which was initially used for niche products, is now being mainstreamed to major agricultural commodities, such as cotton, corn and most commonly vegetable crops. Biocontrol is also slowly emerging in vector control in public health and in areas that for a long time mainly focused on chemical vector control in mosquito/malaria—and black fly/onchocerciasis—control programs. The number and size of commercial companies marketing these biocontrol products has expanded rapidly over the last decade in developed countries. It also offers considerable benefits to developing countries, in terms of a user friendly, employment creating technology. However, as the products of biocontrol (often living organisms such as beneficial insects, entomopathogenic nematodes fungi, bacteria or viruses) are perishable, production facilities tend to be dispersed and as observed in India, it is often difficult to get a sufficient volume and consistent supply of production.[33] Another reason for low availability of biopesticides on the market is the registration process that tends to favour companies registering high-volume products, and thereby indirectly discourages applications of small and medium-sized biopesticide producers.[34]

NEW PESTICIDES

There has also been a continuing development of newer pesticides (sulfonylureas, methoxyacrylates, napthoquinones, nereistoxin analogues, Pyridine azomethine, pyridine azomethine and pyridinamines and the biorationals (microbial pesticides and semiochemicals) that require less volume when applied, are more potent against target pests, and may be less toxic to mammals than the older and voluminous organophosphates and chlorinated hydrocarbons. However, the development, especially registration and commercialization process (the "bringing to market"), of the new pesticides has been slower and more costly, as fulfilling the technical and environmental sustainability criteria have become

[33]Harris (2000) lists the main challenges in biocontrol delivery as (a) developing products to meet high performance standards; (b) achieving good product quality with inherent safety and efficacy implications; (c) achieving adequate market penetration and product distribution; (d) competing effectively with agrochemicals; and (e) operating within an unfavorable regulatory environment.

[34]Anon 1997.

more complex and expensive. The compatibility of some of these newer pesticides, such as Pyrethroids, with IPM should be assessed, as they can be highly toxic to other organisms (e.g., crustaceans) and to beneficial insects.[35] Furthermore, the uptake of these newer products in the developing country markets is limited by the availability of older, less expensive, generic pesticide products (that are often already banned in developed countries).[36]

Application Technology

More efficient application of pesticides has received considerable attention; however, the technologies are mainly used in the developed countries. Broadcast spraying (or blanket spraying) is still the main application method of choice, although the timing and implementation of such spraying is increasingly regulated, and to such an extent that in some parts of the world farmers leave the spraying (and the increasingly tightening rules on storage, etc) to specialized pesticide application companies. Western spraying equipment has become more sophisticated (computer control, and precision control/site-specific application, and gradual-release granules) and more expensive and employs technologies that are often ill-suited to mixed farming and or small holder farming. Some other applications, such as improved nozzle selection for knapsack sprayers and improved temporal targeting of applications, may offer opportunities for small farmers in developing countries. Due to price and availability issues, the application in developing countries is largely based on simple sprayers and hand mixing of chemicals. Better adapted packaging and more innovative application methods could reduce unnecessary human exposure to pesticides.

Genetic Engineering

To reduce human and environmental exposure to persistent and broad spectrum pesticides, and to prepare for the envisioned future limitations on pest control by spraying of chemicals, the agrochemical companies invested heavily in the biosciences since late 1980s. Advances in plant biotechnology during the past decades have introduced major changes in the development of new plant varieties, including new approaches for improved disease and insect resistance. A known example of an insect resistant transgenic crop is *Bacillus thuringiensis* (Bt) cotton developed through insertion of an insecticidal protein gene in the cotton variety. Another biotechnological innovation in crops is herbicide resistance, whereby the crop is made resistant to an herbicide, which can then be used to control weeds in the field where the transgenic crop is grown (e.g., *"Round-up ready soybean"*). Recent evidence shows that some transgenic crops, especially insect-resistant cotton, are yielding significant economic gains to small farmers as well as important social, health and environmental benefits through the reduced use of agricultural chemicals. See box 2.4 for further details. Despite positive impacts in the case of Bt-cotton, the economical, environmental, and social impacts of transgenic crops overall are still widely debated. Especially the question on whether herbicide resistant crops increase or reduce the use of herbicides is unresolved.[37]

Advances in Crop Management

Other "new" agricultural practices, such as no-till agriculture, urban agriculture and bio-control of pests, offer exciting new opportunities but are not without risks.

a. The no-till technology has generally been promoted with chemical weed control, rather than with non-chemical weed

[35]A DANIDA study in Vietnam. In: Insecticides disrupt IPM. *Pesticides News* No. 39 (March 1998): 12–13.

[36]APO 2002; Harris 2000.

[37]Eichelbaum et al. 2001; Freckleton et al. 2003; Persley and Lantin 2000.

BOX 2.4. REDUCTION IN INSECTICIDE USE AND INSECTICIDE POISONING AMONG FARMERS IN HEBEI/SHANDONG, CHINA

A survey of agricultural producers in China demonstrates that *Bacillus thuringiensis* (Bt) cotton adoption increased production efficiency and improved farmer health. After adopting Bt-cotton, both insecticide use and poisonings among small farmers were reduced five-fold, from 57.8 to 10.3 kg/ha and 22.2 to 4.7%, respectively. A survey of China's plant biotechnologists showed that China is developing the largest plant biotechnology capacity outside of North America. The list of genetically modified plants already in the field trials, including rice, wheat, potatoes, and peanuts, is impressive and differs from those being worked on in other countries. Poor farmers in China are cultivating more area of genetically modified plants than are small farmers in any other developing country.

Source: Huang et al. 2002.

control methods, such as use of cover crops and mulch technologies. The choice is by no means clear as no-till mulch technologies tend to have a variable impact on weed control. In some cases they effectively reduce the need for herbicide use whereas in other cases the need for weed control may increase as the composition of weeds in the field changes. Many soybean producers in Brazil, for example, use no-till without herbicide-resistant crops whereas in Argentina farmers appear to depend more on the use of herbicide resistant soybeans.[38]

b. Urban/peri-urban agricultural production in the world is gaining in importance—in 1993, 15–20% of the world's food was estimated to be produced in urban areas.[39] However, the renewed emphasis on urban agriculture is generally not increasing the risk of unsustainable pesticide use, as many of the producers are driven by producing "safe or organic" food for specialized markets.[40]

[38]Schnepf et al. 2001.

[39]Mougeout 2002.

[40]FAO 1999.

SOCIAL DEVELOPMENTS

Consumers in both developed and developing countries have become more aware of food and environmental safety. Highly publicized outbreaks of two animal diseases (mad cow disease and foot and mouth disease) in Europe and an initially poorly managed release (in terms of public relations) of transgenic crops resulted in a greater consumer awareness of food safety, farming practices and rural livelihoods in general and fueled an intensive and broad debate about biotechnology by consumers. Several complex issues among which poor information provision and lack of public consultation associated with the first commercial releases of transgenic crops and overall weak consumer confidence in some European countries in regulatory processes contributed to the debate. Consumers are also becoming increasingly aware about the risks, both real and perceived, of certain production systems and demand that such risks are weighted against the societal including environmental benefits. The risks of using pesticides have been part of that debate.

Authorities and consumers also in the developing countries have become more aware of the pesticide residue levels in their food and pesticide- and other food-related- poisonings, indicating a need for vigilance by producers, traders and retailers in developing countries. Requirements of the food industry regarding pesticide residues have become a major force that

encourages developing country governments to support the adoption of IPM practices. The rising public demand for food safety and quality is creating niche market opportunities for certified products, such as organic and pesticide-free or "green" food in both developed and developing countries. This heightened awareness of food- and feed-related risks can create incentives for country level policy changes and practices contributing to sound pest management.

The understanding of the specific effects of pesticides on human and animal health has improved. New epidemiological and biochemical studies provide more detailed information on the adverse effects on human health. There is increasing evidence of the adverse effects of exposure to pesticides on overall health, on reproductive health, cancer risks, and prenatal and juvenile growth rates in children[41] (See box 2.5 and box 2.6 for further details). There is also evidence that these effects may differ in people (and pets[42]) depending on sex, ethnicity, type and length of exposure, etc. These differences

[41]See de London et al. 2002; Murray et al. 2002.

[42]Glickman et al., 2004 provided strong evidence of susceptibility of one specific breed of dog to exposure of herbicide (2-4D) treated lawns (and leading to bladder cancer).

BOX 2.5. PESTICIDE EFFECTS ON FARM WORKERS

The number of pesticide poisoning cases reported to the DPR in California, dropped from 665 in 1991–1996 to 475 in 1997–2001. California has the strictest rules on pesticide application worldwide, to such an extent that many farmers leave application to professional companies that know the rules and use up-to-date equipment. Most farms have reduced their reliance on chemicals and use various means of biological control. In contrast to this, over 50% of flower workers in Ecuador showed symptoms of pesticide intoxication (Pálan and Pálan 1999) and in Indonesia, 92% of farmers participating in the Integrated Swamps Project reported health problems after applying pesticides (Ishii-Eiteman and Ardhianie 2002). The long term effects of these poisoning episodes are not known, but recent experience seems to indicate that minor exposure may have major effects on child growth and development.

Source: Ishii-Eiteman and Ardhianie 2002; Pálan and Pálan 1999.

BOX 2.6. HUMAN HEALTH, ENVIRONMENTAL, AND ECONOMIC EFFECTS OF PESTICIDE USE IN POTATO PRODUCTION IN ECUADOR

The International Potato Center (CIP) conducted an interdisciplinary and inter-institutional research-intervention project dealing with pesticide impacts on agricultural production, human health, and the environment in Carchi, Ecuador. Carchi is the most important potato-growing area in Ecuador, where smallholder farmers dominate production. They use tremendous amounts of pesticides for the control of the Andean potato weevil and the late blight fungus. Virtually all farmers apply class 1b highly toxic pesticides using hand pump backpack sprayers. Research concerning pesticides has examined: neurological impacts on farmers and their families; poisoning incidence; studies of farmers' attitudes, knowledge, and practices; economic impacts; and contamination of ground and surface water, clothing and body surfaces, food, and farmers' homes. Intervention activities have included: farmer field schools, community meetings analyzing personal and household exposure pathways, promotion of safety measures, radio announcements, educational programs, and stakeholder workshops.

The study found that the health problems caused by pesticides are severe and are affecting a high percentage of the rural population. Despite the existence of technology and policy solutions, Government policies continue to promote the use of pesticides. The study conclusions concurred with those by the pesticide industry, *"that any company that could not ensure the safe use of highly toxic pesticides should remove them from the market and that it is almost impossible to achieve safe use of highly toxic pesticides among small farmers in developing countries."*

Source: Yanggen et al. 2003.

demonstrate that generalizations are risky, and that especially with respect to developing country populations, often ethnically different and less studied than Western populations, extrapolations of safety data have to be done on a case-by-case basis.[43]

The internet, world wide web, and other rapid access information exchanges along with mass media approaches[44] have helped in the dissemination of information in a number of countries and regions where farmers increasingly have better access to such communication means.

[43]Most countries do require local verification of efficacy, but rarely require locally verified safety data.

[44]Heong et al. 1998; Huan et al. 1999.

CHAPTER 3. STEPS TOWARD SOUND PEST MANAGEMENT IN THE WORLD BANK PROJECTS

POLICY CONTEXT

WORLD BANK'S PEST MANAGEMENT POLICY

Overall, the World Bank has played an important role in focusing the attention of the development community and client countries on the importance of pest management policies. Numerous publications generated by the World Bank's Development Research Group (DECRG), Agriculture and Rural Development Department (ARD), and by the Environment and Sustainable Development Division in the Africa region (AFTES), discuss various policy aspects of pest management and IPM.[45] The main tool for mainstreaming the implementation of sound pest management in the World Bank since 1998 has been the OP 4.09 safeguard policy on pest management and related policy and implementation documents. This policy is part of the Environmental Assessment umbrella policy (OP/BP 4.01) used to identify, assess and mitigate the potential negative impacts associated with project operations. The application of the Environmental Assessment to projects involving pest management is detailed in the Annex C of the Bank Procedures on environmental assessment (BP 4.01 Annex C). The latest revisions of OP 4.09 and BP 4.01 Annex C (1998 and 1999 respectively) did not include major changes in the policy itself but was mainly aimed to clarify and, hence, improve the compliance by requiring a pest management plan in the case that World Bank investments would lead to changes in pesticide use directly or indirectly through significant changes in agricultural practices.

Rural: The World Bank's pest management policy in lending is guided directly by the OP 4.09 and implemented through various instruments, ranging from support to country policy development to implementing sound pest management/IPM at the project level. Box 1.1 (chapter Introduction) lists examples of recent World Bank projects that support sustainable pest management.

The pest management and IPM issues debated in the World Bank in the last decade have included:

(i) The use of Farmer Field Schools to promote IPM; while recognizing the merit of intensive training for participating farmers, the World Bank questioned the extent of farmer-to-farmer diffusion, and raised the issue of fiscal sustainability related to this knowledge intensive educational approach;

(ii) The World Bank's position towards the use of genetically engineered crops in developing countries; and

(iii) The trend toward meeting the dual objective of agricultural productivity and environmental sustainability through sustainable intensification (see the section on Sustainable productivity intensification in the Agriculture Investment Sourcebook).

Above mentioned issues have been discussed in various World Bank publications[46] as well as in international and national workshops.[47]

[45]See Farah 1994; Feder 1979; Feder et al. 2004a, b; Kiss and Meerman 1991; Lele 2003; Quizon et al. 2001; Rola et al. 2002; Sheriff and Fleischer 2005; Schillhorn van Veen et al. 1997; and Sorby et al. 2003.

[46]E.g., Feder et al. 2004a,b; Quizon et al. 2001; Rola et al. 2002; and World Bank 2004a.

[47]See Persley and Lantin 2000.

More recently,

(iv) Food safety and standards have been added to this agenda, including the need to harmonize and enforce standards, reduce pesticide residues in food and facilitate developing countries' access to international markets (van der Meer et al. 2005).

(v) In addition, considerable work was done to develop tools and policies to reduce obsolete stock of out-dated pesticides, especially in the Africa region.

Most of the above mentioned issues are part of the World Bank's "do good" agenda (promotion of measures to avoid farmers' adoption of pesticides and supporting IPM as an agronomic best practice among other sustainable agricultural practices), new developments in the realm of pest management may also require a review under the "do no harm" (i.e., safeguard and mitigation of potential negative effects of pesticides, including use of IPM) policy.

Health: The World Bank's vector control policy in lending is more or less guided by the World Health Organization (WHO) or UNICEF (United Nations International Children's Emergency Fund) initiated policies. Previous success stories include the long term commitment to River Blindness control in Africa and to a lesser extent control of Chagas and other vector transmitted diseases. The most recent example is the joint WHO-UNICEF initiated guidelines used in the *Roll Back Malaria Partnership.* These guidelines are fairly simple and mainly focus on the use of bed nets in mosquito control. However, for a more sustainable long term approach, greater emphasis on integrated vector management (IVM) methods is needed.[48] Toward that end, the WHO developed a global strategic framework on integrated vector management to guide policy makers and to strengthen collaboration within the development community.[49]

Transport and Energy: The major link to pest management in the transport and energy sectors is by way of the need for vegetation control. In some developing countries, where labor is cheap, the cost-benefit ratio of using labor rather than (imported) pesticides may tilt towards using labor, especially when the potential negative externalities of herbicide use (including sustainability of the farm ecosystem and effects on human health) are taken into account. However, relatively little work has been done to reduce reliance on herbicides in vegetation control. Therefore, there is a need to consider the feasibility of labor intensive alternatives to herbicides in World Bank financed projects that involve vegetation control.

World Bank's Role in the Global Policy Dialogue

The World Bank continues to engage the various pest management interest groups in the development community in a dialogue to promote a favorable policy environment for expedition of sound pest management/IPM adoption. It uses all opportunities to create a platform to influence the global policy framework. Recent examples include the adoption by the Steering Committee of the Consultative Group on International Agricultural Research (CGIAR) System wide Program on IPM (SP-IPM), in which the World Bank is represented, of a pesticide policy that excludes the use of Persistent Organic Pollutants, Class I pesticides and where feasible class II pesticides. In the recent locust crisis, the World Bank, in conjunction with the donor community urged FAO and the Desert Locust Control Committee (DLCC) to consider: (a) continued support for long-term preventive approach to the Desert Locust problem, including joint planning for prevention; and (b) giving greater attention to

[48]See Review by Rose, 2001 (Pesticides and Public Health).

[49]See WHO 2004.

the use of environmentally friendly pesticides. Excessive supplies of chemical pesticides under declared emergency situations are likely to contribute to the buildup of stockpiles of obsolete pesticides. The World Bank urged the donor community to consider the concept of a "Pesticide Bank" to supply affected countries pesticides in small consignments, spread over time to reduce the risk of buildup of stocks.

National Pesticide and Pest Management Policies

The importance of sound pest management practices for sustainable agricultural production is being recognized by many developing countries. Some have developed policies that authorize plant protection services to coordinate the promotion of pest management practices for agricultural production and promote their adoption among local farmer groups. These policies provide the institutional framework for the planning and implementation of pest management, including IPM, as well as emphasize the promotion of sound pest management practices within the local farming communities. The extent to which these national policies successfully promote environmentally sound agricultural practice will depend on the country's capacity to enforce their articles and the incentives to implement them (prices for exports crops and specialized markets). A greater number of countries are signatory to the FAO International Code of Conduct on the distribution and use of pesticides and are passing laws on the control of the distribution and use of pesticides. However, there are still many inadequate local policies and lack of enforcement of the existing regulations that contribute to the greater use of unsafe pesticides. The World Bank continues to engage in policy dialogue on pest management with borrower countries (See table 5.1 for examples).

Operational Context

Staff Recruitment and Skills

The creation of the safeguard compliance unit in 2000 had the objective to improve the oversight of and compliance with the World Bank safeguard policies. The World Bank also agreed to improve its staffing to oversee the policy compliance of OP 4.09, as well as the implementation of IPM in general by acquiring a full-time technical specialist, initially as a secondment under the umbrella of the joint FAO/UNEP/UNDP/ World Bank IPM facility, but after 2003 with a staff expert. Training on safeguards, and pest management in particular, started in 2001 and intensified in 2003 both at headquarters and in the field offices.

Some erosion in agricultural technical know-how and skills among World Bank staff during the past decade has taken place, mainly due to retirement of skilled staff and hiring of generalists. The total number of staff in the rural sector declined by about 15% from 1996 to 2001.[50]

Some of the regional pest management related work was outsourced to consultants or to the IPM Facility. The Facility had a depth of skills and helped in the quality control of the World Bank project operations, although the focus of the Facility was somewhat limited, (i.e., mainly FFS training and associated in-country projects). The outsourcing for IPM expertise did not significantly advance sustainable pest management and IPM in World Bank lending. This issue was further complicated by the policy of increased hiring of local staff in country offices, many of whom have had limited earlier exposure to the risks and benefits of various pest management tools and policies.

[50]From "Vision to Action in the Rural Sector:" Working Paper 1996. World Bank and Reaching the Rural Poor 2001.

The hiring of the World Bank-wide pest management expert in 2003 and the nomination of regional safeguard focal points is showing some positive impact in several regional projects. Furthermore, the increased awareness of SPS in the promotion of export projects has actually resulted in a genuine call for sound pest management practices that are country-driven.

Technical Support and Training

Sufficient human and financial resources are needed to support TTLs, the World Bank's in-country staff and borrowers to identify, design and supervise projects that require compliance with OP 4.09 as well as the projects that would benefit from promotion of pest management alternatives and IPM as an agronomic "best practice." World Bank task teams could be helped by the regional full- or part-time technical specialist as well as by manuals and templates for World Bank staff and project staff on pest management that relate to specific and relevant issues (i.e., pest management in non-agricultural sector such as health, energy, and transport); or related to specific lending instruments (i.e., Community Driven Development (CDD), on-lending, adjustment), including a template for pesticide procurement. As current skills on pest management are stretched far, it is recommended to review and reassess the need to hire and/or train specialist staff, and include an appropriate reward system. Attention to identification and design of pest management activities at the preparation stage are likely to support compliance but more attention has to be paid on the quality of supervision. Training of team members and the World Bank's in-country staff (e.g., a primer in pest management and training in safeguards) is one step. Supervision missions and review of supervision documents of projects with pest management activities could be supported by internal and external technical specialists as needed. Formal and informal monitoring of pest management activities (among other project activities) and safeguard compliance by the private sector and non-governmental organizations could be further promoted. Besides improving compliance with OP 4.09, it is important to promote the "do good" agenda by identifying means to integrate overall sustainable agricultural practices, including IPM, into projects that do not explicitly require compliance with the safeguard 4.09. Finally, to support the trend toward policy-based lending, which reduces the leverage of the World Bank's own safeguards, special attention should be paid to building capacity among national experts involved in plant protection to prepare sound pesticide policies and national safeguards.

Procurement

The World Bank has recognized the potential risks associated with the use of pesticides and has set a number of conditions on their procurement. However, the internal compliance to these conditions has been somewhat irregular, which can pose a reputational risk to the World Bank. Additional guidance in procurement has been deemed necessary—steps toward this goal are the recent revision of the pesticide procurement guidelines and the updated and detailed instructions available in the Pest Management Guidebook[51] to help with pesticides and pest management issues.

Other Policies and Changes Impacting Pest Management

Apart from the pest management safeguard policy (OP 4.09) there are a number of other policies and actions, which have an impact on the

[51]http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTARD/EXTPESTMGMT/0,,menuPK:584328~pagePK:64168427~piPK:64168435~theSitePK:584320,00.html

World Bank's ability to comply with OP 4.09 and to promote overall sound pest management. These include:

Changes in World Bank's Lending Instruments

The rural portfolio is moving towards greater decision-making power being shifted from government officials to farmers and rural communities (particularly in CDD projects). In addition, the project safeguard responsibilities are shifting from World Bank teams to the project counterparts. This greater decision making by rural people and rural societies through credit and social or competitive fund instruments has increased development financing through on-lending programs. This has also shifted the direct program oversight from World Bank staff to local agencies and loan officers who comply with and adhere to the policies of their own lending institutions and are less familiar with risk assessment and management, and in general unfamiliar with the principles and application of the World Bank's safeguard policies. Changes in the policies of the lending institutions as well as training of local loan officers in environmental risk management are options to pursue to reduce the risk of unsustainable pest management practices.

Partnerships

As in-house expertise in pest management is very limited, there is a need to further enhance partnerships with expert organizations in pest management (e.g. CGIAR SP-IPM, the Global IPM Facility (GIF), Food and Agriculture Organization of the United Nations (FAO) and WHO, Non-Government Organizations (NGOs) and selected research organizations, such as World Vegetable Center (AVRDC), The International Center for Insect Physiology and Ecology (ICIPE), and CABI). These partnerships may: (a) help in the development of sound pest management programs targeted to specific crops, livestock, agroforestry, fisheries or public health in developing countries; (b) raise awareness and support dissemination of the concept of sound pest management (both "do no harm" and proactive "do good") as well as specific pest management technologies; and (c) help the World Bank in identifying those technologies that are ready to be main-streamed through World Bank supported programs. ICIPE, for example, not only has a sound research program on IPM in public health and agriculture, but has also promoted commercialization of IPM technologies that are specifically targeted for rural development in Africa.

Of all the partnerships the alliance of the World Bank with the CGIAR System wide program on IPM is of strategic importance because it provides the World Bank with an access to a wide and inclusive network of specialist expertise to help in promoting sound pest management practices in World Bank financed projects. The SP-IPM, an initiative of the CGIAR, has grown into a program including many IPM interest groups and stakeholders operating in several countries.

Codex Alimentarius and Private Sector Standards Promoting Sound Pest Management

Developing countries are increasingly facing stricter regulations related to health and food safety standards that continue to evolve internationally, nationally, and within individual supply chains as a response to improved scientific understanding of risks and consumer demand. Non-compliance with these standards seriously threatens countries' access to lucrative markets in developed countries.[52] As part of the technical assistance related to SPS and trade, the World Bank has been involved in operational lending projects in standards and SPS capacity building with the goal of enhanced agricultural productivity in developing countries. Current projects in World Bank lending operations include: (a) The Agro-Pastoral Export Promotion Project for Niger that aims to make producers and exporters

[52]World Bank 2004b.

more efficient at supplying the agro-pastoral export market with pesticide free produce; and (b) the Tunisia Agricultural Support Services Project that aims to improve the institutional capacity and quality of agricultural services delivered by public and private institutions and producer organizations to improve market access by focusing on pesticide residue testing in Tunisian produce and promoting more sustainable pest management practices. Many developing countries have taken the lead in updating or setting standards for their products to make them more competitive in the market place. For example, asparagus producers in Peru accepted the Codex Alimentarius standards as the international benchmark for food standards and Peruvian policy makers presented their position at the various Codex Committee meetings, hence influencing the standard setting. Peru is now one of the largest asparagus exporters in the world. Another, a more extreme example of the private sector's interest in IPM is cocoa production in Indonesia. The entire sector is threatened by the rapid expansion of cocoa borer infestation. The private sector is engaging with national experts and international donors to introduce IPM to control the borer.[53]

Private sector has an important role to play in promotion of sound pest management and IPM particularly through promotion of agronomic good practices and requirements for certification and compliance with safety standards. Private sector involvement includes trade associations concerned with the interests of the food processing industry, crop protection and biotechnology companies and farmers' associations. As an example of food industry initiative, the Sustainable Agriculture Initiative (SAI) Platform that was created by the food industry and currently includes 17 members, aims to actively support sustainable agriculture involving the different stakeholders of the food chain. SAI Platform supports agricultural practices, including sound pest management and IPM, and agricultural production systems that preserve the future availability of current resources to guarantee a long-term supply of agricultural raw materials. EUREPGAP, including retailers, suppliers/growers and associate members from the input and service side of agriculture was established in 1997 as an initiative of retailers belonging to the Euro-Retailer Produce Working Group (EUREP). It aims to agree on standards and procedures for development of good agricultural practice (GAP) and is based on Integrated Crop Management. Activities include a certification scheme and harmonization of standards for IPM and minimized pesticide use.

CropLife International, led by companies such as BASF, Bayer CropScience, Dow AgroSciences, DuPont, FMS, Monsanto, Sumitomo and Syngenta, is a global federation representing the plant science industry (mainly crop protection and agricultural biotechnology companies) network of regional and national associations in 91 countries. The companies participate in promotion of sound pest management particularly through stewardship programs, on a broad range of crop protection and environmental stewardship issues that support the marketing standards agreed under the FAO Code. Activities include e.g., educational outreach programs, research, best practice in manufacture, marketing, use and disposal of pesticides, certification and farmer training on pesticide use and IPM. Lastly, the umbrella organization of 100 national farmer associations (IFAP) is promoting sound pest management and IPM as part of its work on sustainable agriculture.

New Chemistry and Genetically Modified Crops

Progress in the plant science industry is focused on producing safer pesticide products with shorter persistence in the environment. New pest management tools ranging from less toxic

[53]http://www.chocolateandcocoa.org/Programs/SARF/indonesia.asp

chemicals, to semiochemicals, biopesticides, and insect resistant transgenic crops are becoming available to both developed and developing countries. The benefits of these new technologies to the improvement of agricultural productivity and environmental sustainability have been demonstrated in many cases, including those arising from the use of genetically modified crops. The latter have, however, generated a great deal of debate over the potential risks these crops pose on the environment. The World Bank's position is to engage in a dialogue on these developments with all the interest groups in the countries, including NGOs, academia and the private sector. The World Bank remains an important partner for investing in new technologies while maintaining its long-standing tradition of being an honest broker of information in helping the World Bank's client countries to make informed decisions about science and technology policies and investments in the agriculture sector.

CHAPTER 4. ENVIRONMENTALLY SUSTAINABLE PEST MANAGEMENT POLICIES AND PROGRAMS IN THE DEVELOPMENT COMMUNITY—LESSONS LEARNED

Before reviewing the World Bank's performance in pest management a brief description is provided of pest management approaches in the general development community. This includes a view of: development banks, international organizations, bilateral assistance agencies, the private sector, and civil society organizations.[54]

Development Community Involved in Sound Pest Management

Regional Development Banks

Regional Development Banks exert considerable leverage on national policies through their lending programs. The African, the Inter-American and the Asian Development Banks all have experience in funding projects including IPM practices. The Asian Development Bank (ADB) has operated both through policy and strategy support to its mandate countries as well as through farm level training in IPM. The African Development Bank's (AfDB) Environmental Policy emphasizes the importance of natural resource management in the agricultural sector. It is committed to long-term sustainable productivity with strategies to use environmentally safe chemicals and IPM techniques and has an IPM operational policy similar to that of the World Bank. The Inter-American Development Bank (IDB) has a broad operational policy, which encourages integrated approach to sustainable agricultural development. However, IDB does not have an operational policy on IPM. International Fund for Agricultural Development (IFAD) is a strong supporter of agricultural development and promotes IPM supporting technologies and farmer level training approaches.

International Organizations

International organizations have diverse mandates and different experiences. The Organization for Economic Co-operation and Development (OECD 1995) focuses primarily on harmonizing the policies and standards of its member countries. It sees IPM as one of the most effective ways to reduce the risk of pesticide use and issued "Guidelines for Aid Agencies on Pest and Pesticide Management". The CGIAR is the most prominent organization in research to support international agriculture. In 1995 it formed the SP-IPM program, which focuses on the generation and information sharing on new IPM technologies, fostering links between different stakeholders including the private sector and NGOs and promotion of sound pest management policies. The FAO has a broad agenda with strong focus on sustainable agriculture and IPM including heading up the International Code of Conduct on the Distribution and Use of Pesticides and the Rotterdam Convention on Prior Informed Consent (with UNEP). Together with UNDP, UNEP and the World Bank, FAO also co-founded the Global IPM Facility in 1997 to assist governments and NGOs in developing national and local IPM programs.

Bilateral Assistance Agencies

Bilateral agencies support pest management and IPM through funding research, field project implementation, guideline development, and

[54]See further information and discussion in Sorby et al (2003).

support to regulatory reforms. For example, United States Agency for International Development (USAID) supports research on IPM through funding the CGIAR centers. The European Commission (EC) supports IPM through several agricultural research and field projects and has developed guidelines for assessing environmental impact of pest management programs. In 1993 the EU facilitated the formation of IPMEurope, a network for coordinating European support to IPM in research and development. IPMEurope involves institutions of the EC, EU member states, Norway and Switzerland (the associate states) with an interest in promoting IPM in developing countries. IPMEurope operates mainly through donor harmonization of pesticide policies and IPM among the donor agencies of its members and through partnerships and policy influence in international fora. The French development agency commissions its IPM work to French Agricultural Research Centre for International Development (CIRAD), which is a large research organization specializing in tropical agriculture. Other major bilateral donors active in IPM include the Netherlands Development Agency and UK Department of International Development (DFID). Also the Nordic donors and Swiss Aid have supported a limited number of IPM field projects.

Civil Society Organizations

The Pesticide Action Network (PAN) is a globally active NGO working in the field of pest management. PAN focuses on influencing international and national policies to reduce pesticide use and increase the use of sustainable and ecological alternatives to chemical pest control. The Water Resources Institute (WRI) is an advocacy organization with a broader environmental agenda that also includes IPM as a part of sustainable agricultural development. Other NGOs concerned with pest management include the Sustainable Agriculture Network (SAN)[55] and the Rainforest Alliance.

[55]Formerly called the Conservation Agriculture Network (CAN).

In light of the activities in the development community as a whole, the World Bank experience and performance in pest management is reviewed below.

World Bank's Performance in Sound Pest Management

The World Bank works on pest management both through enhancing knowledge through analytical work as well as through supporting pest management and IPM in the World Bank's lending operations. Various efforts have been made in the recent years to measure the World Bank's performance in pest and pesticide management and its adherence to its safeguard policy. These evaluations include assessment by the Quality Assurance Group, Regional Environmental Reviews and OED. While none of these reviews dealt exclusively with pest management, they did point out good practices and alerted to problems in this area. In addition to these internal reviews, a number of NGOs provided World Bank management and the public with feedback on the World Bank's compliance to its safeguard policy.[56] In a more detailed desk review (See box 4.1). World Bank projects (Project Appraisal Documents and Project Supervision Reports[57]) and policy documents were screened and reviewed to assess progress made in the application of the World Bank's Pest Management policy (OP 4.09) in recent economic policy recommendations and project interventions.

[56]Reviews have been prepared in particular by the Pesticide Action Network North America that has a dedicated program monitoring the World Bank's performance with respect to its Pest Management policies.

[57]The Project Supervision Report (PSR) has been streamlined and redesigned as the Implementation Status and Results (ISR) report. The PSR system was frozen on December 31, 2004 and the new ISR system was rolled out World Bank wide on January 3, 2005.

BOX 4.1. METHODOLOGY USED TO REVIEW THE INTEGRATION OF PEST MANAGEMENT ISSUES IN THE WORLD BANK'S COUNTRY STRATEGIES AND LENDING PORTFOLIO

CAS and PRSPs: Country Assistance Strategies (CAS) and Poverty Reduction Strategy Papers (PRSPs) from 1999 to 2004, a total of 92 and 62 documents, respectively, were reviewed for content on: pest problems, pest control/management (including pesticide use, crop protection or plant health measures), IPM, level of IPM interventions, vector/malaria/dengue and control measures, pesticides and insecticide treated bed-nets, and IVM. (Notes: In case there was more than one CAS/PRSP per the review period, the most recent one was selected. In the case of PRSPs either a full or an interim paper was reviewed. In addition, where possible one annual progress report per PRSP was also included as significant changes were often observed in the progress reports).

Project documents: Project Appraisal Documents (PADs) for agriculture (including agriculture, credit, fisheries, forestry, irrigation and research), health, transport and energy projects approved from 1999 to March 2004 were reviewed. The 115 agriculture PADs were screened for triggering of the pest management safeguard policy OP 4.09, mention of pesticide purchase, mention and/or activities on pest and pest management, and indication of pesticide use (e.g. pesticide purchase and use, mitigation of the negative impacts of pesticide use, etc., projects that aimed to limit pesticide use for research purpose only, were not considered). The 127 transport and 38 energy PADs were screened for mention and/or activities on vegetation control (and related activities) or herbicide use in vegetation control. The 87 PADS of health projects were screened for mention of vector/malaria/dengue, inclusion of vector/malaria/dengue control activities, use of pesticides and insecticide-treated bed-nets. Projects that mentioned malaria and/or vector control only in association with Millennium Development Goals were not considered. All PADs were screened for inclusion of Pest Management Plan (PMP), mention of the term "Integrated Pest or Vector Management", and the level of intervention of IPM measures (or displayed IPM-related activities) as a minor component, a component to mitigate the potential negative impact, major component, and/or IPM as a component of a research program. All projects were also assessed for having a direct and/or indirect impact on pesticide consumption and for their compliance with OP 4.09 at the appraisal stage.

The Project Status Reports (PSRs) of the agriculture projects that were assessed for having an impact on pesticide consumption at the appraisal stage (62 in total) were further screened for Pest Management safeguard rating, discussion of pest management and IPM issues, and any changes in compliance during the project implementation. This data was compared to the external (provided either by World Bank or other organizations) information on compliance at the preparation and implementation stages on a few selected projects.

Source: Authors.

POLICY

The World Bank has been among the pioneers in the world-wide dialogue about pest management and IPM policy and its relevance to sustainable development. The results of the analytical work on IPM have been widely disseminated through Word Bank documents and through the mainstream literature (See chapter 1).

On a global scale the effort of the implementation of sound pest management policies in overall policy dialogue or donor investments has been relatively limited and seems to be overshadowed by the major global pesticide policy changes of the last decade, i.e., the Rotterdam and Stockholm Conventions (See also box 2.2). Also, the Global IPM Facility, that the World Bank helped to set up, did not evolve into a major forum for discussion and advocacy on pest management policy issues.

Within the World Bank, the mainstreaming efforts through the analytical work carried out in the Agriculture and Rural Development Department, and in the regional operations appears to have had a relatively good impact as represented in the Country Assistance Strategies (CAS) and especially in the poverty reduction strategies (See table 4.1). About 15% of the CASs reviewed mention either agricultural pests or possible health effects of pesticide use. The

Table 4.1. Pest Management Issues in the World Bank Country Assistance and Poverty Reduction Strategies

	Total (No)	Total (%)	1999	2000	2000	2002	2003	2004
Country Assistance Strategies (CAS) reviewed (total)	92	100	9	16	14	22	24	7*
...that discuss agriculture	89	97	100	100	93	91	100	100
...that mention agricultural pests	3	3	0	6	0	9	0	0
...that mention agricultural pest control***	14	15	11	19	0	18	21	14
...that mention health effect of pesticide use	0	0	0	0	0	0	0	0
...that mention malaria, dengue or vector control	42	46	33	44	21	41	67	57
...that mention vector control	22	24	11	31	7	18	33	43
...that mention impregnated bed nets	1	1	11	0	0	0	0	0
Poverty Reduction Strategies (PRSPs) reviewed (total)	62	100	0	8	10	17	20	7
...that mention pest issues	32	52	n/a**	38	50	53	50	71
...that mention agricultural pests	23	37	n/a	50	80	29	25	14
...that mention agricultural pest control***	39	63	n/a	38	70	65	60	86
...that mention health effect of pesticide use	31	50	n/a	75	90	35	35	43
...that mention malaria, dengue or vector control	44	71	n/a	63	90	76	60	71
...than mention vector control	36	58	n/a	63	70	59	50	57
...that mention impregnated bed nets	2	3	n/a	13	0	0	5	0

Notes: * = 2004 first quarter; ** = PRSPs started in 2000; and ***= incl. pest control, IPM, crop protection, plant health or pesticides.

The numbers in annual columns indicate the proportion of the total number of documents in a given year.

Source: Authors.

Poverty Reduction Strategy Papers (PRSPs) showed even a clearer mainstreaming effect with over half mentioning pest issues in agriculture and health. PRSPs are generally drafted by teams that included other donors and NGOs and may hence provide a more comprehensive view of the issues.

The data also show that the mentioning of pest management related issues in both CASs and PRSPs increased during the survey period. This may indicate an increasing awareness among the World Bank and its clients of sound pest management, as there is no solid evidence of significant changes in pest management that would indicate a real increase in pest incidence. While strategy papers of countries with low or unchanged pesticide use would not be expected to highlight pest management issues, in some cases the CAS did not highlight even a substantial increase in the use of pesticides. For example, pest management issues were not included in the CASs of many of the Central American countries where pesticides have been claimed to cause pesticide-related occupational health problems in 19% of the population or 76% of the farm workers (Murray et al., 2002). Similarly, pesticide issues were frequently not covered in CASs of countries with cotton and other cash crop production usually associated with high pesticide use. The lack of discussion may reflect, however, the overall trend towards including fewer technical details in the policy and strategy papers. Also, the emphasis in general should perhaps be more on internalizing the externalities and on removing distorting policies such as pesticide subsidies.

The analytical method used, (i.e., review of CASs, PRSPs and Project Status Reports (PSR),

does not capture other policy dialogues with Governments. Such dialogues have taken place in the World Bank implemented Montreal Protocol projects with respect to reducing the use of methyl bromide (for example in Mali, Kyrgyz Republic, Tunisia, Iran, and others) or the Global Environment Facility/World Bank Stockholm Convention projects for phasing out and disposal of persistent organic pollutants (i.e., Africa Stockpile Programme, Demonstration of Alternatives for chlordane and mirex for termite control in China) during project supervision. Such a dialogue has also been more or less formalized in the design of the African Stockpiles Program. However, some high pesticide consuming countries may sometimes be reluctant to engage in either a policy dialogue or in a lending program in agriculture, thereby limiting the World Bank's opportunity to initiate such a dialogue and to support sound pest management practices.

PROJECT INTERVENTIONS—LENDING

In the World Bank project Portfolio, there are very few projects dealing exclusively with pest management. Interventions in pest management are always treated as good agricultural practice within larger projects. These interventions range from establishing regulatory frameworks to cleaning up of obsolete pesticides (Schillhorn van Veen, 2003). Specific interventions include:

1. *Regulations:* With the ever-increasing demands on product safety, exporting countries need to establish certification programs. The World Bank is often asked to build the necessary capacity (for example, analytical laboratories for residue testing as in the case of Colombia) and to strengthen local expertise to meet the demands of the export markets. Often these activities are associated with the necessary policy dialogue to support the development of regulatory frameworks (i.e., such as the case of organic production in Romania, and the case of vegetable and fruit production for export in Tunisia).
2. *Introduction of IPM technologies:* The World Bank has supported several initiatives over the years, including biocontrol of cotton pests in Central Asia, the organic coffee production in Mexico, the control of water hyacinth in East Africa, and the introduction of tsetse traps for the management of trypanosomiasis in Central Africa.
3. *Research, extension, and training:* The World Bank has a number of agricultural support projects ranging from IPM research and extension to providing agricultural inputs, to catalyzing the dissemination of information and promotion of IPM knowledge (i.e., cotton in Mali, export crops in Tunisia, IPM research and extension in Turkey and India, Agricultural research and extension in Peru).
4. *Obsolete stockpiles:* The World Bank is presently leading a partnership effort, including FAO, World Wildlife Fund, Croplife International, UNEP, PAN, and others, to help clean up the obsolete stocks of pesticides in Africa (See Stockpile Program in MNA and SSA regions). This will be a long process that requires interventions on several fronts (regulatory, prevention, procurement, and communication).

A summary of a review of 366 project appraisal documents approved between 1999 (when the stronger pest management policy was in effect for the first time) and the first quarter of 2004 are shown in Table 4.2. The majority of these projects were in transport and rural sector. Over half of the rural projects and between 20 and 30% of the projects in health, energy and transport mentioned pest management, weed or vector control. The number of projects that clearly indicated the use of

Table 4.2. Pest Management-related Topics as Mentioned in the World Bank Project Appraisal Documents

	Total (no)	Total (%)	1999	2000	2001	2002	2003	2004
Projects in Rural/Agriculture (total)	115	100	26	21	22	14	22	10
...with pest management mentioned	73	63	69	52	64	79	59	60
...with indication of pesticide use*	62	54	54	43	59	64	55	50
...with Pest Management Plan (PMP)	34	30	8	19	45	43	32	50
Projects in Energy (total)	38	100	7	7	11	12	1	0
... with vegetation control	10	26	14	14	36	25	100	0
... with indication of herbicide use	2	5	0	0	9	8	0	0
... with PMP	1	3	0	0	0	8	0	0
Projects in Transport (total)	127	100	20	31	25	15	25	11
... with indication of vegetation control	25	20	10	19	16	33	28	9
... with indication of herbicide use	2	2	0	3	4	0	0	0
... with PMP	0	0	0	0	0	0	0	0
Projects in Health (total)	86	100	17	24	19	18	8	0
...that mention malaria, dengue or vector control	17	20	29	17	21	17	13	0
... with indication of pesticide use	14	16	24	13	16	17	13	0
...with PMP	2	2	0	4	0	6	0	0

* = Projects with PMP due to e.g. purchase or application of pesticides, and projects without PMP but with a clear indication of having an increase in pesticide use (8 projects stating an increase in pesticide use, 3 with Environmental Management Plan stating concerns on increased pesticide use, 6 projects claiming to mitigate the negative impact of pesticides, 5 with a clear indication to intensify and increase production, and 6 with other clear indication of using increasing amounts of pesticides). The numbers in annual columns indicate the % of the total number of documents.

Source: Authors.

pesticides[58] was lower, but still fairly high in health (16%) and agriculture/rural projects (54%). Project compliance with the World Bank's safeguard OP 4.09 would have required the development of a pest management plan (PMP) in the projects. The observed trend towards improvement in compliance is likely to be due to improved understanding of the safeguard OP 4.09 requirements. It should also be noted that projects focus on implementing World Bank safeguards but as policy-based lending is increasing there is a stronger need to establish and build capacity in client countries to develop and enforce their own safeguard policies.

The compliance with the safeguard requirement at the appraisal stage of the agriculture/rural projects varied to some extent among the regions, 20 to 75% of the projects having a PMP, and 60 to 100% of the projects having a PMP and/or IPM component (See table 4.3) indicating that some projects planned to include IPM activities without developing a PMP. The compliance improved significantly during the review period, from 14% in 1999 to between 58–100% by the first quarter of 2004. It is also noteworthy that 40% of all agriculture projects (46 out of 115) mentioned that they include IPM activities. In

[58]In agriculture/rural projects, clear indication of pesticide use was considered in (a) projects that included a PMP due to (e.g., purchase or application of pesticides), and (b) projects without PMP but with a clear indication of having an increase in pesticide use: 8 projects stating an increase in pesticide use, 3 with Environmental Management Plan stating concerns on increased pesticide use, 6 projects claiming to mitigate the negative impact of pesticides, 5 with a clear indication to intensify and increase production, and 6 with other clear indication of using increasing amounts of pesticides. Projects that limited pesticide use only for the research purpose were not considered to have a major impact, and as such, not counted.

Table 4.3. Agriculture Project Appraisal Documents (PADs) between 1999 and the First Quarter of 2004 with Pest Management Activities and Pest Management Plans (PMP)

	LCR	MNA	AF	SA	EAP	ECA
PADs reviewed	13	11	25	13	22	31
PADs mentioning pest management (PM) activity	7 (54%)	8 (73%)	18 (72%)	9 (69%)	14 (64%)	17 (55%)
Projects with impact on pesticide use[1]	5	8	16	8	10	16
... of which with PMP	3	6	10	6	6	3
...of which with PMP and IPM	2	4	10	4	6	2
... of which with IPM	5	4	13	6	9	9
... of which without PMP and IPM	0 (0%)	2 (25%)	3 (23%)	2 (25%)	1 (10%)	6 (40%)
Compliance at PAD stage[2]	60%	75%	63%	75%	60%	20%

1 = Projects with PMP due to e.g. purchase or application of pesticides, and projects without PMP but with a clear indication of having an increase in pesticide use (8 projects stating an increase in pesticide use, 3 with Environmental Management Plan stating concerns on increased pesticide use, 6 projects claiming to mitigate the negative impact of pesticides, 5 with a clear indication to intensify and increase production, and 6 with other clear indication of using increasing amounts of pesticides).

2 = Compliance defined as having a PMP in place when the project had an impact on pesticide use. The compliance improved significantly during the review period, from 14% in 1999 to varying degree between 58–100% by the first quarter of 2004.

Source: Authors.

addition, eight projects without pesticide use intended to include IPM or similar activities (data not shown). The inclusion of IPM in PSRs was less than that at the design stage (See table 4.4).

Supervision of Project Implementation

Realism of compliance with safeguards is difficult to measure. A recent Quality of Supervision Assessment[59] indicated that overall supervision quality, after a steady improvement from fiscal year 1997 to year 2000, has stabilized at about 90% satisfactory. Many aspects of supervision performance were rated strong, but supervision quality for compliance with safeguard policies for environmental assessments and pest management was satisfactory at 72%.

To enforce compliance, considerable emphasis on monitoring is required. To get a clearer picture on the situation, the agriculture/rural projects assessed for having an impact on pesticide consumption at the appraisal stage (57 in 1999–2003) were further screened for pest management safeguard rating, discussion on pest management and IPM issues, and any changes in OP 4.09 compliance during the project implementation (See table 4.4). The PSRs of projects with clear indication to increase pesticide use typically paid little attention to pest management and IPM issues despite the fact that most of these projects (73%) mentioned IPM issues at the appraisal stage. Attention to IPM issues in PSRs improved steadily, albeit slightly from 1999 to 2002. The lack of attention to pest management and IPM issues in PRSs may also reflect the fact that there were no serious issues in the implementation of the prior agreed IPM plans or the fact that aide memoirs are the preferred choice of TTLs to discuss project implementation in detail.

In most PSRs, the rating for pest management safeguard compliance was satisfactory or not applicable, and remained the same throughout the project implementation. Seven percent of the projects (a total of 8 out of 57) also rated compliance satisfactory despite not having a PMP at the appraisal stage. However, most of

[59]QSA5, 2003.

Table 4.4. Pest Management Safeguard Rating and Discussion of Pest Management and IPM Issues in Project Status Reports (PSR) of 57 World Bank Agriculture/Rural Projects (1999–2003) Assessed for Having an Impact on Pesticide Consumption at the Project Appraisal Stage (PAD)

	Total (no)	Total (%)	1999	2000	2001	2002	2003
Total number of PADs	105	100	26	21	22	14	22
PADs with pesticide use[1]	57	54	14	9	13	9	12
of which with IPM activities	36	34	6	5	10	7	8
of which with PMP[2] at PAD stage	29	28	2	4	10	6	7
Retrieved projects with PSRs	47	100[3]	12	8	13	8	6
PSRs of projects with IPM activities	7	15	1	1	3	2	0
PSRs mentioning plant protection (in addition to IPM)	8	17	2	1	2	3	0
Pesticide safeguard compliance rating							
Satisfactory—Highly S	33	70	9	4	11	7	3
Unsatisfactory	3	6	3[2]	0	0	0	0
Not Applicable	10	21	0	4	2	1	3
Notes: Dropped (D) or not available (NA) projects in 1999–2003 all had IPM activities at the PAD stage.			1 NA, 1 D	1 NA		1D	6 NA

[1]Projects with PMP due to (e.g., purchase or application of pesticides), and projects without PMP but with a clear indication of having an increase in pesticide use (8 projects stating an increase in pesticide use; 3 with Environmental Management Plan stating concerns on increased pesticide use; 6 projects claiming to mitigate the negative impact by pesticides; 5 with a clear indication to intensify and increase production; and 6 with other clear indication of using increasing amounts of pesticides).
[2]The rating in two projects changed from U to S in the next PSR.
[3]The rating percentages in the total % column from this point downward present the proportion of retrieved projects with PSRs, not of the total number of projects in 1999–2004.

Source: Authors.

these projects were approved in 1999, when the PMP requirement was in effect for the first time whereas the project preparation had taken place prior to 1999. Information gleaned from the World Bank internal reviews of application of its safeguards in supervision indicated that the supervision effort—increasingly by staff with limited experience in agronomy or pest management tend to concentrate on the major project objectives (often research, extension, and credit disbursement). In some cases where the pest management safeguard was not complied with included those with a major objective to encourage private sector participation. However, when such non-compliance was noted during supervision (or during safeguard review of supervision) corrective action was taken (See box 2.2).

A comparison between the internal and/or external supervision and evaluation reports and the regular World Bank PSR reports also verified the challenges in supervision (See table 4.5). A total of 19 projects were selected based on the availability of recent reports by the World Bank and others. Regarding the design stage, deviations from the safeguard policy were frequent and claims for non-compliance valid in all but 2 cases out of 15. The selected supervision missions were able to identify major deviations from the pest management safeguard in 2 out of 12 projects. In most cases, deviations were observed and followed up after external monitoring missions identified them. These results indicate that due attention at the design phase does not guarantee compliance during the implementation stage.

Table 4.5. The World Bank Agriculture/Rural Projects Flagged for Possible Non-compliance by Internal or External Reviews

	LCR	MNA	AF	SA	EAP	ECA	Total
Number of projects with possible compliance issue	2	1	8	1	4	3	19
Design stage reviewed							
Internal[1]	0	0	7	0	0	0	7
External[2]	1	1	2	1	2	2	9
Validity of the claim[3]	1	1	8	0	2	2	13
Implementation stage reviewed							
Internal	0	0	7	0	0	1	8
External	1	1	1	0	2	1	5
Issue flagged in PSR[4]	0	0	2	0	0	0	2
Follow-up action by the project	1	—	3	—	1	1	5

[1]Internal reports refer to supervision/evaluation reports prepared by the World Bank's own quality assurance staff and/or consultants. The selected projects were approved between 1994 and 2001.
[2]External reports refer to reports prepared by independent organizations/individuals, (i.e., mainly PANNA.)
[3]Validity of the claim = whether the World Bank reviewer considered the claim valid.
[4]Value 0 = the Project Status Reports did not identify any deviations from safeguard compliance.

Source: Authors.

Staff Recruitment and Training

One indicator of implementation of pre-stated objective is the hiring of staff and the amount of effort provided into staff training. The World Bank's attempts to recruit IPM expertise from the agro-chemical industry through the staff exchange program met with limited success. Staff secondments to the Agriculture and Rural Development Department from the Global IPM Facility and the GTZ organization helped to promote the IPM agenda, however, only provided a temporary solution. More recently the World Bank has hired a fulltime pest management expert.

Although about 30% of the rural sector investment projects include pest management, few of the regions have been able to designate a dedicated pest management expert among their staff. The East Asia Region frequently uses consultants, and the ECA Region has designated a staff member with an agronomy background as the pest management specialist with part-time responsibilities in oversight of pest management safeguard reviews. Other regions either use consultants or depend on the QACU (Quality Assurance and Compliance Unit)/ARD specialists.

With the increasing visibility of the safeguard the World Bank started a comprehensive training program that consisted of a comprehensive 1-day training of safeguard application in general, as well as a 0.5 or 1-day special training covering a single safeguard. For example, in the period of April 2003 to March 2004, a total of 9 training sessions were organized, four specifically provided in the regional offices (SA, LCR, and AF), others were held at the headquarters (See table 4.6).

Comprehensive training was provided through the World Bank's training program (by World Bank Institute) and in some cases through regional training. During the period of April 2003–March 2004, a total of 5 training sessions were provided at headquarters with an average attendance of 15 staff members/half-day session. This appears fairly low especially in the ECA, LCR, and SA region (Note in table 4.3 that ECA and LCR are also the low outliers with respect to

Table 4.6. Participation in Training Sessions on Implementation of Pest Management Safeguards Policy OP 4.09 (March 03–March 04)

	AFR	EAP	ECA	LCR	MNA	SAR	Other
Staff participating in OP 4.09 training at headquarters (4 sessions)	12	14	5	5	4	5	15
Total task team leaders[1] (WB data 2004)	252	128	187	156	59	112	n/a
Percentage TTLs trained 2003/04	5%	11%	3%	3%	7%	4%	n/a
Participants of in-country training[2] (sessions)	25 (1)	0	0	48 (1)	0	76 (2)	n/a

[1]Most TTLs attending the pest management safeguard training belonged to rural sector.
[2]In-country training for World Bank and project staff was provided in Uganda, India, Bangladesh, and Columbia.

Source: Authors.

PMPs). The LCR and SA regions, however, organized special training in OP 4.09/pest management in the region (i.e., respectively Uganda and Columbia for 2 days, India and Sri Lanka) that was attended by local World Bank and project staff. Other regions have organized safeguard training in general in the region, but not specifically on pest management/OP 4.09.

Unlike training in procurement or trust fund management, training in safeguards is not a precondition for task managers or for safeguard reviewers. The latter is of concern, as recognition of pest management related safeguard issues requires expertise and understanding of the particular systems and alternatives, whether in agriculture, health or vegetation control. However, training and enforcement may result in greater attention on safeguard issues, including pest management, as indicated in Table 4.2. The number of projects (that included pesticide use) with a PMP increased from 11% in 1999 to 54% in 2003 in all four sectors whereas the greatest improvement was in agriculture/rural projects from 14% in 1999 to 58–77% in years 2001–2003.

Apart from safeguard training, training in pest management is generally limited to occasional coverage of relevant topics during the "Rural Week," an annual venue for dialogue and training for rural staff, and covering contemporary issues. Of the 8 rural weeks held since 1997, pest management was 5 times on the program, of which once on the main program and 4 times in break-out sessions. Nearly all training is provided at the headquarters; some of this is concentrated around Rural Week or other events during which country-office staff visit headquarters. In some cases pest management related topics are part of the program of regional sector retreats.

Procurement

Although the procurement of large volumes of pesticides is deemed to be something of the past (with possible exception of emergency programs) many projects appear to procure small volumes of pesticides (See table 4.2). The purchases include herbicides for vegetation control in power and transport projects, vector control in health (including the use of impregnated bed nets) and various agricultural and CDD interventions.

Direct large scale pesticide procurement, although decreasing, may be facilitated by continuing the on-going effort to develop better procurement manual and templates. Much of the procurement, however, relates to smaller volumes in CDD projects, on-lending projects and or (agricultural) research. Some regions, ECA for example, have prepared specific manuals for the procurement of (agricultural) goods through on-lending or CDD projects. Safeguard condi-

tions include monitoring and/or annual reporting of the aggregate portfolio of the communities, credit banks or other group-clients to prevent adverse cumulative effects when numerous on-lending clients would borrow for pesticide or other commodities, products or equipment that could affect human health or the environment.

The preparation of detailed World Bank documents, such as project implementation plans and tender documents, need to be managed by trained staff or consultants who are familiar with World Bank requirements and/or past experience. The pesticide tender documents aim to help in moving towards this sustainability goal. Recent reviews of compliance with World Bank safeguards and other experiences with the procurement of pesticides indicate that task leaders, Project Implementation Unit staff and others involved in World Bank financed projects are neither always aware of best practices nor of the risk and need for compliance.

New Programs and Projects

In part driven by the recently adopted Stockholm Convention and by the World Bank's interest in sector wide approaches (SWAPS), the World Bank has launched new programs and projects with direct impact on the pest management policy. Principal among these, the Africa Stockpile Program, in collaboration with FAO, WWF, PAN-UK, PAN-Africa, NEPAD (New Partnership for Africa's Development) and the private sector. This program aims to help African countries cope with obsolete stock of pesticides that threaten human health and the environment. The project on the Demonstration of Alternatives to Chlordane and Mirex in Termite Control aims to phase out the persistent organic pollutants, Chlordane and Mirex, through environmentally sustainable and cost-effective integrated termite management, based on baiting systems. Sector-wide approaches, and close collaboration with international agencies (especially FAO and WHO) are also successfully implemented in the health sector (Malaria Booster Program) and in the agricultural sector (the Africa Emergency Locust Project).

CHAPTER 5. CONCLUSIONS

In the past, investments in agricultural intensification were often associated with an increase in external inputs such as fertilizers and chemical pesticides. More recently, new investments are more economically, socially and environmentally based. This holistic approach is seeking to enhance agricultural productivity (through efficient use of agricultural technology), to improve the livelihood of the rural poor and to foster an environment conducive to sustainable rural development. Within this context, the Bank considers integrated pest and crop management as a cost-effective and sustainable agricultural practice to increase farmer income, foster growth and food security by reducing pest losses while protecting the health of producers, consumers and the environment.

Chemical pesticides have indeed been a powerful tool in managing pests in various sectors and ecological conditions. They can be effective, fast acting, adaptable to all crops and situations. When first applied, a plant protection strategy based exclusively on chemical pesticides can result in impressive production gains. However, despite these initial gains, excessive use of insecticides has proven to be ecologically unsound, leading to the destruction of natural enemies, the increase of pest resistance pest resurgence and outbreaks of secondary pests. These consequences have often resulted in higher production costs and lost markets due to undesirable pesticide residue levels, as well as environmental and human health costs. Many development agencies and international research organizations have recognized these negative effects of chemical pesticides and many, including the World Bank, have pursued the strategy of promoting IPM as an alternative crop protection and springboard towards sustainable agricultural production. The strategy has in most cases been two-pronged: (a) monitoring the procurement and application of pesticides by safeguard policies with associated institutional mechanisms for their enforcement; and (b) promotion of IPM in development projects and programs. The latter has been attempted mainly through extending IPM technical support for projects involving investments in crop production. These efforts have met with only limited success. The adoption of IPM practices by farmers has been relatively limited in view of the investments made for its promotion. The low adoption of IPM has been attributed a number of reasons with varying relative importance. These range from technical, institutional, social, cultural, economic, educational, informational, to policy constraints. The traditional response has been to allocate more funding to alleviate one of more of these constraints. The most important reason, however, remains with the end user. Farmers often address this dilemma in economic benefits and their decisions are based on whether their efforts will result in actual profits.

The economic incentives for the adoption of IPM in many cases start with a significant reduction in production costs, but can also come from two other sources: (a) internalizing the potential harmful external impacts of pesticides in their price and removal of price distorting direct and indirect subsidies; and (b) price premiums paid for food products grown under IPM regimes. The former calls for sound national pesticide policies and the latter for technical, marketing and certification competence to reach the recently opened markets created by consumer demand for pesticide free and organic food products. In addition, an improved regulatory system is needed to reduce the utilization of undesired pest management methods, thus improving the prospects for IPM approaches.

In this context, and in view of the trend towards policy based lending and restricted resources available for agricultural development,

it is important that the World Bank and the development community at large revisit their strategies regarding pest management and IPM.

Proactive and Selective Approach to Advancing Sustainable Pest Management

In order to allocate resources efficiently, and to enhance the impact of policy dialogue and investments in IPM, a more targeted strategy may be considered by development agencies, such as the World Bank.

A targeted promotion of more intensive IPM programs in those countries/areas where the benefits of IPM are likely to be higher, the resource use justified and opportunities for IPM adoption likely, (i.e., countries with a high pesticide consumption, prominent cash crop production, large monoculture/sole cropping areas, access to high value markets for pesticide-free products, countries with a conducive policy environment for IPM or with particular risk of pesticide exposure and pesticide related health problems). Agricultural and economic benefits that can be obtained include decreased pesticide use, reduced likelihood of emergence of pesticide resistant pests, reduced production costs, higher output prices and lower public health costs.

The above approach is relatively easy where governments have expressed interest in developing their pesticide policies and in promoting IPM, but may be more complicated when this interest and especially when the respective sector dialogue is lacking. Table 5.1 lists a number of entry points for such a discussion, whether within agriculture (especially with the renewed interest of countries in SPS and international trade) or in health (especially where there are solid data on farm worker intoxication and water contamination, (i.e., in LAC and Asia). This dialogue can be strengthened through coordination with international agencies (including CGIAR, WHO, FAO, and others), and through involvement of NGOs, and the private sector in identifying the issues, conducting preliminary studies, helping to design solutions and in monitoring implementation. Considering the number and diversity of stakeholders and the potential associated conflict of interest, the World Bank is well placed to play a catalytic role as an honest broker in such policy dialogues. An added benefit of enhanced national policy-based support to IPM is the need for capacity building in the client countries' own safeguard policies and good practice as development assistance shifts from project support to development policy based support. This focus may also be supported by identifying and monitoring clear and measurable indicators (e.g., yield losses to pests, pesticide consumption per capita, health indicators for farm workers, and pesticide residue in water and in the food chain; area under IPM production) which are consistently included in policy dialogue, CAS reviews, PRSPs, and portfolio reviews.

Improving the World Bank's Performance in IPM Implementation in Operations

Improvement of World Bank performance can be achieved by paying more attention to project design and supervision through improvement of staff skills, in particular those of task team members and operational staff in country offices. Further effort also needs to be made to increase awareness among managers and safeguard reviewers. In addition, it is essential to address the need to include sufficient resources to build up borrower's capacity in pest management policy, research and management issues.

The World Bank task teams could be helped by the availability of technical specialists (or staff with pest management skills), as well as by manuals and templates for World Bank staff and project staff on pest management that relate to specific and relevant issues (i.e., pest management in the non-agricultural sector such as health, energy, and transport or related to specific lending instruments) and pesticide

Table 5.1. Entry Points for Initiating a Policy Dialogue on Pest Management with Borrower Countries

Entry point	Examples of policy discussion or projects
Global data show excessively high pesticide consumption, either in terms of volume or in expenditure.	Limited experience with Pakistan. Potential candidates include selected Latin American countries.
Global data show excessively high incidence of pesticide toxicity among farm families.	CGIAR's work in Ecuador is a powerful example, but so far rarely used because of the lack of data. Better public health data may help in using this approach.
Country has considerable stock of obsolete pesticides.	Countries participating in the Stockpile Program in MNA and SSA regions.
Countries that have substantial or growing domestic pesticide industry.	China, India
Countries where a large number of international pesticide companies are present.	India, China, Pakistan
Countries where agricultural sector policy indicates diversification into crops which are traditionally high pesticide users (e.g. horticulture, cotton).	Horticultural production in Kenya. Promotion of exports in Tunisia. Irrigation Project in the coastal region of Peru.
Country wants to improve sanitary and phyto-sanitary standards (SPS) to enhance trade. Data on refused exports, or below-price exports can be used in the assessment.	Various countries have approached the World Bank including Tunisia (ASSP), Romania (ASSP), Colombia and Brazil.
Country wants to borrow for pest management related investments.	Borrowers for locust and vector control.
(Agricultural) research projects, especially competitive research. Allocate a certain funding block to IPM research.	Turkey Agricultural Research Project. National Agricultural Technology Project in India.
EA during project Project Concept Note indicated a need for PMP. PMP discussion may lead to broader Government interest in improving pest management policy.	Iran Integrated Water and Land Development Project (pending).
Project supervision shows flaws in safeguards compliance, and country wants to correct this.	Armenia ARP (completed), Romania ASSP (ongoing)
Country wants to mainstream pilot work by NGO's, CGIAR or others.	Indonesia IPM (completed).
Partnership with international organizations whether locally or strategically.	Malaria control projects (ongoing) African Stockpiles Program in alliance with FAO and WWF (pending).
Partnership with private industry.	IPM initiatives with Masterfoods in Indonesian cocoa industry.

Source: Authors.

procurement (i.e., Pest Management Guidebook). As current skills are stretched far, it is recommended to review and reassess the need to hire and/or train specialist staff or to obtain necessary expertise through partnerships with expert organizations. It is also recommended that linkages with regional and country focal points on pest management, pesticides, safeguards and those for international protocols and conventions (Montreal protocol and Stockholm Convention) be strengthened.

Supervision performance needs to be improved by continuing current quality assurance monitoring of supervision. PSRs/ISRs and supervision packages of projects that include pest management activities should be reviewed by technical specialists, and more attention should be given to possible formal or informal monitoring of safeguard compliance by the private sector, non-governmental organizations or by the civil society (i.e., the communities themselves).

The experience of using FAO and the Global IPM facility technical expertise in project design and supervision and involving NGOs to monitor implementation has been positive and should be encouraged, and expanded to a wider group of NGOs. Similarly, preliminary experiences with

community monitoring have been promising, and can be considered at the project design stage as it is the case for the Africa Stockpile Programme. Partnerships with technical and policy groups in academia, NGOs, farmers and other professional associations, with specialized international centers and institutes, such as the SP-IPM, CGIAR institutions, AVRDC, ICIPE, GIF or CABI, as well as other international organizations, such as WHO, ILO (International Labor Organization) and FAO, are essential in obtaining technical input, local buy-in and a balanced view of this dynamic field. ICIPE, for example, not only has a sound research program on IPM in public health and agriculture, but has also promoted commercialization of IPM technologies that are specifically targeted for rural development in Africa.

These partnerships should be strengthened to: (a) develop and support IPM programs as a "good practice on specific crops, livestock or public health projects in developing countries; (b) raise awareness and support dissemination of the concept of IPM as well as specific IPM technologies and policies; (c) facilitate compliance with pest management policy by providing backstopping support in the preparation, implementation and supervision of projects; (d) catalyze the dissemination of knowledge and information through workshops, training courses and exchange visits; and (e) help the Bank in identifying those technologies that are ready to be main-streamed through Bank supported programs. Examples of successful partnerships include the Africa Emergency Locust Project, where the technical expertise of the FAO Emergency Center for Locust Operations has been crucial to the project; the Africa Stockpile Programme featuring a close collaboration with the FAO obsolete pesticide unit, the World Wildlife fund and the Pesticide Action Network (United Kingdom and Africa). Other potential outcomes include the collaboration with the International Potato Center on the linkages of agriculture, pesticides, and health.

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ANNEX 1. POTENTIAL SIDE EFFECTS OF PESTICIDE USE

The debate on pesticide effects is generally stratified by effects on health, environment, economy, and trade and—in particular relating to methyl bromide—on global implications. The positive effects are linked to reduction in vector-borne diseases (especially malaria) and plant pests, to labor saving in agriculture, road and power line maintenance, to erosion reduction in agriculture, and to the production of esthetically attractive produce with extended shelf life or storage. The negative effects include:

Health Effects

- Direct poisoning among farm workers and or food industry.
  This is still a major issue in developing countries. In Central America, for example, case rate is 171/100,000 in the general population, but a staggering 76% among farm workers (mainly fruits, vegetable and banana plantation workers). An economic analysis indicates the cost per case is at least 5 times the daily wage.
- Indirect effects on others exposed either through contact or pesticide (residue) consumption.
  More sophisticated research is pointing to the fact that these effects can not be generalized but are product specific, which complicates the analysis. However, among the major effects of pesticide are cancers and endocrinal changes (including effect on fertility, refocus puberty, child development etc.)

Environmental Effects

- Effect on plant biodiversity.
- Effect on animal biodiversity. Especially the newer pesticides (including pyrethroids) that are relatively safe for mammals but are very toxic for lower animals.
- Presence of pesticides in the environment that may further affect public health.
  There is some evidence that meat-eating human population can accumulate certain pesticides in their bodies and in the longer run be affected similarly to other predators at the top of the food chain.

Economic Effects

Improper pesticide application has major effect on beneficial insects including

- risk of eliminating bees, silkworms and other economically important insects.
- detrimental effect on predator arthropods (“bugs”) that largely control populations of insect pests.

Trade Effects

- Developing countries that export agricultural products are faced with fairly high standards of food safety applied in developed countries, and risk refusal of their product when MRL are exceeded.
- Limiting trade: developing countries see the stricter application of MRL and emphasis on “safe” pesticides as a tool to limit trade to developed countries.

Details in Altieri and Nichols, 2001; APO, 2002; London et al. 2002; Maredia et al. 2003, Murray et al, 2002; Pingali and Rosengrant, 1994: Yudelman et al. 1998.