PESTICIDE LEGISLATION AND THE REGISTRATION PROCESS IN THE CARIBBEAN

PROCEEDINGS OF A MEETING ON THE HARMONIZATION OF PESTICIDE LEGISLATION IN THE CARIBBEAN
HELD IN PORT-OF-SPAIN, TRINIDAD AND TOBAGO
August 2 to 5, 1983

Edited by

CHELSTON W.D. BRATHWAITE

IICA

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Introduction

A meeting of Directors of Plant Protection in the Caribbean, Heads of Pesticide Registration Boards and Representatives of the Pesticide Industry under the auspicies of the Plant Protection Programme of the Inter-American Institute for Cooperation on Agriculture (IICA) was held from August 2-5, 1983 in Port of Spain Trinidad and Tobago.

The objective of the meeting was:

To examine and analyse the concepts of pesticide legislation and registration in the Caribbean region with a view to standardizing criteria for pesticide use.

The meeting was held jointly with a meeting of the Society for Plant Protection in the Caribbean. The meeting of the Society had as its objectives:

1. To analyse the environmental impact of the large scale application of pesticides in the Caribbean;

2. To stimulate training in pesticide registration procedures and in the safe and efficient use of pesticides;

3. To work out guidelines for the development of a regional training programme in pesticide safety.

This document contains edited versions of the proceedings of these meetings.

Programme

TUESDAY, 2nd AUGUST, 1983

9.00 a.m. - 10.00 a.m.		REGISTRATION
10.00 a.m. - 10.30 a.m.		OPENING CEREMONY
	CHAIRMAN:	Dr. Rohit Doon, Ministry of Health and Environment, Trinidad and Tobago
	INTRODUCTORY REMARKS:	Dr. Chelston W.D. Brathwaite, Regional Plant Protection Specialist and Director of the IICA Office in Trinidad and Tobago
		Dr. Federico Dao, Director of IICA Plant Protection Programme, San Jose, Costa Rica
		Dr. William L. Hollis, Director of Scientific Affairs, National Agricultural Chemicals Association, U.S.A.
		Mr. Walter Van Whervin, Director of Plant Protection, Jamaica and President of the Society for Plant Protection in the Caribbean
	OPENING ADDRESS:	The Honourable Mr. Kamaluddin Mohammed, Minister of Agriculture, Lands and Food Production, Trinidad and Tobago
10.30 a.m. - 11.00 a.m.		COFFEE BREAK

Meeting on Harmonization of Pesticide Legislation and Registration in the Caribbean

11.00 a.m. - 12 noon	The International Movement Towards the Harmonization of Pesticide Legislation. Dr. Federico Dao, Director of IICA Plant Protection Programme, San Jose, Costa Rica
12 noon - 1.30 p.m.	LUNCH

1.30 p.m. - 3.00 p.m.	Pesticide Legislation and Registration in the Caribbean	
	. Barbados . Dominica . Grenada . Guyana . Haiti . Jamaica . St. Kitts . St. Lucia . Suriname . Trinidad and Tobago	To be Presented by Country Representatives
3.00 p.m. - 3.30 p.m.	International Movement Towards Standardization of Labelling and Registration of Pesticides	
	Dr. Hugo Penagos Dr. Lidio Parra Mrs. Patricia Ramirez	Members of the Latin American Working Group of the International Group of Agrochemical Manufacturers

WEDNESDAY, 3rd AUGUST, 1983

8.30 a.m. - 12 noon	Consultation between Heads of Plant Protection and IICA on Harmonization of Pesticide Legislation in the Caribbean
12 noon - 1.30 p.m.	LUNCH
1.30 p.m. - 3.00 p.m.	Preparation of Document
3.30 p.m. - 4.00 p.m.	COFFEE BREAK
4.00 p.m. - 5.00 p.m.	Plenary Session and Presentation of Final Document on Consultation

THURSDAY, 4th August, 1983

Meeting of the Society for Plant Protection in the Caribbean

CHAIRMAN: Mr. Walter Van Whervin

9.00 a.m. - 9.30 a.m.	Pesticides and Health in Trinidad and Tobago. Dr. Rohit Doon, Specialist Medical Officer, Ministry of Health and Environment of Trinidad and Tobago
9.30 a.m. - 10.00 a.m.	Pesticide Safety in the 1980's. Dr. William L. Hollis, Director of Scientific Affairs, National Agricultural Chemicals Association, U.S.A.
10.00 a.m. - 10.30 a.m.	New Perspectives in the Development and Use of Pesticides. Dr. Gene Pollard, Entomologist, Faculty of Agriculture, University of the West Indies, St. Augustine, Trinidad and Tobago
10.30 a.m. - 11.00 a.m.	COFFEE BREAK
11.00 a.m. - 11.30 a.m.	Pest Control in Banana - a Case of the Cost/Benefit Challenge in Pesticide Use in the 1980's. Dr. Clayton Shillingford, Development Representative, Dupont de Nemours, Biochemicals Department, U.S.A.
11.30 a.m. - 12.30 p.m.	New Technologies in Pesticide Application. Dr. Lidio Parra, Monsanto Agricultural Products Company, U.S.A.
12.30 p.m. - 1.30 p.m.	LUNCH
CHAIRMAN:	Dr. G.V. Pollard
1.30 p.m. - 2.00 p.m.	The Application of Pesticides in the Control of Vector-borne Diseases of Tropical Crops. Mr. Reginald Griffith, Entomologist, Ministry of Agriculture, Lands and Food Production, Trinidad and Tobago

2.00 p.m. - 2.30 p.m. Commercial Nematicide Use at Worthy Park Estate. Mr. Trevor Falloon, Entomologist, Sugar Industry Research Institute, Jamaica

FRIDAY, 5th AUGUST, 1983

Meeting of the Membership of the Society for Plant Protection in the Caribbean

Report of the President

Report of the Executive Secretary

Election of Officers - 1983-1985 Term

Future of the Society

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OPENING SESSION

Introductory remarks by Dr. C.W.D. Brathwaite, Regional Plant Protection Specialist and Director of IICA Office in Trinidad and Tobago.

Mr. Chairman, Honourable Minister, Representatives of Government of Countries of the Caribbean, Representatives of the Pesticides Industry, distinguished guests, Ladies and Gentlemen;

On behalf of the Director General of IICA, Dr. Francisco Morillo, I welcome you to this meeting on the harmonization of pesticide legislation in the Caribbean and to the meeting of the Society for Plant Protection in the Caribbean which follows it.

The countries of the Caribbean differ in historical, racial, cultural and economic characteristics which have been shaped by time, history and natural endowments. Yet if we are to forge a strong Caribbean Community either within CARICOM or the wider Caribbean and establish successful working relationships in regional cooperation, our differences and similarities must be recognised and understood. For only by understanding the bases of our differences can we effectively mitigate their effects in efforts to better harmonize and strengthen our relationships.

Last year 1982, we collaborated with the Ministry of Agriculture, Lands and Food Production of the Government of Trinidad and Tobago in holding in Port of Spain, the First Regional Training Programme for Plant Quarantine Inspectors. In this programme, the legal provisions were carefully studied in order to give our clients the plant quarantine inspectors an insight into the legal provisions as these affect the movement of agricultural produce in regional trade.

Today, we meet to discuss the legal provisions for the pesticides and the pesticide registration process, in our efforts to assist the region in coming to grips with the problems of pesticide use and abuse and in our efforts to assist in the development of a regional training programme in pesticide safety.

At a recent meeting in Barbados where regional experts examined the performance of the Caribbean community during the past 10 years, Professor Liverpool of the Faculty of Law, University of the West Indies, St. Augustine, pointed out that "Significant steps need to be taken by the development of the community to strengthen laws which can be applied uniformly throughout the region". He noted that if regional cooperation efforts are to succeed uniform laws and law enforcement mechanisms must exist. He referred to the need for harmonization in legislation related to shipping, civil aviation, regional boundaries and trade. I submit that we also need harmonization in pesticide legislation so that we may communicate in a common language.

In the Caribbean, in general the spectrum of diversity in legal provisions relating to pesticides is wide indeed varying from countries with no specific legislation to those with up to date modern legislation, pesticide control boards and the relevant regulations. Trinidad and Tobago is a country at the upper end of the spectrum with a pesticide and toxic chemicals act and a Pesticide Control Board in place.

This is one of the reasons why in considering a site for this meeting Trinidad and Tobago was chosen.

The Inter-American Institute for Cooperation on Argiculture (IICA) is grateful for the cooperation and spirit of willingness which we have enjoyed in our relationships with the Ministry of Agriculture, Lands and Food Production and would like to express our deep appreciation for the honour granted to us today in having the Honourable Minister in our midst. We look forward to continued cordial relations. The IICA is committed to assisting member Governments of the Caribbean in making the Caribbean a zone free from the fears of the danger and undesirable effects of pests and pesticides.

There can be no doubt that pesticides have played and will continue to play a significant role in crop production in order to feed the peoples of the world, however, we must develop strategies to manage pesticides so that they are not only safe in the hands of scientists, but also in the hands of the farmer.

We see this meeting therefore, as the beginning of a new direction and new concept in regional cooperation for the development of pesticide safety.

It is significant, therefore, that we have among us representatives of the pesticide industry, the University of the West Indies, CARDI, CAREC, PAHO, WHO, ECLA, The World Bank, the EPA and most important representative of the Governments of the region. I welcome all of you and I look forward to working with you and I hope that our discussions, recommendations and proposals will be meaningful and relevant so that they may bear early fruit and help the region to cope with the challenges in pesticide management in the 1980's and beyond.

I thank you.

Address by Honourable Kamaluddin Mohammed
Minister of Agriculture, Lands and Food Production

First Meeting on the Harmonization of
Pesticide Legislation and Registration in the Caribbean:
August 2-5, 1983, Holiday Inn, Port of Spain.

Mr. Chairman, Distinguished Guests, Ladies and Gentlemen;

On behalf of the Government of Trinidad and Tobago, I extend to you a warm welcome. I appreciate very much having been invited to open such an important Meeting and I trust that your deliberations during this week will result in definitive guidelines which will help us to achieve ways and means which will ensure the safe and effective use of pesticide in the Caribbean Region. We, in Trinidad and Tobago, feel honoured to be the host country for this first Meeting on the Harmonization of Pesticide Legislation and Registration in the Caribbean. Our concern is with how to promote and achieve an environmental situation which ensures safety and good health for the people of the region.

Ladies and Gentlemen, Third World Countries, including our Caribbean Islands are on the average, in a food-deficit situation. This is highly unsatisfactory and we must aim to reduce our dependence on extra-regional sources of food.

Intra-regional expansion of food production is a major objective in the development programme of our respective governments in the Caribbean. Our Governments have been negotiating and collaborating on many fronts, including the:

(a) the development of a regional Food and Nutrition Strategy;

(b) the Caribbean Food Plan; and

(c) the Agricultural Marketing Protocol.

In Trinidad and Tobago, we are moving ahead in our efforts to expand and develop the agricultural sector. We are making inroads on the massive $900m food import bill. We are expanding food production on all fronts; food for direct consumption, including the production of a wide range of tree crops, including Cocoa, Coffee, Citrus, Mangoes and other fruits. Similar efforts are being made in the livestock, fisheries and forestry sub-sectors. This total effort inevitably necessitates the use of modern technology if we are to make rapid strides. An important aspect of this thrust in modernization will relate to the use of improved techniques of protection from pest and diseases. In today's world, the use of pesticides looms large as an input in high-productivity farming.

A wide range of pesticides are actively used in agriculture, forestry, livestock production, public health and also urban pest control programmes. As the primary means of pest control in most agricultural regions of the world, pesticides have doubtlessly been of great benefit to man. In the Caribbean region, where losses due to pests have been approximated above 30%, we have not escaped this dependence on the use of pesticides in our food production effort.

Let us look at the figures for Trinidad and Tobago; the seven (7) year period 1974-1980 showed an increase in the importation of pesticides into the country from approximately 1,150 tonnes in 1970 at a cost of $9,952,198.00 to 1785 tonnes in 1980 at a cost of $19,716,785.00; more than a 100 per cent

increase in ten (10) years. There have been benefits to the community e.g. reduced insect infestation, greater control of crop and livestock diseases and successful public health programmes; however, the question must be asked how do these benefits weigh, in balance, against the possible ill-effects that are known to occur as a result of pesticide use; for example:

the development of strains of resistant pests,

contamination of the environment,

destruction of useful but non-target organisms,

human pesticide poisonings.

An important question which must be asked is: "How do we balance tomorrow's possible disaster against today's certain benefits?" The old adage "Prevention is better than Cure" might, as an answer, be applicable here.

Distinguished guests, I have not been given the data on the importation of pesticides into the Caribbean region. Available information suggests that there are well over 300 pesticidal chemicals imported and available to the public. Published appraisals of the pesticide consumption patterns internationally, however, show that the Third World uses approximately 30% of all insecticides produced, and 15-20% of all pesticides. It is very disturbing for us to accept the implications of available reports which indicate that many chemicals banned in their country of origin - developed countries - are exported and used extensively in many Third World locations.

There is also evidence that information that should be made available to importing countries to ensure safe and effective use and/or minimization of risks to the human and animal population is not always transmitted to such countries, or can be misleading.

To illustrate this point, let us take two examples from the OXFAM 1982 publication "A Growing Problem - Pesticides and the Third World Poor".

(a) Heptachlor - exported to Central America and recommended for use on several crops including maize, rice and potatoes.

..... - Banned in Europe and the U.S.A. for almost all uses.

(b) Chlordane - exported to Malaysia and advertised as a safe pesticide.

..... - Banned in the EEC except for very limited use.

The author further indicates that "a recent check in Mexico found that 50% of the pesticides sold were incorrectly labelled", while in the Phillipines a survey of herbicide labels showed that many labels did not meet basic information requirements.

Quite recently, in the July 18, 1983 issue of Newsweek, Trinidad and Tobago received considerable mention with respect to the use of "Paraquat", a widely used herbicide. The author made reference to the lack of caution in its use as an agricultural chemical, its use on human bodies and even as a means of suicide - the "Indian Cocktail". There is a lot to be done in order to promote higher levels of safety for our farming population and the consuming public.

In today's world, promotional campaigns, including specific advertisements, play a significant role in the sale techniques of producers and distributors; however, the social responsibility attached to such sale techniques cannot be minimized.

There are varying roles of responsibility for producers and distributors, as well as the scientists and technocrats of each country, and in each region. But, it is, in particular, our scientists and technicians, people like yourselves who must guide us and ensure that relevant legislation and regulations are established and effectively monitored.

It is encouraging that in recent years several regional and international organizations have assisted in respect of export controls in facilitating information exchange with regard to potentially hazardous chemicals. As a result, we have had:

(1) the adoption of a resolution in 1979 by the United Nations General Assembly at its 34th session urging

> "Member States to exchange information on hazardous chemicals..... that have been banned in their territories and to discourage, in consultation with importing countries, the exportation of such products to other countries." and,

(2) the Second Government Consultation on International Harmonization of Pesticide Registration Requirements (Rome, 1982).

Within this Hemisphere, there have already been two consultative meetings on the Harmonization of Registration, Labelling and Quality Control Procedures of Pesticides, viz in 1981, amongst the countries of Central America, and in 1982 amongst the countries of the Andean Region of South America. This meeting, therefore, in which you distinguished delegates are participating, consititutes the third to be conducted within the Hemisphere

on this important subject. Hopefully, we are much closer towards a Hemispheric Harmonization, and eventually an International Harmonization of Pesticide Legislation.

Distinguished delegates, the food producing sector is an area for priority attention. It is clearly established that crop protection will play a dominant role in our struggle to produce food and fibre for our people. However, let us not lose sight of the urgent need for standards on the adequate use of pesticides which must be developed and maintained in order to minimize the problems of environmental contamination and residual effects co-ordinated national, regional and international efforts in this direction are urgent and necessary. We must not be accused of failing to accept our responsibility to ensure that the required degree of progress in agricultural production is achieved within the framework of social and political responsibility.

Trinidad and Tobago has had an Act entitled the Pesticide and Toxic Chemicals Act, enacted by Parliament on December 17, 1979. Regulations covering the registration for use, labelling, storage, advertisement, transport, packaging and licensing of premises for sale of pesticides have been drafted.

A Pesticide and Toxic Chemicals Control Board has been appointed. Further regulations concerning disposal, licensing of pest control operators etc. are being drafted. A Sectional Committee on Goods for use in Agriculture has been appointed, also a Specifications Committee on Pesticides.

A Trinidad and Tobago Standard - A Guide on the Classification of Pesticides and certain Toxic Chemicals has been in effect from August 29,

1980. We have made a good start, and we continue to work at the problem. In your deliberations, remember that you have a responsibility to the peoples of the Caribbean. We trust that guidelines will be developed in consequence of this meeting, which will provide for the development of laws and regulations where they do not exist, and for the improvement where necessary of those that already exist.

On behalf of the Government of Trinidad and Tobago, our thanks go to the Inter-American Institute for Cooperation in Agriculture for its catalytic role in coordinating the arrangements for this meeting. Similarly, I am mindful of the role played by the Society for Plant Protection in the Caribbean.

Ladies and Gentlemen, it gives me very great pleasure to again welcome you all most warmly; I trust that those of you who are visiting will find some time to enjoy our beautiful country. It is with the greatest pleasure that I now declare open this meeting on the Harmonization of Pesticide Legislation and Registration in the Caribbean.

The Importance and Chronological Events of the Harmonization of Pesticide Registration Requirements in the Latin American and Caribbean Countries - by Dr. Federico Dao, Director of IICA's Plant Protection Programme

I welcome the opportunity to address the Directors, the Members of Plant Protection and Heads of Pesticides Registration from the Caribbean area on the importance of the Harmonization or Pesticide Registration requirements, uniform label and property rights of the data in the Latin American and Caribbean countries, and the steps already taken to make this a reality, under the guidelines of International Organizations such as FAO, WHO, etc.

The growth of chemical usage in agriculture to control the losses (up to 40 percent of total crop production) produced by insects, weeds, and plant diseases is greater in developing countries than in the industrialized ones.

The importance of the Harmonization process for the less developed countries can be summarized as follows:

Effective control of pesticides: National and International Front.

Acceptable guidelines for the proper uses of Pesticides.

Establishment and administration procedure designed to provide control over the availability and use of pesticides.

To eliminate pirate products and unscrupulous people dealing with pesticides.

To stimulate training in the safe and efficient use of Pesticides at all levels.

Now that we know the benefits, the next questions are:

1. How can this be accomplished?

   The main factor was to bring together all the interested people of the pesticide business (Government, Chemical Industry, Private and Academic Organizations, etc.) to discuss and plan the criteria and problems so that the guidelines can be drafted and accepted by all the parties responsible for the proper use of pesticides.

2. What are we doing to obtain the results?

Chronological History: Worldwide

In April, 1975, the Ad Hoc Government Consultation on Pesticides in Agriculture and Public Health, reconsidering the importance of registration of pesticides prior to sale and recognizing the differences of the regulation of the various countries, recommended that FAO, in collaboration with WHO, call an International Consultation to analyze and discuss the basis for harmonizing the requirements for registration of pesticides of the different countries.

Governments, International Organizations, Scientific Societies, Representatives of the Pesticide Industry and other interested parties should be encouraged to attend and participate.

This resolution was supported by the 18th Session of the FAO in November, 1975. The FAO established a panel of experts on pesticides specifications, registration requirements, and application standards.

The Director General of FAO arranged for an Ad Hoc Government Consultation on International Harmonization of Pesticide Registration requirements to take place in Rome, from October 24 to 28, 1977.

Ad-Hoc Government Consultation on International Standardization of Pesticides Registration Requirements

This meeting was held in Rome, October 24-28, with the participation of 125 delegates representing 41 countries, 11 organizations, and the chemical industry. The objectives of the consultation were:

1. To analyse and discuss the basis for harmonizing the requirements for registration of pesticides in different countries.
2. To provide opportunity for governments and industry to discuss the basic for pesticide registration requirements guidelines.
3. To guide developing countries in the establishment and administration of legislation designed to control over the sale and marketing of pesticides.
4. To stimulate, develop, and adopt guidelines or standards or technical methods.
5. To develop and publish a glossary of definitions and terms concerning pesticides.

Six principal working committees were formed to deal with the diverse aspects of pesticide registration:

a. Chemical and physical properties
b. Efficacy and crop safety
c. Toxicology
d. Residue in agricultural products
e. Environmental impact potential
f. Labelling, packaging, storage, and disposal

Recommendations:

1. They emphasized the importance and urgency of harmonizing pesticide registration requirements and legislation.
2. The consultation recognized that FAO is the only international body with capability to coordinate the activity.
3. Registration requirements and application standards in consultation with representation by the pesticide industry, to investigate ways and means of reconciling the public and industrial interest in data, in both developed and developing countries, while at the same time, provide protection from competitive uses of such data by other registrants.

Latin American and Caribbean countries

The First Consultation between the Latin America Governments and the Industry was on February, 1979, at San Jose, Costa Rica. It was sponsored by the Policy Sciences Centre of New York, in collaboration with the International group of National Pesticide Manufacturers Association (GIFAP), and the Inter-American Institute of Agricultural Science (IICA).

The Latin American Governments recommended to the General Assembly three areas in which to conduct a special study in the region:

a. Formulation

b. Application

c. Labelling

To implement the recommendation, a survey was approved to be conducted in 8 Latin American countries. A second meeting was scheduled to see the results and to give the final recommendation for the harmonization of the Western Hemisphere.

The Second Consultation of the Latin American Governments and the Industry was held in February, 1981, in Key Biscayne, Florida. The meeting was sponsored by Policy Science, GIFAP and IICA. The results from the survey of the 8 Latin American countries were presented to the General Assembly. It showed that even though they have superior legislation governing pesticide registration and labelling related to toxicology classification of the pesticides, there was great diversity in registration requirements, the existence of too many Government Agencies involved in the process differences in toxicology classifications, and lack of industrial standards and standardization informity in technical grade pesticides specifications.

The industry recommendation was to start a series of consultations with countries with common interests and necessities at a hemispherical level.

The meeting for the Consolidation of Criteria relating to Pesticide Registration, Labelling and Quality Control in Central America and Panama was held on September 9-11, 1981, at Contadora, Panama. The meeting was attended by the Director of Plant Protection and Health of Guatemala, Honduras, Nicaragua, El Salvador, Costa Rica and Panama and the Industry Representation of Monsanto, Dupont, Dow Chemical, ICI, FMC, Roussel UCLAF, and Agroquimicas de Guatemala.

They harmonized in pesticide registration requirements, uniform label, and property rights of data. This was very important because it was the first real step taken in the harmonization process.

The toxicological classification accepted was one designed by ICAITI (Instituto Centro Americano de Integracion y Tecnologia Industrial) of 5 Pesticide Toxicological Categories.

III Consultation meeting on the Adequate use of Pesticides in America and the Caribbean was held in March, 1982, in Mexico City, Mexico. Fifteen countries attended: GIFAP, FAO, IICA and OIRSA. After the Governments had an opportunity to examine and analyse concepts for the registration of pesticides to become familiar with measures currently in operation and to review the guidelines to enact and enforce legislation to regulate the use of handling of pesticides and the elaboration of adoption of norms and technical procedures for pesticides evaluation, they (the Governments) recommended the following:

1. All countries should have the means to control importation, production, formulation, transport, and uses of pesticides in their own territory. Member countries should enact legislation based on the recommendations of international bodies, such as FAO and WHO.
2. The registration procedure should be handled by a control agency.
3. The adoption and use of the recommendations of the 1977 FAO Government consultation on the standardization of pesticide registration requirements in Rome are supported.
4. High priority be given to regional collaboration in programs for education and training. Such programs must include training in:
    a. Registration systems
    b. Labelling elaboration
    c. Pesticide applications
    d. Analytical procedure for quality control of pesticide formulations and residue analysis
5. IICA should be responsible for coordinating further actions on recommendations from this meeting.

Personally, I was very happy because it was the first time we had the presence of representatives of the Caribbean countries (Guyana and Jamaica).

A meeting of the Advisory Committee of the Directors of Plant Protection and Public Health of the Andean Region was held in Cartagena, Colombia, in August, 1982 and was attended by the Directors of Plant Protection and held by Bolivia, Colombia, Ecuador, Peru and Venezuela and

the industry representatives of Dupont, FMC, ROHM and HASS, ICI, BAYER, CIBA-Geigy, BASF, UNI ROYAL, Monsanto, Union Carbide, and Dr. Carroll Collier of AID, and Dr. William Hollis of NACA-GIFAP, under the supervision of IICA.

The governments of the Andean harmonized in pesticide registration requirements, uniform label and property rights of the data, under the guidelines of FAO, the governments harmonized in adopting the WHO toxicological classification.

The Second Government Consultation on International Harmonization of Pesticide Registration Requirement was held in October, 1982, in Rome. The purpose was to define the status of the international harmonization of the registration requirements of pesticides and send the final recommendatio to the Director General. The objectives for this meeting were:

1. To analyse and discuss the basis for harmonization of pesticide registration requirements.
2. To provide an opportunity for governments and industry to exchange views on registration procedures.
3. To agree on acceptable guidelines suitable for worldwide uses.
4. To assist member countries in the establishment and administration procedures designed to provide control over the supply and use of pesticides.
5. To ascertain the actions being taken, or that could be taken, by governments to introduce harmonized requirements into national registration processes.
6. To stimulate training in registration procedures and the adequate use of pesticides.

Eight (8) Latin American countries had representatives at this meeting of the consultation. The headline was a recognization of the importance of the Contadora and Cartagena meetings as the only area outside Europe that shows a reliable mechanism and progress in the harmonization process.

XXX Meeting of the International Regional Committee of the Ministers of Agriculture of Central America and Panama was held in February, 1983, in San Salvador, El Salvador. A resolution about the necessity for revising, updating, and harmonizing the guidelines approved in Contadora with those of the Andean region countries was made.

II Government Consultation on Harmonization of Pesticide Requirements for Mexico, Central America, Panama, and the Dominican Republic. They harmonized in registration requirements of pesticides, uniform label and proprietary rights of the data of the Andean region countries, and they accepted the WHO toxicological classification.

I am very happy to inform you that right now we have 13 countries in harmonization with the pesticides requirements, uniform label, and proprietary rights of data.

At this moment, the first pesticide training course, sponsored by the Colombian Government and the Agrochemical industry, is taking place. The participants are: personnel of pesticide registration of the Government, extension services, and the academic personnel from the universities.

This is living proof that the 2 most important sectors, such as Government and Agrochemical industry, under the supervision of a Regional Organization, can solve problems which involve mutual needs and interests - in our case, the adequate uses of pesticides in our countries.

COUNTRY PAPERS

Pesticide Legislation and the Registration Process in Barbados

by John P.W. Jeffers
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Barbados

Prior to the start of the diversification project in agriculture 1967 - the main agricultural product was sugar cane. The use of pesticides in this crop was confined mainly to herbicides for the control of pernicious weeds, insect pests being controlled by biological agents.

With the increase in production of vegetable crops, especially on a plantation scale, there was a dramatic increase in crop pests, diseases and weeds with a concomitant proliferation in the importation and use of pesticides at all levels of agriculture. It was recognized as early as the late 60's that there was an urgent need to control and monitor the approval, importation, manufacture and use of pesticides in Barbados. To this end, we were fortunate to have the assistance of Dr. Gibbs, through the Overseas Development Agency (ODA). He helped us to prepare our first Pesticide Act which was enacted in 1973, and the regulations on approval and labelling in 1973 and 1976 respectively.

The Pesticide Control Act, Act. 36 of 1973 sets out to:

(a) control the quantities of pesticides which may be imported or manufactured and the types of containers in which such substances may be imported, transported, offered for sale or otherwise distributed;

(b) control the labelling on containers, their subsequent disposal and the disposal of unwanted stocks of pesticides;

(c) require the keeping and inspection of records and the furnishing of returns and other information with respect to pesticides;

(d) restrict or prohibit the use of particular pesticides or classes of pesticides;

(e) impose restrictions and obligations on pest control operators;

(f) impose duties on employers of workers, on the workers themselves and on others;

(g) require the provision and keeping in good order of -

(i) protective clothing

(ii) proper equipment

(iii) facilities for washing and cleaning

(iv) other things needed for protecting persons, clothing, equipment and appliances from contamination by pesticides or for removing sources of contamination there-from and the production thereof on the request of an inspector

(h) require the use of devices by employers -

(i) to warn against poisoning by pesticides

(ii) to ensure proper use of the apparatus and facilities provided in pursuance of the regulations; and

(iii) to warn against eating, drinking and smoking where there may be a risk of poisoning by pesticides or the possibility of an explosion

(i) prescribe limits to periods of exposure of workers to risk of poisoning by pesticides and the length of the intervals between periods of exposure;

(j) require employers to provide proper facilities for first aid treatment and the safety of workers;

(k) require employers to provide, and the necessity for workers to submit to, instruction and training in the use of apparatus and facilities provided in pursuance of the regulations;

(l) prescribe standards for the composition of pesticides;

(m) make it necessary to obtain a licence to manufacture, import, package, sell or otherwise distribute or use any pesticide;

(n) prescribe the manner for the application for and grant of licences necessary under paragraph (m).

To enable these to be carried out, a Board, the Pesticides Control Board was established with the following functions:

(a) to advise the Minister

(b) to carry out the provisions of the Act and Regulations

The Act also makes provision for the appointment of Inspectors whose duties are wide and far reaching. It gives them right of entry on to lands, premises on which a pesticide is being used, has recently been used or is about to be used, manufactured, packaged or stored. They can call for registers, records or other documents as well as size and detain any article which they reasonably believe to be in contravention of the Act or the Regulations.

Under the Act a Pesticide Control Board is appointed and consists of -

(a) A Deputy Chief Agricultural Officer, assigned by the Minister and who shall be Chairman;

(b) the Chief Medical Officer or nominee;

(c) the Government Analyst; and

(d) two other persons one of who may be a public officer.

Members are appointed for a term of three years, unless he dies, resigns or is removed from office by the Minister for due cause before the end of that term.

To date two sets of regulations have been proclaimed. In 1974, the Approval of Pesticides Regulations were proclaimed and in 1976, the labelling of Pesticides Regulations.

Under the Approval of Pesticides Regulations, no person is permitted to manufacture, import, store, distribute, sell or expose or offer for sale any pesticide other than a pesticide approved by the Board.

Secondly, any person who desires to have a pesticide approved by the Board, shall submit in such a form as the Board determines an application addressed to the Secretary of the Board. A copy of the application form is attached showing the nature of the information required. Special permission for recognised research institutes or other organisations engaged in research can be granted by the Board to import and use limited quantities of a pesticide whether or not such pesticide is approved under these regulations. However, when permission is granted to an institute to import and use a pesticide, such pesticide shall not be sold or distributed and shall be used only on the premises on which the research work is being done and shall be used only

by the employers of the institute and for the purpose for which it was imported. Furthermore, complete records must be kept and a report sent to the Board on the completion of the trial.

Provisions are made for the Board to withdraw approval of a pesticide or to cancel amend or refuse renewal of a licence. Where this is done the person affected may appeal and the Board may revoke a former decision and substitute another decision or confirm its former decision and such decision shall be final.

The Labelling of Pesticide Regulations 1976 apply to all pesticides except those manufactured exclusively for use in the control of endoparasites of animals. Under these regulations, every container in which a pesticide is distributed or exposed or offered for sale shall have fixed to a label approved by the Board. On the label the following information must be set forth:-

(a) the trade or proprietory name of the pesticide

(b) the name and address of the distributor or manufacturer

(c) the common name of all active ingredients

(d) the net contents by weight or volume of the ingredient

(e) precautions to observed in handling and use of the contents

(f) adequate directions approved by the Board respecting the manner of use

(g) specific information about the interval to be observed between application and subsequent grazing of stock or harvesting of crop to which the pesticide has been applied.

(h) mandatory, every label must have the words POISON and KEEP OUT OF REACH OF CHILDREN, printed in bold print.

To carry out its functions, the Board meets monthly to consider applications and carry out its functions. It is sub-divided into Insecticide, Herbicide, Fungicide and Rodenticide Sub-committees. The sub-committees consider all applications and report to the full Board where decisions are ultimately made.

While almost 1000 formulations of the above classes of pesticides have been approved in the last ten years, it has not been possible to monitor them as well as we should. However, Inspectors have been appointed and this aspect of the work is receiving priority attention. It is strongly recommended that the monitoring of pesticide storage, labelling and use be closely monitored, and that every effort be made to limit the quantities of different pesticides approved for use. Also, a system for keeping check on the quantities imported and use would be most useful.

Pesticide Legislation and Registration Process in Dominica

By Hannah Clarendon, Crop Protection Officer

Chairman Pesticide Control Board, Dominica

Introduction

In order to minimise effects of disease and pest organisms, Pesticides must be used wisely. The pesticides should be up to standard. Workers using pesticides or exposed to it must be protected.

It is also important to protect the environment from unreasonable adverse effects. Therefore, various precautions are necessary during the course of importation, distribution, sale and use of pesticide, and legislation is important to promote safe and effective use.

Dominica Pesticide Act 1974

During 1974, an Act was enforced to regulate sale licensing, inspecting of pesticides and worker protection. There are no specific regulation but broad areas for regulations are sited.

The act came into being as a result of an exercise carried out by Mr. I. Gibbs, Officer at Commonwealth Caribbean Pesticide Control Unit.

The main provisions of the Act are as follows:

Licensing of Pesticides dealing with application for licensing, terms for licensing, validity of license, Labelling, experimental permit.

Restriction of sale - inferior products, false advertisement, Containers storage, transportation of pesticides.

Control Board: Appointment of Officers, administrative expenses.

Inspectors: Roles, Authority

Regulations: Areas to be covered, manufacture sales, Importation, Protection of workers.

Offences and Penalties

Licensing of Pesticides

The regulations under this section came into force six months after they were made.

All pesticides have to be licensed before offered for sale, advertised or used.

Information required before a Pesticide can be licensed:

(1) Proposed trade names of the pesticide

(2) Have an address of the manufacturer

(3) Statement of all active ingredients and their percentage content

(4) A copy of the label and accompanying instructions which are proposed for the pesticide

(5) A statement as to whether the product is licensed for sale or other distribution in other commonwealth Caribbean countries and if so, which countries and whether any restrictions are attached to such sale. If a license for sale has already been granted in another Commonwealth Caribbean country, the Control Board may not require the submission of some or all of the remaining information described in this section.

(6) Adequate toxicological data concerning active ingredients

(7) Information on the efficacy of the product, preferably obtained under tropical conditions

(8) A certificate of clearance or registration from the competent authority with whom these products are licensed in the country of origin, also a copy of the label stamped as being approved by that authority. If the product is not on sale in the country of origin, the reason should be stated.

(9) methods of analysis of the formulated compound

(10) methods for the determination of its residues

The Control Board may refuse to issue a license for a pesticide if in its opinion the conditions governing the registration are not fulfilled or for any other reason.

The license shall be valid for two years or such lesser time as may be decided, and may be received thereafter, following review of data of the pesticide in question. Licenses may be withdrawn or their conditions modified at any time.

Labelling and Packaging

All pesticide containers must have affixed to them a label clearly stating:

-trade or proprietory name of product

-name and address of the distributor or manufacturer

-common name or chemical designationa of active ingredient and its percentage content

-adequate directions concerning the manner in which the pesticide is to be used

-precautions to be observed in the handling and use of the contents of the container

-net weight or volume of the container

-highly toxic pesticides should have the word poison and first aid, and medical treatment to be carried out in event of poisoning and such other statements which may be required by the board.

All packages must be deemed suitable by the Control Board.

Storage

Storage areas must be certified as approved by the pesticide Control Board. No contamination of food, utensils, water supplies and where there is no danger of destroying plant and animal life.

Advertisement

There may be no misleading or unsatisfactory clauses and all information used must comply with label and that submitted to the Board prior to licensing.

Transportation

All packages must be secure to avoid leakage and spillage arising from ordinary risk handling. The driver must be clearly instructed that no food items must be transported along with pesticide. All precaution must be taken to avoid contamination of food, water, plants and animal life.

Government Body associated with Act

The Pesticide Control Board is that body associated with the Act. The duties of the Board are:

(1) to advise the Minister on matters relevant to the making of regulations under this Act.

(2) carry out the provisions of the Act and of the regulations made there under.

The Board comprises of the Chief Medical Officer, Chief Agricultural Officer, Government analyst and two other persons appointed by the Minister, one of whom shall not be employed in the government service.

Inspection and Surveillance

To enforce provisions under this act, an inspector

(1) may inspect documents records to be kept by regulations

(2) check as to whether regulations are being kept

(3) interview persons operating on certain lands which he is authorised to inspect

(4) carry out medical examinations of persons suffering from toxic effects produced by pesticide if he is a registered medical examiner

(5) take samples necessary for analysis

(6) seize articles violating law

The inspector has the authority under the Act to enter into premises to carry out his duties - but he must be able to produce a signed document authorising him to enter.

Regulations

Only licensing regulations are specified in the Law.

The Law makes provisions for areas under which regulations may be drawn up.

-prohibition or control of manufacture, packaging, importing advertisement sale and use of particular pesticides or classes of pesticides

-control use of pesticides in agriculture, storage

-protecting workers against risks of poisoning

-prescribing permissible levels of any pesticides in a particular product at time of marketing

-control amount of pesticides to be imported, type of containers, labelling, disposal of unwanted stock

-imposing restrictions and obligations on pest control operations

-imposing duties on employers and employees

-requiring the provision and keeping in good order

(1) protective equipment

(2) proper equipment

(3) facilities for washing and cleaning

(4) any protective equipment needed to avoid contamination

-requiring the use of devices by employers - to warn against poisoning by pesticides, to warn against risk of poisoning by pesticides when eating, drinking and smoking.

Offences and Penalties

Any person who assaults, interferes, hinders, bribes or intimidates any inspector on the execution of his duties, or contravenes any provisions of this Act, or the regulations, is guilty of an offence and is liable on summary conviction to a fine, not exceeding $250.00, and in the case of a continuing offence to a fine not exceeding $50.00 for each day or part there of during which the offence continues.

II Actual Registration Process in Dominica

In April of 1982, all Business firms dealing with the importation of pesticides were requested to make available all the information required in the act to lincense or register a pesticide.

To date most of the firms have compiled and sent in a package of information to the Pesticide Control Board for consideration.

The Board had been in the process of preparing guidelines for considering the registration of these pesticides. Certain criteria were drawn up as to whether or not

-The pesticides were registered in country of origin

-The hazard/toxicity ratio

-The factors to be considered for storage

-The potential danger to users, public health, wild life

-The efficacy/risk ratio

-Alternative control measures

-Ability of user to use the pesticide wisely

The Board had difficulty as to where to draw the line,

what level of toxicity will be allowed

which pesticide to ban or place under restricted use.

Based on the applications made to the Board, a temporary license will be granted until the Board is in a position of being more fully informed to draw up more specific terms of reference. It is hoped that some of these information will be gained from this meeting.

III Discussion and Recommendations: Specific shortcomings of the Act

First of all the Act does not make provision for the most informed person on pesticide use management, to be a member of the Board namely the Crop Protection Officer.

The Act speaks in terms of the appointment of inspectors, but in reality, no provisions have been made by Parliament for the appointment of any inspector. Presently, there is only a part-time Inspector who is paid an allowance and hence the amount of work required by the Act cannot be carried out.

Provisions are made in the Act for medical inspection - but no follow up as to relevant test at hospital until this year.

More critical, the Act has made provisions for regulations to be made by the Minister, but to date no regulations have been embodied except those pertaining to licensing.

Licensing

Under regulations for Licensing, one of the criterion for registration is that a statement is to be made as to whether this pesticide is being used in other Commonwealth Caribbean countries - this is both positive and negative, whereas products used in Europe may not be appropriate for use in the Caribbean, because of country relationships, this may still go on.

Whereas products appropriate for use in the Caribbean may be disallowed based on conditions on mother country (European). Also it may be quite easy to come up with two countries where there are no regulations or close control on what comes in.

There is not sufficient provisions for demanding data on treatments related to pesticide poisoning. It simply states adequate toxicological data - this may be only LD50 dermal and oral without due regard for hazards especially pertaining to wild life.

It does not indicate the party responsible for registration, the parent company or the local agent.

There should be a description for suitable container and approved storage area in terms of the requirements for guidance of persons dealing in storage and handling.

The law makes no provision for the with-holding of products taken into the country, without a license, by custom authority.

Information on the efficacy of the product preferably obtained under tropical conditions - the amount of data is not specified in terms of the number of countries and conditions under which test should have been carried out - a number of field experiments that should be used as reference not stated - the agent applying for the licensing can give the bear minimum which would be of little or no use to the board.

It does not indicate whether or not an active ingredient will be registered or the trade name - and there are a number of problems associated with this point.

Because of continuous change in the types of pesticide used, and because of change in emphasis over the years from a position of strictly efficacy to a position to safe use and handling - regulations under the law must be changed to adapt itself to the new demands.

It would be better to have the Act as one stable area with general recommendation in terms of governing body to implement the Act and a more flexible part taking in:

(1) regulations to cover registration, classification of compounds, according to hazards and toxicity, and Pesticide for general use and restricted use.

(2) Guidelines for registration which need to be changed from time to time. Registration should be in keeping with technical ability for enforcement. Whereas in our Act, persons must go to Doctors for check ups, the corresponding test needed for diagnosis of poisoning were not available.

Technical assistance in the form of manpower, and access to technical data is critical to the enforcement of the law. Economic realities in terms of employing pesticide inspectors, having a Board that is fully functional, informed and capable of dealing with pesticide management.

In terms of harmonisation one needs to see the reflection of the realities of the life in each particular country.

Guidelines and criteria for registering and the general modus operandi of the Board may be similar.

We need to draw on available experties in the region, both in terms of technical data on efficacy and safety and on the experience in managing the affairs of the Board. We need as well to pool resources in terms of laboratory services for monitoring residues in food, water and in human tissue for use in effective diagnosis of contamination and poisoning respectively.

Pesticide Legislation and the Registration Process in Guyana

by Federick A. Jones, Ministry of Agriculture, Guyana

Guyana does not have any Legislation for the Importation, Registration and use of Agrochemicals, however there exists an "Agreement" between the Ministry of Agriculture and a major importer of Pesticides. The Agreement was made in the early 1979's when it was observed that Pesticides, particularly herbicides were being utilized at an alarmingly increasing rate.

The Agreement allowed for consultation between the importer and a Ministry of Agriculture personnel prior to importation. The Ministry of Agriculture personnel served as the Technical Arm that advised on the type, and quantities of each type of Pesticide that could be imported to meet the demands of the small farmer.

Sugar and Rice the major industries in Guyana do not come under the direct control of the Ministry of Agriculture and as such the aforementioned Agreement between the Ministry of Agriculture and the Importer does not cater for Pesticides used in these major industries.

The Ministry of Agriculture further has instituted in the mid 1970's a Plant Protection Service manned by Plant Protection Assistants. The main function of the Plant Protection Assistant was the monitoring of Pests and Diseases and recommending appropriate treatments for control. Follow-up

visits were mandatory to ascertain the efficacy of the treatment. Such information on efficacy was channelled back to the Ministry of Agriculture and influenced subsequent importation of Pesticides.

The Plant Protection Service had a measured amount of success but the principal objective was lost since the Plant Protection Assistants became primarily involved in sale of pesticides - without monitoring - to meet the assumed needs of increasing numbers of farmers. Plant Protection Assistants swere trained in the use of Pesticides and their absence from the farms further stresses the need for Legislation and Rules governing the use of Pesticides.

In 1978 the first Plant Protection Training Course was held by the Ministry of Agriculture. Participants were drawn from the Ministry of Agriculture and Agricultural Agencies in Guyana. The programme of the Training Course dealth extensively with Pesticide Management. Participation in the practicals was a mandatory requirement for all participants.

Radio programmes are aired very regularly and information on Pesticide usage is given adequate coverage. Further efforts to educate the public on safe use of Pesticides are made at frequently held seminars. The Ministry still recognises the absolute need for Legislation to strengthen its efforts.

There is no system of monitoring the deaths that have resulted from accidental ingestion of Pesticides, and farmers can readily purchase large quantities of toxic Pesticides. Because of sporadic shortages, farmers very often hoard chemicals in badly labelled and unsafe containers. Data are available on suides that have resulted from deliberate ingestion of Pesticides

Efforts are presently being made by the Ministry of Health to monitor marketed vegetables for chemical residues. Such an effort is fully supported by the Ministry of Agriculture since this effort may stimulate action towards the implementation of Pesticide Legislation.

The Plant Protection Section has prepared a Pesticide Act patterned after the model of Dr. Gibbs of the Commonwealth Caribbean Pesticide Control Unit. The document has been with Parliament for some years now, but recently efforts have been made to use the Pesticide Act of Trinidad and Tobago as a direct model for the preparation of the Guyana Pesticide Act. It is hoped that the document will soon be approved in the interest of the health of the people and the environment.

Pesticides Legislation and the Registration Process in Jamaica

by David W. Ellis and L. Walter VanWhervin

Ministry of Agriculture, Jamaica

Introduction

World pre and post harvest crop losses owing to pest attack in 1967 was estimated as 14% by insects, 12% by diseases and 9% owing to weeds (Walker, 1975). Parker (1975), however, estimated the world food production in 1972 to be of the order of 2,500,000,000 metric tons; of this figure, 287,500,000 metric tons or about 11.5% was lost to weeds. Other pests such as rodents and birds do account for sizeable losses. Rodents exert a serious limitation on world food supply as well as causing chronic losses to export crops upon which developing countries depend for foreign exchange (Sanchez, 1975). In Jamaica comprehensive studies of crop losses owing to pest attack have not been done. But crop losses due to pest where no pesticides are used my range from minimal to complete loss. In Jamaica damage to cocoa by rodents is estimated to be 20%, meaning a loss of more than $1,500,000 to farmers (Topper, 1982); rodent damage to coconuts ranges from between 5 and 36.5%, in sugar cane it is put at 5.4%, whilst in coffee it is about 2% (Wilson, 1982).

Pesticides are used in an effort to minimize pest attack. But inherent dangers exist with the use of pesticides. Newsweek magazine, July, 1983, reported that the World Health Organization estimates that 100,000 people die annually from accidental exposure to a wide range of

agricultural chemicals (including pesticides). Because of the possible adverse effect pesticides may have on non target organisms, including man, the introduction and use of pesticides must be controlled in some way to reduce risks associated with their use to a minimum. Legislation is necessary to rationalize the advantages and the potential harmful effects of pesticides on the ecology. The use of pesticides against noxious organisms dates far back but only relatively lately Authorities placed restrictions on the manufacture, sale, packaging, transport labelling, use and disposal of pesticides (Snelson, 1978). Public concern often exploited by mass communication has caused governments to introduce and review standards and procedures for evaluation and acceptance of new chemicals prior to sale. A system involving registration of pesticides has come into being and is becoming more diverse, stringent and restrictive (Bates, 1978). Many countries now have legislation governing pesticides, for instance the United Kingdom, and the United States have various Acts and legislations regulating the use of pesticides and specifications for pesticides for agricultural use are issued by the F.A.O. (Fryer & Makepeace, 1977; Bates, 1978; Adams, 1978).

Legislation in Jamaica

Legislation to regulate drugs and poisons has existed in Jamaica in some form. The provisions of the drugs and poisons law gave jurisdiction for the regulation of drugs and poisons and the right to act in protection of the public to a board then appointed by the Minister of Health. This was repealed by the Food and Drug Act, 1964 and the Pharmacy Act 1966. The Drug Law considered any substance used to kill insects to be a drug.

In 1975, the Pesticide Act, 1975, was passed. The Pesticides Act, 1975 defines terms such as functions, inspector, label, manufacturer, package, pest control operator, pesticide, prohibited pesticide, Registration, restricted pesticides and registered premises, etc.

It is intended to make provisions for regulating the importation, manufacture, sale and use of pesticides, for the licensing of pest control operators and for matters connected therewith or incidental thereto.

Authority

The Act calls for a body called the Pesticides Control Authority of not more than 14 members including a Chairman and Registrar. Individuals constituting the Authority should have ability and experience in the fields of plant protection, food storage, pesticide chemistry, public health, food chemistry, the pest control industry and other matters incidental to pesticides.

The functions of the Authority should be to:

(a) register pesticides
(b) license persons to import or manufacture pesticides
(c) authorize persons to sell restricted pesticides
(d) register premises in which restricted pesticides are sold
(e) license pest control operators
(f) consider and determine applications made pursuant to the Act and to deal with all aspects of the importation, manufacture, packaging, preparation for sale, sale, disposal and use of pesticides and to advise the minister under whose portfolio the Act falls on all matters in relation to pesticides, and

(g) to do such other things as may be expedient or necessary for the proper performance of its functions under the Act.

Registrar

Under the Act the Registrar's functions are prescribed thus:

(a) to keep a register to be known as the Register of Pesticides in which the names and prescribed particulars of any pesticides registered under the Act are to be entered.

(b) to keep a Register known as the Register of Licenses in which are to be entered the name and prescribed particulars of any person authorised under the Act to sell a restricted pesticides and prescribed particulars of the premises registered by that person for the sale of restricted pesticides.

(c) to keep a register of registered pest control operators in which are entered the name and prescribed particulars of any person licensed under the Act as a pest control operator.

The registers kept are to be open to any member of the public for inspection and to be published in the Jamaica Gazette at prescribed times.

Under the Act it would be the duty of the Registrar to issue license or certificate of registration or authorization, to remove from any of the registers any entry that the Authority directs to be removed, correct any incorrect entry which the Authority directs to correct, and to make alternations as necessary in any prescribed particular.

Inspectors and Analysts

The act also has provisions for monitoring the use and otherwise of pesticides by the employment of Inspectors with certain powers such as to enter and examine premises, books and documents or records, take samples and to seize or detain articles. The function of the Analyst would be to examine, analyse and determine the constitution of a substance as may be required under the Act and to make reports of his analysis.

Penalty

The Act makes provisions for prosecution for an offence under the Act. Such prosecutions are to be instituted and sanctioned by the Director of Public Prosecutions.

Schedules

Three schedules occur under the Act.

First schedule

The first schedule gives the terms and references of the 'Pesticides Control Authority'.

Second schedule

Under the second schedule should be listed prohibited pesticides. Such pesticides would be classed as pesticides of which the possible effect on the environment, plants, animals, or humans would be considered to be too dangerous to justify their use. Prohibited pesticides would not be allowed entry into the country except, perhaps, under very unusual circumstances. Twenty prohibited pesticides appear under the second schedule and include such substances as aldicarb, DNOC and Zectran.

Comment on the second schedule

Pesticides appear not to be totally banned or prohibited in the United States; but a pesticide may have a registered use. Regulations ought to be designed to take into account the fact that one method of using a chemical may be inherently more dangerous than another to the operator; other factors being equal, granular or soil application is safer than ordinary spraying. So regulations governing spraying need not apply to liquid applied to the soil in an unbroken sheet or when the substance is injected under ground.

In the United Kingdom pesticides recommended for scheduling in their Health and Safety (Agricultural) (Poisons Act 1933. Such substances as Dinoseb, DNOC (=4, 6 - Dinitro - o - cresol), endothal, paraquat and mercuric Chloride are listed in their Poisons List Order, 1972. This means that they may generally be sold only by a retail chemist or by a listed seller of poisons, that is, someone who is registered with the local authority for that purpose. The Poisons Rules 1972 (Instrument 1972, No. 1939) lay down the conditions under which listed poisons must be labelled, packaged, transported, and stored in the shop. Also specified are the conditions under which the poisons may be purchased, e.g. any of the chemicals above, such as mercuric chloride,may normally be purchased only on production of a signed order in a prescribed form and by attending at the shop to sign the poisons book. (Fryer and Makepeace, 1978). Also an annual booklet, 'Approved Products for Growers' states which products approved under the Agricultural Chemicals Approval Scheme are scheduled and labelled as poisons.

Some guidance as to which chemicals should be scheduled can be obtained from a study of the Guidelines to the use of the WHO Recommended Classification of Pesticides by Hazards and the annex accompanying it. (Anon., 1980). This may be supplemented by materials from other agencies as the Environmental Protection Agency (EPA) of the United States. For a very general guide the classes of technical products appearing in Table I should prove to be helpful.

CLASS	ORAL		DERMAL	
	Solids	Liquids	Solids	Liquids
Extremely hazardous	5	20	0 - 1.0	40
Highly hazardous	5 - 50	20 - 200	10 - 100	4 - 500
Moderately hazardous	50 - 500	200 - 2000	100 - 1000	500 - 4000
Slightly hazardous	500	2000	1000	4000

third schedule

Under the third schedule should appear restricted pesticides. These should include a preparation or mixture in which the quantity of any pesticide identified by an asterisk is not more that 2% by weight e.g. DDT* or an impregnated resin strip in which the quantity of a restricted pesticide is not more than 20% by weight of Dichlorvos*. 69 pesticides appear in the third schedule and include such substances as Abate, carbofuran, and zinc phosphide. Pesticides for free sale would not appear in the schedules but in the appropriate register.

Implementation of the Pesticides Act, 1975

The III Reunion of Consultation on the Adequate Use of Pesticides in America and the Caribbean held in Mexico in 1982 recommended that all countries should have means of controlling the introduction, transport, and use of pesticides in its territory and that as appropriate member countries should enact relevant legislation as soon as possible to ensure those objectives and that such legislation should be reviewed regularly. (Requirements of these legislation should be based on the recommendations of bodies like the FAO and WHO).

Despite such recommendations and very obvious need as shown by accidental pesticides poisoning of people in Jamaica (Aldrige & Irons, 1980) and by the sale of restricted pesticides, e.g. phosdrin contains mevinphos, in grocery shops and the fact that the Act has been signed into law, it has never been implemented. Nor have regulations necessary under the Act been promulgated.

One problem faced in the non implementation of the Act is that the Ministry of the Public Service appears reluctant to create the central body, the 'Pesticides Control Authority', as designated by the Act for its jurisdiction. But owing to the importance of pesticides to Jamaica, the creation of such a body appears to be necessary. And in the Mexico meeting, refered to above, it was recommended that it is advisable that the registration of pesticides be managed by a central organization within a country supported and advised as appropriate by all departments with an interest in the safe and efficient use and handling of pesticides. The view concurs with the provision of the Act for the creation of the 'Authority'.

Another problem encountered appears to be which Ministry should have jurisdiction over the Act. The Ministry of Agriculture, The Ministry of Health and Environmental Control, the Ministry of the Public Service and the Office of the Chief Parliamentary Council do not seem to concur. At present the responsibility for implementing the Act seems to rest with the Ministry of Health.

It appears that at present what legislative control exerted over pesticides is through the Pharmacy Act, 1966. The position now is the Pharmaceutical Services Division of the Ministry of Health performs the following:

(a) registration of pesticides

(b) issuance of licences to persons to import or manufacture registered pesticides

The Pharmacy Council is supposed to do the following:

(a) authorize persons to sell restricted pesticides

(b) register premises in which a restricted pesticide may be sold

(c) consider and determine applications maderelative to the Act and to deal with all aspects of the importation, manufacture, packaging, preparation for sale, sale, disposal and use of pesticides and advise the minister in matters relative to pesticides.

Pest control operators on the whole appear to operate without being licensed as no body of government now performs that function. The result is that there has been a great increase in the number of these operators performing in

households, etc., without training, or with little knowledge of pests, pesticides and safety standards.

Again because of non implementation of the Act no monitoring of pesticides being sold, used on farms, in industry or in households occurs.

The position is unwholesome as restricted pesticides often fall into the hands of illiterate users who use them without observing normal safety standards and apply them to unindicated crops, which crops may be harvested without observance of safety periods between the last application of a pesticide and harvesting of the crop.

The Future

It appears that the Pesticides Act, 1975 should be implemented as soon as possible and made operative. And then certain inadequacies in that Act could be dealt with.

Registration

At present the registration procedure for pesticides in Jamaica addresses itself to fundamental issues (see APPENDIX), and it employs many of the principles recommended by the FAO (ANON, 1977). Registration of pesticides contractors and operators should follow FAO standard and should ensure proper knowledge of pesticides safety standards and the ability to maintain equipment.

The registration process for pesticides could proceed in stages: Clearance could be given for testing purposes for a suitable period of time say one year; a provisional registration when most of the relevant data has been evaluated and full registration for free sale when all evaluated data show that the use of the pesticide is unlikely to be accompanied by unacceptable risks. These claims may, however, be restricted, and limitations placed on their use or a time limit placed on the validity of the registration.

Safety Standards and Education

The Act could place obligations on users for safety in the use of pesticides. In the UK, for instance, the Health and Safety at work etc. Act, 1974, placed general obligations as follows:

(a) employers to ensure so far as reasonably practicable the health, safety and welfare at work of their employees.

(b) the self employed and employees are to take reasonable care of their own health and safety at work

(c) employers, self employed and employees not to put at risk by their own work activities, the health and safety of others.

(d) manufacturers and suppliers of articles and substance for use at work to ensure so far as is practicable that they are safe when properly used and that the purchaser is informed of any potential hazard which the use of the articles or substances may present.

Under that Act anyone who intentionally or recklessly interfers with or misuses anything provided under the requirement of law in the interest of health, safety, or welfare is liable to prosecution.

The regulations could state the maximum number of hours operators can do scheduled operations and the minimum age, training, supervision of operator performing schedule operations, also notification of sickness. Added precautions are needed when working in closed space such as greenhouses, warehouses and animal buildings.

All aerial applications of pesticides should require permission from a competent authority and the pesticides to be applied should be listed. (In Jamaica banana sprayoil and technical malathion in oil base are known to be applied by aircraft).

For safety 'good practice in use of pesticides' should be a matter of public education. For our purposes 'good practice' means the officially recommended or authorised usage of pesticides under practical condition at any stage of production, storage, transport, distribution and processing of food and agricultural commodities, bearing in mind the variations in requirements within and between regions and which takes into account the minimum quantities necessary to achieve adequate control, and applied in such a way so as to leave a residue which is the smallest amount practicable and that is toxicologically acceptable (ANON., 1981).

In following good practice the least hazardous but efficient chemical would be recommended for use, for instance in Table I, substances classed as 'slightly hazardous' would be the ones most likely indicated for use by house-holders as potential risk and problems of disposal would not be so great. These safety measures could apply to all territories in the region.

Maximum Residues Limit (MRL)

It is not to our attention that this matter has been addressed in Jamaica. But for the purpose of foreign trade and the interest of the safety of national subjects the matter calls for attention. This stems from the knowledge that the use of certain pesticides in accordance with good agricultural practice can result in residues on or in crops, in livestock and may leave residues in food derived therefrom. Government should, thus, set up or strengthen appropriate facilities necessary to collect and analyse data and to publish information on this matter.

Many governments have already accepted MRL's recommended by the Codex Alimentarius Commission (ANON., 1977).

Poisons Centres

Users of pesticides are exposed to pesticides and especially field workers who use pesticides regularly should be subject to such epidemiological studies as are indicated. National Poisons Information Centres should be established and equipped to disseminate information on all toxicants used in the country.

Resistance

Pesticides are a most valuable human resource. Whilst they themselves do not increase production directly they do by removing or reducing certain constraints such as pests and vectors. Remarkable improvement has occured in human and animal health consequent on the use of pesticides (Frazer, 1967). Pesticides, though, are a limited human resource based on the few classes of new compounds that emerge. This means that a scarce resource demands careful management to ensure its lasting usefulness. Widespread resistance of pests

has been reported to many types of pesticides, in some cases, as was the case in the cotton belt in Peru some years ago, it can be traced to poor use of pesticides. It does not occur to use now how legislation can delay or prevent the development of resistance to pesticides but this could be a problem for careful study.

Acknowledgement

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Appendix Ministry of Health & Env

Ministry of Health & Environmental Control

Pharmaceutical Services Division

Registration of a New Pesticide

1. TRADE NAME OF PESTICIDE .....

GENERIC NAME OF NON-PROPRIETARY
DESIGNATION OF PESTICIDE OR
CHEMICAL CONSTITUENTS .....

2. NAME AND ADDRESS OR MANUFACTURER.....

.....

.....

3. NAME AND ADDRESS OF APPLICANT .....

.....

.....

.....

List of Requirements for assessment purposes

1. Samples of the pesticide in the finished and commercial form in which it is to be sold, labelled in the English language, with the names and quantities of the active ingredients, the directions for use, the name and address of the manufacturer and adequate words of caution printed on the label thereof. Quantities should be expressed in terms of the Avoirdupois or Metric System.

2. Detailed literature with regard to the chemistry and composition of the product, its efficacy and toxicology, antidotes, together with any available references, and precautions to be observed during and after use.
3. Six (6) sample copies of the label proposed to be used in connection with the new pesticide, also samples of the packaging materials to be used for Trade Package.
4. A Certificate of analysis which contains:
   (a) an assay report on a recent batch of the product analysed, and
   (b) the method of analysis used.
5. A duly authenticated and legalised Certificate of Free Sale from the Competent Authority with whom the product is registered in the country of origin, and the conditions under which it may be sold in that country, also a copy of the label stamped as being approved by that Authority.
6. A statement showing:
   (a) The countries in which the product is registered for Free Sale other than the country of origin.
   (b) Any country in which the product has been refused registration for Free Sale and the Reasons for refusal.
7. A certificate in the English language from the manufacturer, respecting the safety of the new pesticide, recommended conditions for use, and giving the conditions under which it is recommended for sale.
8. Any other relevant information.
9. The prescribed fee of $100.00 made payable to the Permanent Secretary, Ministry of Health & Environmental Control.

N.B. All the above requirements must be submitted at one and the same time to the Pharmaceutical Services Division.

FOR OFFICE USE ONLY

DATE RECEIVED..... NOTIFICATION SENT .....

ASSESSMENT COMMENTS .....

DATE APPROVED/REFUSED .....

Pesticide Legislation and the Registration Process in St. Lucia

by Everton Ambrose, WINBAN, St. Lucia and
Henry Lubin, Ministry of Agriculture, Lands,
Fisheries and Co-operatives, St. Lucia

Summary

A Pesticide Control Act (1975) designed to protect the public, animals and the environment was passed in 1975. Unfortunately the provisions of the Act have not been enforced and pesticides are being misused. Efforts intended to be undertaken to control the sale and use of pesticides are outlined.

Introduction

The island of St. Lucia is 238 sq. miles with a population of about 140,000. It is a member of the Windward Group situated about 14^{o}N latitude and 61^{o}W longitude. It lies about 20 miles south of Matinique, 25 miles north of St. Vincent and about 100 miles west of Barbados.

St. Lucia is volcanic in origin and has a rugged terrain made up of a central range of mountains from which spurs run on either sides. Between these ridges are low lying valleys in the west and east and two large plains in the north and south of the island. These low lying areas provide suitable habitat for mosquito or sandfly breeding. The economy of the island is largely based on Agriculture. The banana industry accounts for 80% of the export earnings. The second most economically important crop is coconut.

Other crops are citrus, mangoes, avocados, cocoa with vegetables and food crops grown as subsistence crops. Most of the cultivation occurs within the range of 70-100 inches per annum. Serious losses of crop yield and quality and livestock production is caused by pests.

A pest is any organism which damage, cause nuisance or reduce the value of a commodity. For the purpose of this paper, pests include insects, and nematodes that attack crops and livestock, weeds, bacteria, fungi and viruses causing diseases of crops and other organisms causing a nuisance to man. Pesticides are chemicals used to control these pests.

Pesticides have played a significant role in increasing crop yields, increasing crop yields, increaing livestock production and in combating vector borne diseases of animals and people. Unfortunately, pesticides have not always been used in the correct way. There has been a breakdown of communication between the manufacturers and distributors on one hand, and farmers and other users of pesticides on the other.

Pesticides can be obtained from the Banana Growers' Association or from local commercial distributors. A small amount of pesticides may be obtained from the Coconut Growers' Association and the St. Lucia Agriculturists' Association. Some Pesticides are imported directly by some farmers or taken into the island by residents returning from overseas trips.

The Pesticide Control Act

Because of the possible effects they may have on non-target organisms, the introduction and use of pesticides in the island must be controlled in some way to reduce to a minimum, risks associated with their use.

A Pesticide Control Act designed to protect members of the public, consumers and users, animals and the environment against the dangers from pesticides was passed in the St. Lucia House of Assembly in 1975. The Act applies to all chemical formulated as pesticides (fungicides, rodenticides, insecticides, herbicides) growth regulators and similar products used in agriculture, forestry and disease vector control.

The Act provides for the establishment of a Pesticide Control Board comprising members of the public and private sectors involved with pesticides. The Board advises on the regulations necessary to implement the Act.

The Act provides for the appointment of pesticide inspectors whose task is to ensure compliance with the regulations made under the Act. Inspectors are empowered to enter and inspect ships, warehouses, retail stores and any other premises they know that pesticides are stored or sold. Inspectors may also inspect documents and seek information from individuals concerning pesticides. They may recommend medical examination of persons handling pesticides or in contact with pesticides and take samples and detain materials and articles believed to contravene the regulations. The inspectors are empowered to implement measures to control the dangers posed by pesticides. These may include prohibition, restriction or control of manufacturing, packaging, advertising and sale of pesticides in agriculture and health, and storage in warehouses and buildings. They can prescribe the conditions under which pesticides must be stored and measures for the protection of workers handling pesticides.

The Act outlines the offences that may arise under the regulations and the corresponding penalties imposed. It is an offence for example to assault, resist, obstruct, abuse, intimidate or, bribe an Inspector in the execution of his duties.

Current Situation

Since the Act was passed in 1975, the provisions therein have not been enforced. Pesticides are being used carelessly. They are used to discourage people from stealing crops, they are stored near foods or in situations which can lead to accidents. Labelling of locally repacked pesticides are inadequate, sometimes giving only the product name. There is usually nothing to indicate that the chemical is poisonous. Packages are often unsatisfactory and easily broken or punctured. Repackaging may be such that the active ingredient may be lowered since other material may be used to increase the weight or volume of the chemical. The original labels may be too complicated and so fail to provide the information needed by a local farmer. The language may also be inappropriate. Storage is often inadequate - no security and sometimes little protection against rain or sunlight. Pesticides are often in soft drink or rum bottles and this has led to accidents. Measuring and mixing are often done casually sometimes and by guess work.

The potential dangers precipitated by this manner of dealing with pesticides did not altogether go unnoticed. As a result, a group of concerned people involved in pesticides met to discuss the situation.

It was agreed that the situation relating to the handling and use of pesticides necessitated and demanded redress. The 1975 Act had made provision for the establishment of a Pesticide Control Board and this Board became operative in August 1982 under the Ministry of Agriculture and the Board meets every month at the Ministry. The Act itself was not proclaimed until November 1982.

Registration Process

St. Lucia has, as yet, no established system for the registration of pesticides. A system is presently being discussed by the Pesticides Control Board, and it can be said this is in its final stage of acceptance.

It is suggested that the registration process be carried out in the following way: For application for a licence to import/manufacture a pesticide, the manufacturer or his agent submits the following completed forms to the Board through the Secretary.

(a) Application for approval of a pesticide (Appendix I)

(b) Application for a licence to import/manufacture a pesticide (Appendix II)

Following receipt, the Board discusses the application and also assesses the supporting technical information submitted with the application. Iff needed other people with the necessary expertise may be co-opted to assist the Board in the decision-making process. In considering the application it may also be necessary, and indeed desirable for the Board to request, from other countries in the Caribbean, information concerning their experience with certain pesticides.

Certain pesticides are to be put on restricted list. This means that permission must first be sought and obtained by the intending purchaser before a restricted pesticide can be sold to the applicant. A completed form (c) Purchasing of a Restricted pesticide (Appendix III) is to be submitted to the Board, if a restricted pesticide is to be purchased by an operator for his own use. This form seeks to firmly place responsibility for the restricted pesticide, once purchased, on the purchaser.

As it is the intention that approved licences remain valid for a period of one year, there will, as a matter of course, be an annual registration programme of all pesticides used in St. Lucia. This exercise is thought to be necessary since it would give the Board the opportunity to periodically assess the performance and usage of the pesticides in current use. The latter becomes necessary considering the insufficiency of manpower, facilities and funding for carrying out detailed studies on any pesticides.

The Board recognised and has considered it imperative to organise and implement a continuous education programme on the use of pesticides and the procedures to be followed for registration of a pesticide. To this end, a publicity or awareness group was appointed as a sub-committee of the Board to specifically undertake this exercise.

Chemical manufacturers must recognise that the main users of pesticides in the island are agricultural workers and therefore must gear themselves for the type of services and information needed. The Pesticides Control Board, using the provisions of the Pesticides Control Act of 1975, is moving to control activity in this useful though potentially dangerous area.

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Pesticide Legislation in Suriname

by Ronald M.L. Goedar, Agricultural Experiment Station, Paramaribo

Introduction

Pesticides are applied annually in large quantities in order to control the pests endangering our food production and the health of human beings and domestic livestock. The continued and wide spread use of pesticides is essential because modern agriculture, with its high quality food and fibres, cannot exist without the use of pesticides. Weeds, diseases and insects pests will take an extremely heavy toll if these chemicals are not used. But there is also a great need for controls over pesticides because they have also brought the hazard of harmful effects to humans, wild life and the environment (1) when used improperly.

Experience has shown that various precautions are essential in the manufacture, distribution and use of pesticides. Safe use of pesticides is paramount in importance. A fatality or illness resulting from a pesticide, whether from homeowner or commercial farm use, is unnecessary. Therefore it is essential that every country using pesticides should have a practical legislation promoting safe and effective use

The current status of Pesticide Legislation in Suriname

The Pesticide Ordinance of Suriname has been enacted by the Government and published in the official Government Journal (pesticides Ordinance G.B. 1972 no. 151 and Pesticides Regulations, made under this Law G.B. 1974 no. 89). This legislation envisaged the promulgation of implementing Rules in order to give substantive effect to the Law. These rules were to deal, inter alia, with pesticide registration, requirements regarding labelling, storage and containers; authorization to sell pesticides and conditions under which pesticides may be used and crops treated.

The rules, however, have not yet been promulgated. For this reason the basic law on pesticides has never been formally into force. I would like to give you an idea of the existing situation in Suriname as regards the trade in and the use of pesticides.

(a) Origin of pesticides

In Suriname there is no production or formulation of pesticides. Hundred percent of the pesticides used are imported.

(b) Import of pesticides

The pesticides are imported through private enterprises and during the last few years there have been approximately ten importers.

(c) Legal provisions for imports of pesticides

For the importation of any product into Suriname, including pesticides, an import license is required. The licensing system is operated under the aegis of the Ministry of Transport, Commerce and Industries. Although there is no legal basis for it, applications for an import license for pesticides have to be sent directly to the Ministry of Agriculture. Depending on whether a positive or negative recommendation is given by the Ministry, the import license is either granted or withheld by the Ministry of Transport, Commerce and Industries. In practice the import permission for pesticides has always been granted.

(d) Kinds of pesticides and quantities imported

Imports of all pesticides into Suriname had a value of Sf 9.2 million during 1982 and approximately 51% of all these imported pesticides were used in hthe rice growing sector. The following table illustrates the increase of the use of pesticides in agriculture in Suriname.

Pesticides use (kg - litres) in Suriname agriculture during the years 1976 - 1981.

Group	1976	1979	1980	1981
Insecticides	183.000	289.761	191.425	326.598
Fungicides	9.570	33.293	11.531	70.910
Herbicides	134.000	289.933	336.601	401.705
Molluscicides	-	31.182	111.550	39.800
Total	326.570	644.169	651.107	839.013
Area in production in ha	58.285	70.841	77.619	83.389
Use per ha	5.60	9.09	8.39	10.06

Source: Annual Reports Ministry of Agriculture, Animal Husbandry Fisheries and Forestry.

(e) Packaging, containers, labelling, storage

1. Packaging

In general pesticides in Suriname are imported in their original drums or bags. Approximately 80 percent is delivered in the same packaging to the users. Approximately 20 percent is repacked by the importers of pesticides in Paramaribo, or by their subsidiaries or by retailers. Only one importer takes adequate safety precautions as for instance; separate buildings, separate entrace and exit, automatic supply of pesticides, special clothes and shoes, washing and bathing facilities. The safety precautions taken by the other importers or retailers are inadequate. Though special gloves and masks are available, these are not always used.

2. Containers

For liquid pesticides the repackers are using plastic bottles and glass bottles of all types, mostly whisky bottles. The plastic bottles are of too light quality and are closed with a plastic cap. The glass bottles are closed with a cork. Leakage of the plastic bottles is quite common. The other quality, which cannot be reclosed.

3. Labelling

Although there is no regulation on the subject, retail packaging are properly labelled, the label indicating the name of the product together with methods of use and safety instructions.

4. Storage

The storage rooms used for pesticides in Suriname are in general insufficiently equiped.

(f) Use of pesticides

1. General

The effects of pesticides on fishes and birds in rice fields were investigated from October to December 1971. Dying fishes and birds had been observed by workers in the rice fields, especially (2) during application of sodium pentachlorophenol (NaPCP) and of Endrin. The levels of pentachlorophenol and endrin in the birds suggested that ingestion of contaminated food was a probable cause of the sickness and mortality observed. The Stichting Machinals Landbouw at Wageningen Suriname used endrin against leaf miners (Hydrellia sp.) and caterpillars (Laphygma frugiperda) but use was discontinued in 1972 so that residue levels would meet the requirements of the German Federal Republic, a principal importer of rice from Suriname. Endrin is being replaced by methyl parathion and monocrotophos (Azodrin^{R}).

The use of NaPCP and endrin two extreme poisonous pesticides has been prohibited in many countries. In Suriname only the state-owned companies have replaced such pesticides with less toxic products.

Among the private agricultural producers the use of endrin and NaPCP is still quite common because these pesticides are cheaper than the less toxic products.

2. Paddy culture

In paddy culture, application of pesticides is mainly carried out by plane. Experience has shown that aerial application of pesticides is one of the most efficient methods of controlling pests when large areas have to be treated. Rice fields infested with (3) paddy bugs (Oebalus poecilus) are treated simultaneously in order to get the best control results.

In those areas where small producers have their paddy sprayed with pesticides by plane, we have the following problems:

1. Vegetable grown between the rice lots are often contaminated.
2. Roofs are sprayed with pesticides, resulting in the contamination of rain water, which is collected from the roofs and used for drinking and/or washing purposes.

3. Oil palm and bananas

In oil palm and bananas sectors, some research has been done, which has resulted for the oil palm sector in the replacing of Endrin by Furadan.

4. Vegetables

The use of pesticides in vegetables growing is very uncontrolled. There are indications, that the amount of residues of pesticides

at the moment of harvesting will be often fairly high, which can only be proved and reduced by residue control.

(g) Registration

In Suriname until now activities in the field of pesticides registration have been insufficiently developed.

Although there is a license system for the import of pesticides, in practice almost any pesticide can be imported in almost any quantities.

Up to now, only the quantities of the imported pesticides have been registered. Suriname is wholly dependant on the import of pesticides and their formulations.

A mandatory registration (4) would be useful to eliminate undesirable pesticides that were introduced in the past and are still on the market.

Conclusion

The above mentioned situation is the result of non-enforcement of the Pesticides Ordinance and the absence of rules under this law.

The use of pesticides is wide spread, so the need for control over pesticides in Suriname is evident.

As there are no special regulation governing trade, storage, packaging or labelling of pesticides, in general not even the minimum requirements are met by the importing and trading companies.

Control over the use levels, claims, labelling, packaging and advertising, cannot be exercised because there is no registration. The interests of the end users are not protected.

As long as the regulationw which should give substantive effect to the Pesticide Law are not promulgated the situation in Suriname as regards the use of and the trade in pesticide will be as it is now.

In order to bring some improvement in this unsatisfactory situation, a working group on Pesticides was installed in February 1982. The main task of this working group is to advise the Government with regard to pesticide policy and its enforcement.

The Suriname Government intends to realise the Pesticides Legislation in 1984. In this connectiong, an information campaign will be organized for the interested parties, as well as a training course. International cooperation in this field, especially in our region, is most desirable.

Recommendations

1. Regulations as regards the registration of pesticides should be promulgated as soon as possible in order to eliminate or restrict undesirable pesticides.
2. The interministerial/departmental cooperation should be improved in order to avoid procedural delays as regards the enforcement of the Pesticide Ordinance.

3. The Extension Service of the Ministry of Agriculture should keep activities up to date in order to provide society with maximum protection from adverse effects as regards the use of pesticides. With proper information the public will be aware that most of the pesticides present a potential hazard to non-target organisms.

4. The environment should be protected from the adverse effects of pesticides. There is an urgent need for the development of guidelines and standard procedures as regards the disposal of unused pesticides, their left overs and used containers. Misuse of used containers and indiscriminate throwing away of unused pesticides in the field, results in pollution of the environment.

5. Food should contain the least possible amount of chemical residue. Because of the uncontrolled pesticides use in vegetable growing in Suriname, safe legal limits should be established for residues in foodstuffs. Residue control should be initiated as soon as possible.

6. Research in the use of pesticides in the rice sector should be started again, because of the intensive use of pesticides in this sector. Almost 10% of the pesticides used in the rice sector are applied ineffectively.

7. The Pesticide Ordinance of Suriname should be brought into force as soon as possible. In order to solve all the problem as regards the use of and trade in pesticides a legal basis is indispensable.

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Pesticides Legislation and the Registration Process in Trinidad and Tobago, by Dr. Ronald Barrow, Director of Research, Ministry of Agriculture, Lands and Food Production, Trinidad

One of the principal areas in which official services intervine in plant protection is through the registration and control of pesticides. In order to satisfy these requirements (registration and control of pesticides i.e.) in Trinidad and Tobago an interim committee under the chairmanship of the Chief Chemist and Director of Food and Drugs was established in 1969 to draft the necessary legislation. Several drafts were produced culminating in the enactment of legislation in December 1979. The Act entitled -'The Pesticides and Toxic Chemicals Act' seeks to control the importation, storage, manufacture, sale, use and transportation of pesticides and toxic chemicals. Regulations including registration of pesticides under the act have been drafted and await the approval of the Legal draughtsman and Cabinet before adoption.

Until the Pesticides Act is proclaimed chemicals will continue to be imported under an Open General Licence issue by the Ministry of Industry and Commerce. Control of this importation is vested in the Competent Authority (for the purpose of Imports and Exports Control Regulations 1941). Pesticides on the Negative List published as a Government notice are allowed into the country subject to certain conditions (see Appendix I). It should be noted that the pesticides on the Negative List are updated from time to time by the Negative List Review Committee and this process will continue until the Pesticides Act becomes enforceable. The pesticides that are presently

controlled by import licensing are given in Appendix according to their ISO standard names.

Pesticides and Toxic Chemicals Control Board

To carry out the provisions under the Act and to advise the Minister (Health) on matters relevant to the making of regulations under the Act are the responsibilities of a Board. The Board comprises officers from the Ministries of Health, Agriculture and Labour, Bureau of Standards and representatives of both workers and employees organizations. The Chief Medical Officer (Health) on the Ministry of Health is the Chairman and the Registrar functions as the Secretary of the Board. Since the enactment of the Pesticides Act in December 1979 the Board has been appointed and it has been appointed and it has met regularly and has been engaged in the drafting of the required regulations namely, Registration

Licensing of premises (wholesale outlets)

Disposal

Storage and transport

The Board has also been involved in the training and education of users. To this end a workshop on Pesticide Management was held in September 1982 to 'Train the Trainer.

Labelling and Classification of Pesticides

These two important aspects of user information are covered by compulsory standards devised by the Trinidad and Tobago Bureau of Standards. Pesticide labelling systems are particularly important since they provide the principal means by which the national authority can communicate with the users.

The labelling standard specifies the information to be included on the labels of pesticide packages intended for the retail trade and the information to be included in the instruction printed on leaflets accompanying the packages.

As with the standard on labelling, the classification standard follows the recommendation of the World Health Organization and is based on the degree of hazard which pesticides present to human life. There are four (4) hazard classes as outlined in Table I. It will be noted that the hazard class to which a chemical is assigned will depend on its LD_{50} values oral dermal for the rat, availability of antidotes and the toxic action due to the intake of the pesticide. Class IA pesticides are extremely hazardous e.g. methyl parathion, aldicarb Class III pesticides are slightly hazardous e.g. malathion, trichlorfon (50% wettable powder). It is expected that the Bureau of Standards will also devise procedure for checking the quality of locally marketed pesticides.

Registration

It must be emphasised that the effective control of pesticides is a necessary condition for a registration system to be of any value. Registration is only one aspect of control and essentially it is intended for the protection of the user, consumer and environment by assuming that pesticides are only used according to good agricultural practice. Pesticides should be available only to those capable and instructed in their use or able to read, understand and follow a label. Restricting the vailability of a product to an appropriate use can be an important way of reducing hazards to man and his environment.

In the drafting of the registration regulations attention was given to the guidelines established by PAO, WHO, OECS and other institutional organizations. It was noted that there was need for the system to be practical and smooth running and also to ensure that new and useful products are not necessarily delayed before getting into the market. To this end a stepwise registration procedure is recommended and it is expected that there will be close collaboration between the Registrar and the manufacturer's agents.

As indicated earlier the Registrar is the Secretary of the Board and in accordance with the Pesticides Act is also responsible for keeping and maintaining a Register of Licences, a Register of Pesticides and a Register of Toxic Chemicals. Once the Act is proclaimed all licences now granted under the Trade Ordinance 1958 for the importation of pesticides will have to comply with the requirements of the Act and as such all licences will be issued by the Registrar on behalf of the Board.

It is envisaged that the workload of the Registrar will be burdened and in order to lighten same it will be necessary to adopt accepted guidelines for the manufacture and also by the mutual recognition of data obtained from other countries following such guidelines. It has been recommended that in the absence of an effective pesticide registration process and infrastructure for controlling the availibility of pesticides an importing country such as Trinidad and Tobago must depend heavily on the pesticide industry through international associations such as GIFAP to promote the safe and sensible distribution and use of pesticides by working with whatever infrastructure that exist in the country. To this end, FAO is in favour of the development of an internationally agreed 'Code of Conduct in the

Distribution and Use of Pesticides'. It is felt that a Code of Conduct could offer a major contribution to the safe and efficient use of pesticides.

There is much concern in the region with regard to the importation of pesticides that are either banned and or not registered for use in the country of origin. The concern alike. Although one will not that there is a close resemblance in the details of the enabling legislation for Pesticides control for the Territories in the region due in part to the effort of Dr. Gibbs who was attached to the Commonwealth Caribbean Pesticide Control Unit (1972 to 1975) with headquarters in Trinidad, as far as I am aware little effort has been given to harmonize the evaluation of the efficacy of pesticides used in the region. There is need for the establishment of guidelines for the region for pesticide evaluation. It should be noted that local conditions - climate, cultivation practices etc have an important effect on the real efficacy of pesticides and the recommendations made for metropolitan countries may well beway off the mark where we are concerned in the wet tropics.

Ministry of Industry and Commerce - Trade and Commerce Division

Notice to Importers - No. 4 of 1966

Open General Licence

Appendix I

In exercise of the powers conferred on the Competent Authority for the purpose of the Imports and Exports Control Regulations 1941, as continued in force by section 10 of the Trade Ordinance, 1958, as amended by the Trade (Amendment) Ordinance, 1959, and pursuant to the provisions of paragraph (1) of Regulation 3 of the said Regulations, the Competent Authority hereby gives notice that NOTICE TO IMPORTERS No. 3 of 1960: OPEN GENERAL LICENCE dated 5th May, 1960, published in the Royal Gazette of the 7th May, 1960, as amended from time to time, is hereby further amended by the addition of the following items to the Negative List therein contained under Part 11 thereof:-

LIST A

Standard Name	Chemical Name
Phorate	0, 0 diethyl S-(ethylthiomethyl) phosphorodithioate
Dinoseb	4, 6-dinitro-2 sec-butylphenol
DNC or DNOC	2, 4 dinitro-6-methylphenol or dinitrocresol; or 3, 5 dinitro orthocresol
Endothall	Disodium 3, 6-endoxohexahydrophthalate
Calcium Arsenate	Calcium Arsenate
Copper Arsenite	Copper Arsenite
Sodium Arsenite	Sodium Arsenite
Potassium Arsenite	Potassium-Arsenite
Hydrocyanic acid	Hydrocyanic acid, gas, liquid or solution

The chemicals described in List A above may be imported only by:

Research Institutions, and Government Laboratories.

They must be used only under the supervision of qualified scientists with appropriate experience. Records must be kept of use and supplies.

LIST B

Standard Name

Aldrin	Arsentic Trioxide	Dichlorvos (formerly known as DDVP)
Dolnay	Demeton	Demeton Methyl
Demeton S-methyl	Dieldrin	Dimefox
Dimethion	Dimethoate	Dinitro cyclohexyl
Dithion	Endothion	Endrin
EPN	Fluoracetamide	Lead Arsenate
Nicotine	Organo-mercurial compounds	Parathion
Pentachlorphenol	Phenkaptone	Phosdrin
Phosphamidon	Schradan	TEPP
Telodrin	Thiometon	Trithion

With regard to chemicals described in List B above the following conditions shall apply:-

1. The chemicals shall be imported only by Research Institutions: Government Ministries or Departments: Pharmacist and Manufacturers who comply with the conditions set out in 2 to 6.
2. Importers shall keep records of the quantity of any of these chemicals received; and of the quantities sold or used in manufacturing preparations for agricultural use, or for other purposes, and take reasonable steps to safeguard these chemicals from loss of theft.

3. Any importer who sells to a manufacturer complying with the conditions set out in 4 to 6 below shall keep a record of the name and address of the person to whom the toxic chemical was sold.
4. Any manufacturer who uses these chemicals to make preparations for agricultural or horticultural use shall.
   (a) take such steps as are considered necessary by the Medical Officer of Health to protect the health of the workers handling these chemicals;
   (b) label each package of these chemicals or their preparations which he sells with -
      (i) a warning that the material in the package is poisonous;
      (ii) directions for safe use;
      (iii) the name of the toxic chemical included in the preparation;
      (iv) his name and address;
      (v) a warning to keep the package out of the reach of children.
5. An importer or manufacturer who uses these chemicals as pesticides shall -
   (a) take such steps as are recommended by the original manufaturers or by the Medical Officer of Health to protect the health of workers handling and applying the pesticides;
   (b) warn the public who have access to the buildings or areas being treated with the pesticides that such treatment is in progress;
   (c) ensure that no areas are exposed to the pesticides other than the one intended to be treated;

(d) warn the owner of the area treated that any food crops treated should not be harvested until a reasonable time has passed to allow the pesticide residues to decrease to reasonable safe level;

6. No licence to import will be issued for these chemicals to any person or firm other than a Research Institution, a Government Ministry of Department or a Pharmacy, unless the person or firm has agreed to comply with these conditions.

General

Importers of chemicals described in Lists A and B are hereby notified that they are required to inform the PORT AUTHORITY of (i) quantity of chemicals (ii) type of packaging used and name and date of arrival of ship, in respect of each shipment of such chemicals.

This information must be supplied to the PORT AUTHORITY at least three (3) days before the arrival of the ship.

PRESENTATION BY INDUSTRY

Toxicological Classification and Labelling of Pesticides

by Dr. Hugo Penagos, Labelling and Registration Specialist

Dupont Latin America, U.S.A.

Introduction

Agriculture is the cornerstone of development of Latin American countries. Its importance as fundamental resource in the economic and social development of our countries is better understood if we consider that agriculture:

(1) Is the activity that generates the production of basic food crops for the ever growing populations in the Region.

(2) Is the main source of revenue through the export of agricultural commodities in the international markets.

(3) Agriculture is an inexhaustible source of work that gives occupation to the great rural majorities of Latin America.

Modern technology has contributed dramatically to increase yields and production of agricultural crop. One of the key factors that has made this possible is the use of agro-chemicals to protect the crops from the attack of pests, diseases, competition of weeds and other biotic agents that reduce agricultural crop production.

The crop protection process by the use of agrichemicals has created conflicts, basically due to the improper use of these products in the past. One can frequently read in the news media adverse publications to agrichemical industry based on isolated cases of poisoning, many times presented out of proportion.

This is a perpetual topic of discussion that will always subsist as long as the present situation of misunderstanding and lack of communication among the conflicting parties is maintained.

That there are problems, we all acknowledge that.

This concern on the better use of agrichemicals has brought to the negotiating table both Industry and Government to openly discuss existing problems and try to find adequate solutions and reach agreements which could be of benefit to both sides.

In February o- 1979, in San Jose, Costa Rica, a meeting was held between Industry and Government to discuss common problems related to the use of pesticides in Latin America. The meeting called CONSULTATION ON AGRICULTRUAL CHEMICALS was sponsored by the Policy Sciences Center, Inc. of New York in cooperation with the GROUPEMENT INTERNATIONAL DES ASSOCIATIONS NATIONALES DE FABRICANTS DE PESTICIDES (GIFAP) and the Inter-American Institute of Agricultural Sciences (IICA).

This was the first part of a four-stage project. This meeting was intended to define problems rather than solve them, and to accumulate information so that ultimately solutions could be found.

In February of 1981 in Key Biscayne, Florida, a second meeting was held between Industry and Government to further discuss the safe use of pesticides in Latin America.

Between the Costa Rica and key Biscayne meetings, a team of expert consultants undertook research on problems of labelling, application and formulation in Latin America.

This team travelled throughout Latin America interviewing government officials and agrichemical company representatives. The results of their finding along with specific recommendations on the three areas under consideration were published in the document:

IMPROVING THE SAFE USE OF AGRICULTURAL
CHEMICALS IN LATIN AMERICA:
A RESEARCH REPORT ON LABELLING,
APPLICATION AND FORMULATION

by: Harvey L Cromroy
Lawrence O. Roth
Kenneth J. May

The Policy Sciences Center, Inc.
New York, New York

December 22, 1980

In April 1981, a group of chemical companies started talks with government registration officials in Central America, to try to organize a meeting between industry and governments to discuss harmonization in labelling of pesticides.

After several months of negotiation, on September 8-12, 1981, the first meeting on harmonization took place in the island of Contadora in Panama. This meeting, called FIRST JOINT MEETING BETWEEN AGRICHEMICAL COMPANIES AND GOVERNMENT REGISTRATION OFFICIALS ON LABELLING, REGISTRATION AND QUALITY CONTROL IN CENTRAL AMERICA AND PANAMA, was coordinated by the International Regional Organization of Plant Protection (OIRSA) with the IICA delegation attending as observer.

Recommendations were made at the end of the meeting to harmonize the label format for Central America and Panama, based on the model presented to the government delegates.

In March 1982, the III Consultation Meeting on the Safe Use of Pesticides in America and the Caribbean took place in Mexico City. This meeting was organized and sponsored by the Secretariat of Agriculture of Mexico, FAO and IICA.

The final report of this meeting states that "Taking into consideration that the Central American countries and Panama have reconciled criteria on labelling, registration and quality control of pesticides that are marketed and used in said countries, it is considered to be highly feasible to harmonize.

CLASSIFICATION OF PRODUCTS BY TOXICITY AND HAZARD

The safety precautions needed in the use of a product are dictated by its potential hazards, and the hazards are mainly dictated by the mammalian toxicity of the formulated product. Thus, an acceptable system for classification or grading of formulated pesticides by their mammalian toxicity has long been desirable, to form the basis of an internationally acceptable hazard classification scheme.

In 1975, the World Health Organization published a proposed classification system in which the health hazards of a formulated pesticide to its users would be ascribed to one of four categories: Extremely, Highly, Moderately or Slightly Hazardous. The adoption of the WHO Hazard Classification Scheme is strongly advocated by FAO wherever a new or modified scheme of pesticide hazard classification or product registration is being introduced.

Under the WHO system, the hazard category or class into which a formulated product falls is based primarily on its acute oral and dermal toxicity to experimental animals, specifically its acute oral and dermal LD50 values in the rat. However, if toxicological or any other information comes forward at any time signifying a greater or less hazard to users than that based solely on LD50 data in the rat, the product may be ascribed to a higher or lower category of hazard. Similarly, if the product's dermal toxicity is so great as to ascribe it to a higher class of hazard than by its oral toxicity, the higher and more restrictive category of hazard should be adopted.

Table 1.- WHO CLASSIFICATION OF HAZARD ACCORDING TO LD50 VALUES OF FORMULATED PRODUCTS

Class	Acute LD50 for the rat (mg/kg bodyweight)			
	Oral		Dermal	
	Solid	Liquid	Solid	Liquid
Ia Extremely hazardous	5 or less	20 or less	10 or less	40 or less
Ib Highly hazardous	5-50	20-200	10-100	40-400
II Moderately hazardous	50-500	200-2000	100-1000	400-4000
III Slightly hazardous	Over 500	Over 2000	Over 1000	Over 4000

The WHO system is intended for the classification of the acute hazard of finished products, using whenever possible LD50 data from animal studies with the commercial formulation as supplied for use. This is because only animal studies give reliable information on the total toxic effects of the formulation and any interactions occurring between active ingredients, solvents, formulants or other substances present.

Where experimental LD50 data for a product are not available, estimated values will have to be used, and can be calculated from the LD50 values for the unformulated technical grade active ingredients published by WHO and FAO, as follows:

- For a product containing only one active ingredient, the estimated LD50 is given by the formula $\frac{T \times 100}{C}$, where

  T is the acute LD50 of the active ingredient in mg/kg, and C is the % concentration of the active ingredient in the product.

- For a product containing two or more active ingredients, there are two possible methods:

  By Method 1, a mixed formulation's LD50 is calculated as if each of the active ingredients and therefore the total amount present has the same LD50 value as the most toxic of them. For example, the total active ingredients present in a product add up to 34%. The most toxic is that with the lowest oral LD50, say, 68 mg/kg. The product's calculated oral LD50, using the formula above, is $\frac{68 \times 100}{34} = 200$ mg/kg.

  By Method 2, a mixed formulation's acute LD50 is more exactly calculated by using the following formula:

$$\frac{C_A}{T_A} + \frac{C_B}{T_B} + \frac{C_Z}{T_Z} = \ldots\ldots\ldots\ldots = \frac{100}{T_M}$$

  where C = % concentration of A, B, Z, etc., in mixture, T = LD50 of A, B, Z, etc., in mg/kg and T_M = LD50 value of the mixed formulation.

  Such calculation of LD50 is usually permissible in simple cases, such as a proposed increase in concentration of active ingredient in an existing formulation of known LD50 in the rat, or in other cases where there are valid grounds for assuming that a calculated LD50 would not differ much from an LD50 obtained by a biological test. Calculation may however prove significantly in error if used for complex new formulations, so in this or any case of reasonable doubt, every attempt should be made to obtain LD50 data directly from animal studies.

LABELING

Label

What is a label? What is the definition?

One accepted definition with some international support is that proposed by the Council of Europe. "Label" - refers to any printed information that is durably affixed or directly applied to the container. It includes accompanying instructions, containing information that is supplied with the container or pesticide product. A label should possess the appropriate technical qualities in such matters as strength, attachment, durability and resistance to the elements and to the contents of the container or other substances with which it might be expected to come into contact. The size of the label will be determined by the shape and size of the container to which it is affixed or applied.

Label Contents

The product label is intended to tell the purchaser and user

what is in the container
who made or supplied the product and label
any legal responsibilities applying to the product
the restrictions of its use

what biological problems it is to be used for
how it should be prepared, used and stored

what type and degree of hazards it presents
what precautions are needed before, during and after use
what to do if adverse effects occur.

These requirements for information will now be discussed under the three headings of Product Identity, Directions for Use and Hazards and Precautions.

Product Identity

The following factual information concerning the product should be provided on the label:

Trade or commercial name.

Name and main address of distributor/agent responsible for sale of the product in the country concerned.

The names of all active ingredients in the product, using common names approved by the International Standards Association, National Standards Association or the Chemical Society.

The lowest amount which may be present of each of the above active ingredients in the product, expressed as follows:

for solids, viscous liquids, aerosols and volatile liquids; as percentage (%) by weight, or in grams per kilogram

for other liquids; as % by weight, or in grams per litre

for gases; as % by volume.

Identification number of manufacturing lot or batch.

Physical nature of the product.

The net weight or volume of the product in the container.

A phrase stating the category and limitations of use of the product, e.g., FOR USE ONLY AS A HERBICIDE.

A brief statement summarizing the main biological uses of the product, e.g., for pre-emergent control of annual and broad-leaved weeds in cotton.

Any legal responsibilities arising from the purchase or use of the product. Certain products or substances may fall within a national legislation concerned with the control or safe use of hazardous or poisonous materials. The label of such a product should state that, for example, THE REQUIREMENTS OF THE ... APPLY TO THIS PRODUCT, and any labelling requirements of that legislation should be incorporated in the product label.

An expiry date, if it is known that the product may give unsatisfactory results if used as directed by the label after a certain period of time under the storage conditions likely.

The official registration, approval or reference number given to the product, if such procedures exist in the country of sale.

Directions for Use

The label information given under this heading is intended to tell the user how to store, prepare and apply the product properly, so that there is maximum efficiency in use, and minimum risk of technical error.

A statement of the intended uses for the product, listing the crop and pest situations for which use is officially registered or approved, and manufacturer's recommendations not yet officially approved.

Information on recommended dosage rates, methods and timing of applications for the above uses.

Information on compatibility with other products or substances which may be proposed for use with the contents.

Any warnings or contraindications intended to prevent misuse of the product, for example, on the wrong crop varieties, soils, pests, growth stages, weather conditions, etc.

Practical advice on methods of preparing and using the product, for example, opening, measuring, diluting, mixing, agitation, etc.

Warning, where necessary, of the time interval which must be allowed before sowing or planting a repeat or following crop.

Any special recommendations on storage conditions for the container and product.

Hazard and Precaution Information

This vitally important part of the label must warn the purchaser and user of the toxic and other hazards of the product, and what precautions need to be taken in its use.

The first preliminary step must be to classify the product according to its potential hazards. From the results of direct tests using experimental animals, or less satisfactorily by calculations based on the concentrations and published LD50 values of its active ingredients, the toxic hazard of the product should be assessed according to the WHO system.

Having thus assessed and classified all the potential hazards due to the composition of the product, the next step is to assess those which may arise from the proposed methods, purposes and scale of use.

From previous experience or data, knowledge will already exist in commercial and official organizations of the ways in which the proposed sale or uses of such a product may cause risks of unsafe contamination levels. Such risks may involve the users; workers cultivating or harvesting the treated crop; members of the public, especially young children; domestic animals and livestock, including poultry and fish; household pets; humans or farm animals consuming the crop; beneficial species of the area, especially pollinators; germination and growth of following crops; and the wildlife of the local environment - birds, insects, fish, other animals, and plants. All these will need consideration. Toxicological and biological information available on the product, or similar products, or on its old or new active ingredients will usually give warning of any special risks to users, or to particular animals or plants, agricultural, domestic or environmental. Safety or "withholding" intervals necessary before harvesting a crop will be derived from information on residue persistence and dietary toxicity

of the product's active ingredients. Consultation with appropriate experts may be necessary during these evaluations of hazard.

This assembly of technical information and practical experience will enable the appropriate warning symbols, phrases of risk and safety precautions for the product to be decided. At this stage it is very important to make careful reference to what has been required on labels previously issued for similar products or uses, both nationally and in other experienced countries. If this is not done, inconsistent recommendations may at times occur.

Depending on the product's hazard classifications and proposed uses, from one to all five of the label items listed below will be needed to inform users of its hazards and the precautions necessary.

- A Hazard Warning Symbol if the product's toxicity is within WHO classification I, II or III; also a symbol or additional symbol if the product is highly flammable, explosive, corrosive or oxidizing.

- Standard phrases giving Warning of Risk appropriate to any Hazard Warning Symbols required as above.

- Usage Precautions, using standard phrases or part-phrases, for the safety of users and operators: members of the public including children; food consumers; farm and domestic animals; pets; beneficial species; wildlife and the environment.

- Information on Safety Intervals needed before grazing, harvesting, use or consumption of the crop, and before re-entry into or handling of the crop.

- First Aid Advice and Guide to Doctor, giving procedure in case of illness if the dangers of the product make this desirable, as for products in WHO Classification I, II and possibly Class III or occasionally IV. The specialist advice and guidance to be given should be approved or provided by appropriate health authorities.

That completes the list of items of information which may be needed on the label of a conventional ground applied pesticide.

Construction of the Label

Physical Properties

The pesticide label may be defined as any printed information that is firmly fixed or directly applied to the container and any additional

printed instructions that accompany each container or package as purchased.

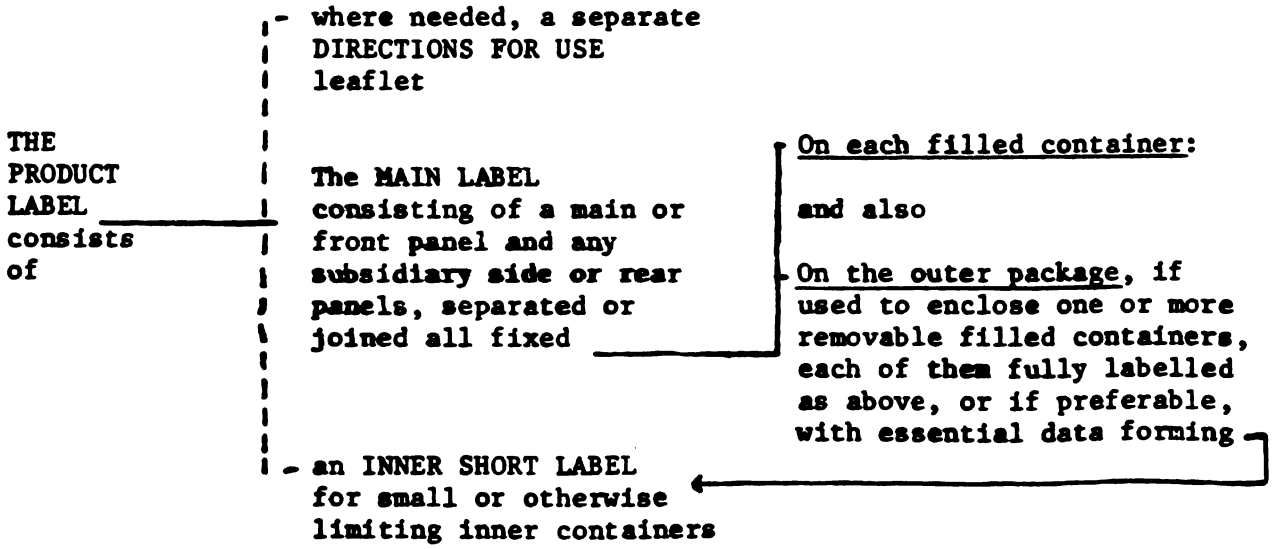
The label should possess the high technical qualities needed in such matters as physical strength, strength of attachment to the container, durability, resistance to the conditions likely to be encountered in transport, storage or use, and to the contents of the container or other substances with which it might be expected to come into contact. These requirements, which apply equally to the print on the label and the material on which the information is printed, are very important, because several years of storage and potential deterioration may elapse between manufacture and final use of the product. Without a complete and legible label a container of pesticide is likely to become a very serious hazard.

Label-approving authorities should therefore not only examine the text and layout of draft labels, but also satisfy themselves on the physical properties of the proposed label or labelled container. The service industries supplying containers, labels and printing requirements are able in most countries to satisfy all physical requirements for the present day label, a service which should be fully utilized in order to prevent the problem of lost or illegible labels.

Label Divisions and Dimensions

It will already be seen that the product label must usually carry a large amount of printed information.

There is also great variety in the sizes and shapes of containers to be labelled, so that considerable flexibility has to be allowed in the format of labelling adopted. The following diagram shows how the label components may be varied to suit circumstances. The label for one product may thus consist of a single panel containing all the required information, or for another product a series of small panels around the container or outer package, with a separate accompanying leaflet.



The dimensions of the main label are dictated chiefly by the area needed to lay out and print all the required information about the product in a clear and legible form. If the surface areas available on the container (or outer package) are not themselves large enough for this, a separate Directions for Use leaflet should be provided.

It should be borne in mind that certain containers (or outer packages) may need to bear additional labels required by regulations on the transport of the product by road, rail, sea or air, for which some space may need to be allowed. Most such containers or outer packages are of large size, and adequate labelling space usually exists for all requirements.

Just as the main label must never be so small that it becomes unreadable or even difficult to read, the label dimensions adopted on a very large container should not be so great as to cause physical difficulties in reading the information.

The dimensions of any Directions for Use leaflet, or Inner Short Label, should be large enough to allow all printed information on them to be clearly legible without difficulty.

Arrangement of Information on Label

A suitable arrangement of information on the product label or its component parts is shown at the end where four different label formats, one for each toxicological category, have been proposed.

The principles adopted are that label positions of greatest prominence should be used for information on the products' composition, uses, hazards and safety precautions and directions for use.

Label Readability and Legibility

For many years, the appeal to pesticide users to "Read the Label" has been a regular feature of campaigns for the safe and effective use of pesticides. It is therefore of interest to consider briefly what is involved by that request. Some of the main factors affecting "readability", meaning those influencing the chance of the label being properly read, are the personal importance and interest of the message to the user; the impact, which should be favorable, of the label's layout, design and colors; the physical location of the label and lines of print relative to the eyes; the choice of the most suitable words, phrases, sentences, and length of label or panel messages; the skills of the translator when used, and of the final editor; the legibility of the print under the range of reading conditions likely; and the visual standards and reading skills of the individual user.

Consideration of the above brings forward the following recommendations:

- The label and its panels should be laid out wherever possible in clearly headed and distinct blocks, making deliberate but not excessive use of color in print or background in order to gain attention.

- Any separate side or rear panels of the main label should be referred to on the main (front) panel, so that their contents are not overlooked.

- All print should be readable horizontally when the container is in its normal standing position (except where a different national typographic method exists).

- The choice of words, phrases and other details of the printed communication should wherever possible be suitable to the less experienced user, and aim at maximum clarity in minimum words.

- The entire label should be printed in one or more official languages of the country or region in which it is to be used. If a container is labelled in two languages, it is preferable that each language has its own complete and separate label.

- All translations should be carefully examined for possible errors in conveying the exact meaning of the words or phrases used in the original label.

High standards should be set for the legibility of printed material, as the label may have to be read under adverse conditions of lighting, or by persons with reduced eyesight or reading ability.

The main recommendations to be made are on print size, choice of type, and color contrast between print and background.

- The size of print to be aimed at is the largest which can be used, accepting as limiting factors the maximum dimensions available for the label area on container or package, the amount of information to be printed on that area and the need to avoid both illegibly small and inconveniently large print.

- To emphasize their importance and to capture attention, certain phrases should be set in capitals and bold (heavy) type (or their local equivalents). These are the Hazard Warning Symbol words (TOXIC, HARMFUL, etc.); the Warning of Risks Phrases; the Limitation of Use phrase; and the headings PRECAUTIONS and DIRECTIONS FOR USE. The main leading words of the standard precautionary phrases selected as Usage Precautions should also be emphasized by the use of capitals.

- The type-face selected should be very clear, and without decorations or oddities. Italic type-face should not be used except for scientific names.

- For products in WHO Hazard Classification I (Extremely Hazardous) special attention should be drawn to the Usage Precautions necessary by enclosing them in a surrounding box.

- Color contrast between print and background, which really means brightness contrast, can be a most valuable means of increasing legibility and impact of a label, or special parts of it, and of maintaining user interest. The most effective, i.e., readable and compelling color contrasts, have been identified as follows:

  Black on yellow
  Green on white
  Red on white
  Blue on white
  White on blue
  Black on white.

  The colors used should be neither too pale nor too solid so that brightness contrast is fully maintained.

Education and Training on Label Instructions

Although authoritative statistics on the worldwide incidence of occupational or non-occupational human poisonings by pesticides do not appear to exist, and there is almost no worthwhile international data on poisoning or other side-effects in farm, domestic or environmental species, such information as exists implies that there are many fatal and very many non-fatal cases of pesticide poisoning of humans and animals every year.

It seems equally certain that while some of the human cases are of deliberate self-poisoning, others truly accidental, and others occupational, all their numbers could be reduced if the recommendations and requirements on the label of pesticide containers were carried out more thoroughly and more frequently, especially those concerned with safe transport and storage of the product, and the prevention and removal of personal contamination at work.

The pesticide user in a developing country is often at a particular disadvantage in comparison with his equivalent in a technologically and educationally more advanced country. No matter how carefully the label is prepared and simplified, it is still a lot of complicated words and statements, not always understood, nor their importance to human safety appreciated.

The small scale user in a developing country may be provided with welcome information on the virtues of the product, but there may be less emphasis on the possible ill-effects of its casual storage or misuse, or on the way he must unfailingly act to prevent them.

Every year, in every country, there are many newcomers to the use of pesticides, who have never previously had the responsibility of their purchase, storage, custody, opening, diluting, closing, application, clearing up and then waiting until the area or crop is safe for normal procedures.

The label tells them, if they can read it or get it read to them, what to do, but not precisely how to do it or why. And yet it does not take a long time, or great knowledge or skills, to explain to a new user or indeed any agriculturalist how to carry out the label's instructions and why.

Undoubtedly, the agricultural advisers and extension officers of most countries have this knowledge at their fingertips and frequently impart it to individual or small groups of agriculturalists. Nevertheless, there remains the need for further improvement and availability of tuition in the safe and effective use of pesticides in most countries. Particular opportunity and need for this probably exists in those developing countries where "reading the label" still does not come so easily as in countries with longer histories of technical and educational development.

It is therefore urged that the agricultural and educational departments of Governments, the agrochemical industry and the international agencies make special and coordinated efforts to plan, prepare and disseminate educational material, be it film, slides, lecture notes, radio or television programs, so that the label is not merely provided and perhaps read, but is explained and better understood by users, so achieving the purpose for which it is intended and compiled: the safe and effective use of the product waiting behind the label.

TOXICOLOGICAL CLASSIFICATION

PROPOSAL

It is hereby proposed to adopt the following toxicological classification, which is based on the World Health Organization and Council of Europe classification.

Class		LD_{50} (Rat) mg/kg body weight			
		Oral		Dermal	
		Solids	Liquids	Solids	Liquids
I.	Extremely hazardous	20 or less	20 or less	10 or less	40 or less
II.	Highly hazardous	21-50	21-200	11-100	40-400
III.	Moderately hazardous	51-500	201-2000	101-1000	401-4000
IV.	Slightly hazardous	Over 500	Over 2000	Over 1000	Over 4000

The terms "solid" and "liquid" refer to the physical state of the product or formulation being classified.

LABELING

PROPOSAL

It is hereby proposed to adopt the standard label format divided in four categories and four colors according to the degree of toxicity (see specimen label attached).

The colors, symbols and precautionary statements for each one of the categories would be the following:

Category	Color	Color Code	Symbol	Precautionary Statement
I	Red	Pantone 199C	Skull & crossbones	Danger-Poison
II	Yellow	Pantone bright yellow	"	Beware-Poison
III	Blue	Pantone 293C	"	Caution
IV	Green	Pantone 347C	"	Caution

READ THE LABEL BEFORE USING THIS PRODUCT

USE PRECAUTIONS

Adequate protection equipment when mixing spray, loading, applying or otherwise handling this product (protective clothing, gloves, rubber boots, respirators, goggles).

FIRST AID

First aid treatment in case of poisoning via:

oral
dermal
inhalation

ANTIDOTES AND MEDICAL TREATMENT

Information on warning symptoms, medical treatment and antidotes.

IN CASE OF POISONING TAKE PATIENT TO A PHYSICIAN AND GIVE HIM A COPY OF THIS LABEL

PROTECTION OF ENVIRONMENT STATEMENT

PRODUCT STORAGE AND HANDLING

NOTICE OF WARRANTY

LOGO OF COMPANY

(Manufacturer-Formulator)

Product Name/Trademark

Common Name

Formulation

Active ingredient ---------- %

Inert ingredients ---------- %

grams active ingredient/L

grams active ingredient/Kg

DANGER  POISON

THIS PRODUCT MAY BE FATAL IF SWALLOWED. POISONOUS IF INHALED.

Do not breathe vapors or spray mist.
Do not get in eyes, on skin, on clothing.

Use with adequate ventilation.
Keep away from heat, sparks and open flame.

KEEP OUT OF REACH OF CHILDREN, DOMESTIC ANIMALS, FOOD AND FEEDSTUFFS

NET CONTENT

Name and address of manufacturer/formulator

Lot No. _____

Formulation Date _____

SPRAY PREPARATION

DIRECTIONS FOR USE

Crop	Pest	Rate	Frequency of application	Pre-harvest Interval
Common & scientific name	Common & scientific name	Metric System	When applied	Interval between last application and harvest

COMPATIBILITY AND PHYTOTOXICITY

Country	Registration No.

Importer _____

Address _____

Red Band (15% of Height of Label)

EXTREMELY TOXIC

Red Band (15% of Height of Label)

READ THE LABEL BEFORE USING THIS PRODUCT

USE PRECAUTIONS

Adequate protection equipment when mixing spray, loading, applying or otherwise handling this product (protective clothing, gloves, rubber boots, respirators, goggles).

FIRST AID

First aid treatment in case of poisoning via:

oral
dermal
inhalation

ANTIDOTES AND MEDICAL TREATMENT

IN CASE OF POISONING TAKE PATIENT TO A PHYSICIAN AND GIVE HIM A COPY OF THIS LABEL

PROTECTION OF ENVIRONMENT STATEMENT

PRODUCT STORAGE AND HANDLING

NOTICE OF WARRANTY

LOGO OF COMPANY

(Manufacturer-Formulator)

Product Name/Trademark

Common Name

Formulation

Active ingredient ---------- %

Inert ingredients ---------- %

grams active ingredient/L

grams active ingredient/Kg

BEWARE  POISON

THIS PRODUCT MAY BE FATAL IF SWALLOWED. POISONOUS IF INHALED

Do not breathe vapors or spray mist.	Use with adequate ventilation.
Do not get in eyes, on skin, on clothing.	Keep away from heat, sparks and open flame.

KEEP OUT OF REACH OF CHILDREN, DOMESTIC ANIMALS, FOOD AND FEEDSTUFFS

NET CONTENT

Name and address of manufacturer/formulator

Lot No. _____

Formulation Date _____

SPRAY PREPARATION

DIRECTIONS FOR USE

Crop	Pest	Rate	Frequency of application	Pre-harvest interval
Common & scientific name	Common & scientific name	Metric System	When applied	Interval between last application and harvest

COMPATIBILITY AND PHYTOTOXICITY

Country Registration No.

Importer _____

Address _____

Yellow Band (15% of Height of Label) HIGHLY TOXIC Yellow Band (15% of Height of Label)

READ THE LABEL BEFORE USING THIS PRODUCT

USE PRECAUTIONS

Adequate protection equipment when mixing spray, loading, applying or otherwise handling this product (protective clothing, gloves, rubber boots, respirators, goggles).

FIRST AID

First aid treatment in case of poisoning via:

oral
dermal
inhalation

ANTIDOTES AND MEDICAL TREATMENT

Information on warning symptoms, medical treatment and antidotes.

IN CASE OF POISONING TAKE PATIENT TO A PHYSICIAN AND GIVE HIM A COPY OF THIS LABEL

PROTECTION OF ENVIRONMENT STATEMENT

PRODUCT STORAGE AND HANDLING

NOTICE OF WARRANTY

LOGO OF COMPANY

(Manufacturer-Formulator)

Product Name/Trademark

Common Name

Formulation

Active ingredient ---------- %

Inert ingredients ---------- %

grams active ingredient/L

grams active ingredient/Kg

CAUTION

KEEP OUT OF REACH OF CHILDREN, DOMESTIC ANIMALS, FOOD AND FEEDSTUFFS

NET CONTENT

Name and address of manufacturer/formulator

Lot No. _____

Formulation Date _____

SPRAY PREPARATION

DIRECTIONS FOR USE

Crop	Pest	Rate	Frequency of Application	Pre-harvest Interval
Common & scientific name	Common & scientific name	Metric System	When applied	Interval between last application and harvest

COMPATIBILITY

Country Registration No.

Importer _____

Address _____

Blue Band (15% of Height of Label) MODERATELY TOXIC Blue Band (15% of Height of Label)

READ THE LABEL BEFORE USING THIS PRODUCT

USE PRECAUTIONS

Adequate protection equipment when mixing spray, loading, applying or otherwise handling this product (protective clothing, gloves, rubber boots, respirators, goggles).

FIRST AID

First aid treatment in case of poisoning via:

oral
dermal
inhalation

ANTIDOTES AND MEDICAL TREATMENT

Information on warning symptoms, medical treatment and antidotes.

IN CASE OF POISONING TAKE PATIENT TO A PHYSICIAN AND GIVE HIM A COPY OF THIS LABEL

PROTECTION OF ENVIRONMENT STATEMENT

PRODUCT STORAGE AND HANDLING

NOTICE OF WARRANTY

LOGO OF COMPANY

(Manufacturer-Formulator)

Product Name/Trademark

Common Name

Formulation

Active ingredient ---------- %

Inert ingredients ---------- %

grams active ingredient/L

grams active ingredient/Kg

CAUTION

KEEP OUT OF REACH OF CHILDREN, DOMESTIC ANIMALS, FOOD AND FEEDSTUFFS

NET CONTENT

Name and address of manufacturer/formulator

Lot No. _____

Formulation Date _____

SPRAY PREPARATION

DIRECTIONS FOR USE

Crop	Pest	Rate	Frequency of application	Pre-harvest Interval
Common & scientific name	Common & scientific name	Metric System	When Applied	Interval between last application and harvest

COMPATIBILITY

Country Registration No.

Importer _____

Address _____

Green Band (15% of Height of Label)

SLIGHTLY TOXIC

Green Band (15% of Height of Label)

Note

This presentation is based on the paper "Guidelines on Good Labeling Practice for Pesticides", prepared by Mr. Eric Edson, at the request of the Plant Protection Service of FAO, and presented as Background Paper 13 at the II Government Consultation on International Harmonization of Pesticide Registration Requirements, Rome, October 11-15, 1983.

Pesticide Research and Development prior to Registration and Marketing in country of Origin by Dr. Lidio Parra, Product Manager, Monsanto Agricultural Products Company, U.S.A.

1. Introduction

This meeting between the government official responsible for the registration and the adequate use of pesticides of the Caribbean countries and the Agricultural Chemical Industry under the coordination of the Inter-American Institute for Cooperation on Agriculture (IICA) is of great importance because it is consistent with the mandate set forth in the third consultation meeting of the Latin American and the Caribbean countries held in Mexico in March, 1982, and the guidelines set by FAO and the World Health Organization (WHO) for the harmonization of the registration requirements uniform label of the Agrochemicals for the world.

Besides, it is the continuation of the harmonization process in the western hemisphere which started with Central American countries, meeting held in Contadora, Panama (Sept. 1981), Andean region in Cartagena, Colombia (August, 1982), Mexico, Central America and Dominican Republic (April, 1983).

At the present time, there are 13 countries (Mexico, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Dominican Republic, Bolivia, Colombia, Ecuador, Peru and Venezuela) under the agreement of the harmonization of pesticides registration requirements, uniform label and property right of the data.

The Importance of Agriculture

It is very important to increase agricultural production because of its impact on public, social and economic well-being in the Caribbean region.

The caricom countries and Haiti have a geographicalarea of 299.460 km^2, (Guyana having 72% of the total area) with a population of 10.5 million. Eighty-two percent (82%) of the people live in three countries: Haiti (52%), Jamaica (20%) and Trinidad and Tobago (10%).

By 1990, the population of the region according to estimates, will reach 13,885,000 with a growing rate of 1.8% over 1980 level. This means that agricultural production must increase to such an extent, not only to meet growing demand for food in the region, but to increase agricultural exports too. Agriculture must be efficient so it can compete with the other part of the world, and at the same time, profitable so that it will prevent an exodus of the rural population to other countries looking for a better living conditions.

Foreign Trade

With the exception of Trinidad and Tobago in which the main product for export is oil, the rest of the Caribbean countries are reliable in agriculture exports for the main source of revenues to pay for the government expenditures which are needed. Agricultural products to establish an Agro-industry in the region is needed also.

National Security

Now more than ever, the nutritional dependence of the Caribbean countries on industrialized nations constitutes a threat to the national security.

Agriculture is a responsibility of everyone.

A. The Industry's Social Responsibility

Development of new technologies for the production of agricultural chemicals, considering:

1. Product efficiency, i.e., production of more economical and effective products giving farmers an adequate return on their investment and an incentive to increase productivity.
2. Chemicals which do not jeopardize the health of individuals, fauna and the environment.

But research and development of agricultural chemicals with those properties is very costly requiring large human as well as financial resources. Therefore, the chemical industry must be profitable in order to continue developing new technologies contributing to the resolution of problems relating to future worldwide food shortages.

B. Educational Responsibilities

1. Universities are required to educate future agricultural engineers in the correct application of agricultural chemicals.
2. They must find more efficient pest control methods posing minimum risk to the health of humans, fauna and the environment.
3. They must disclose their findings to the community.

C. Government Responsibilities

The primary objective of the Ministry of Agriculture is to plan, direct and implement agricultural development policy providing large-scale food production to meet the demand of an ever-growing population.

One of the most important factors involved in agricultural production relates to the use of pesticides. Government must provide farmers with safe and effective products at the proper time of their application, so they must dictate control measures.

Control over import, production, formulation, transportation and use of agricultural chemicals within the various territorial boundaries. Such laws or regulations must be so designed as to guarantee suitable and effective use of pesticides without risk to personal and environmental health.

D. Joint Government and Industry Responsibilities

Elimination of potential dangers caused by registration of pirate products under the assumption that they are toxicologically identical to bona fide products.

Development of training programs for farm workers and farmers in the correct and safe usage of pesticides.

Development of national safe pesticide handling programs. Such programs must include training from regional supervisors from the Health and Agriculture Ministries on down to the regional authorities in charge of national law enforcement.

Maintenance of a dialogue between industry and governments involving subjects of mutual interest.

II. The Chemical Industry

A. Introduction

The decision by a company to undertake production of agricultural chemical raw materials implies that the company shall have to make substantial investments in human and financial resources with the inherent risk of failing.

Before such a decision is made, the company must make an indepth study of the chemical industry in general. At present there are no more than 20 to 30 companies worldwide dedicated to the development and production of pesticides. This number will tend to decrease in the 1980's. A very important factor in making such a business profitable is the setting of goals from technical as well as marketing standpoints. Selected goals must consider such basic criteria as:

1. That the product will resolve technical problems of great significance to agricultural output, that it must have market potential and as such make its research and development a viable undertaking. That is why research is most commonly concentrated on major acreage crops such as: sugarcane, corn, soybeans, rice. etc.

2. That the problem is difficult to resolve and that its solution can only be found through research requiring vast investment but capable of producing benefits since the ag. chemicals' business is highly competitive.
3. That the process is a lenghty one spanning 20 years or more, seven of which are dedicated to meeting the registration requirements necessary before the product can be marketed. That it takes between ten and thirteen years to recover the investment and for the product to generate sufficient profit for reinvestment in the development of new products.
4. That the chemical aside from resolving farmers' problems must be sufficiently economical to make its use profitable. (The price of the product must be such as to guarantee a profit to its manufacturer and economy for its user).

As a point of reference, in 1950 the pesticides' manufacturing industry identified the problem causing grassy weeds in annual crops like corn, sorghum and wheat since broadleaf weeds were being controlled with phenoxyacetic acid (2-4D) base herbicides followed by new chemical formula herbicides such as those based on acentanilides. Thirty years later the grassy weed problem still exists but with a solution in sight.

B. Pesticide Synthesis, Development and Marketing

Once the problem is identified, the potential manufacturer resolves to find a solution, in our case that of developing a new pesticide. The development of a commercial pesticide is an extremely onerous process requiring intervention by a vast number of trained professionals.

Following product synthesis, it may take between 7 and 10 years until that product is marketed at a total cost of US$100 million, including manufacture.

1. Synthesis: Two methods are adopted in the majority of cases:

   a) Random methods: Different industrial process compounds are tested to determine whether they produce some biological activity;

   b) Direct synthesis: If a chemical compound with certain phytotoxic activity is discovered the Organic Chemicals Dept. synthesizes compounds derived from that structure.

   The opportunities for obtaining such activity increases substantially since efforts have been targeted to that end.

   Despite scientific advances and development of 15,000 chemical compounds synthesized and tested only one marketable herbicide may emerge. There has been a case in which a company tested more than 90,000 chemical compounds to produce only 1 commercial herbicide. All costs involved in synthesis must be offset by that one product. At present the cost of synthesising a single compound is US$1,500. There are enterprises in the industry which synthesize between 500 and 1000 chemicals a year at a cost of between 750.0k and 1.5 million dollars.

2. Product Research and Development

   After a product is synthesized and evaluated biologically, its acute toxicity must be determined in order to protect the health of the company's workers.

Once the lethal dosis has been determined and its dermal absorption established it must be verified that phytotoxic action prevents weed germination (pre-emergence action) or that it is effective as a post-emergence weed control agent. It must also be determined whether or not the product is a selective weed control agent i.e. whether or not it controls a determined group of weeds (grasses or broadleaf weeds).

Another determination requiring verification is the rate of application at which a herbicide controls weeds capable of damaging the world's most vital crops. This information also serves as a preliminary market evaluation tool.

After completion of those processes, a patent application is filed in manufacturer's country of origin. But even then tests continue. The product is tested in greenhouses in order to determine such factors as soil types, temperatures, application methods weed development stages, etc. capable of restricting the product's efficiency.

This is the point at which comparison tests begin to compare the newly developed product's efficiency with the performance of competitive products already on the market and an analysis is made of the new product's advantages and disadvantages. At the same time the product is tested in combination with other agricultural chemicals in order to determine its compatibility. Of each 10 products reaching this stage, 9 are discarded.

Till now all experiments have been conducted in laboratories and greenhouses. But in order to determine the true commercial potential it is necessary to formulate a laboratories and greenhouses. But in order to determine the true commercial potential it is necessary to formulate a large volume of the herbicide for extensive field tests covering a broad spectrum of conditions crops need for growth.

In addition one needs a highly trained team of experts to insure that product formulation is simple and economical. It is necessary to test a large number of inter ingredients, solvents, emulsifiers and surfactants and furthermore all of those chemicals must be approved for use by the regulatory agency in the country of origin, by the Environmental Protection Agency in the case of the United States. Another factor to be taken into consideration is that just because a chemical product can be synthesized on very limited scale this does not mean that it can be produced in industrial volumes. Formulation teams must determine the shelf life of a product, the application method most innocuous to its users and raw material availability.

Most efficient application rates and times are determined on the basis of field tests. The majority of field tests are conducted in collaboration with university schools of agriculture and Agriculture Extension services.

The cost of research and development for one agricultural product can reach as high as 30 million dollars.

3. Marketing Decision: Before a decision is reached, New Products Managements or Committees must answer long list of questions such as: Size or market, is the new herbicide beneficial to farmers and its producers, plant characteristics and capacity, are raw materials readily available and what process residues may be deposited in water sources, and/or released into the atmosphere?

   Once the majority of these questions are answer positively, a decision is made as to whether or not the product should be produced on commercial scale.

   The agricultural chemical faces its most critical test when its toxicology level and its impact on the environment is studied.

4. Toxicology and Environmental Safety

   The quest for a good product is a minor part of the entire research task needed for the development of a herbicide.

   The most important and costly part is meeting all of the requirements stipulated for pesticide registration. Determination of its toxicity, more specifically, determination of the harm a herbicide may cause living tissue, requires between 20 and 40 separate toxicology tests before an agricultural chemical can be used at a minimum risk to human and environmental health. Thos studies may take up to 5 years from determination of lethal dosis to 3 generation laboratory animal tests. Acute toxicity studies serve as a basis for the determination of the lethal dosis and chronic toxicity studies serve to determine the potential risk to human and animal

health caused by continuous use of the product over a relatively long period of time. Other studies are conducted to identify possible genetic changes or negative effects on the reproductive capabilities of the species and if the agricultural product is a carcinogen.

Toxicology studies are conducted in combination with tests to determine the herbicide's environmental behaviour, i.e. whether or not it leaves residues in the soil, air and water or whether it decomposes and disappears into the atmosphere by action of atmospheric temperatures, light, chemical decomposition or whether it is degraded by soil micro-organisms. Those tests are supplemented with plant and animal metabolism studies whereby product metabolites and their residues in food products are determined.

Biochemistry centers must update analysis methodology, procedures and precision instruments in order to determine parts per million and to comply with stringent herbicide registration legislation.

The total cost of those studies amounts to some 140 men/year or approximately US$14 million dollars and those costs increase yearly since they involve highly specialized and qualified personnel. In 1970, research expenses to develop a chemical compound exceeded those required for its marketing and registration but in 1982, research costs are half of those expended to market and register a herbicide.

Accompanying the scientific studies a company's engineering department begins to design plant structure and manufacturing processes. With the current cost of inputs, environmental protection measures a plant may require an investment of between 40 and 50 million dollars, depending on the product.

5. Application for Registration

All field test, toxicology, metabolism and residue research data are compiled and detailed in a document to be submitted for application of product registration to the regulatory agency of the government in country of product origin. Applications may differ in content but they may consist of several hundred pages in fact up to 160 volumes making a 4 meter high stack of papers. When registration application is processed in country of origin manufacturers begin the process in other countries as well.

Once it is determined that the product will be approved for registration in country of origin, the product is tested to determine its efficiency in crops under conditions prevailing in other countries of the world. Such studies may be conducted in cooperation with local universities or Agriculture Departments or under supervision by the agency in charge of pesticide registration. Data so obtained plus results of experiments conducted in other countries (backup material) together with toxicology, metabolism and residue potential studies' records are presented to the authorities of each country in which manufacturer intends to market the product

No approval is given until all question relating to product, human, fauna and environmental health are answered satisfactorily by agricultural products' manufacturers.

Currently, it takes between 8 and 10 years, at a cost of between 30 and 35 million dollars from product discovery until registration, depending on the nature of the product involved. Pesticide patents are valid for a period of 17 years from the date it is filed and the first 10 years are lost in the development and registration processes.

The copious information compiled as of product discovery to product registration encompassing analysis methodology, residue, toxicology determination and manufacturing process data are confidential and the property of the company which has invested from 5 to 7 years in research and development at an approximate cost of 30 to 35 million dollars to achieve no more than the initial registration of a pesticide. Added there are from 2 to 3 years between registration application and approval at which time the product can be marketed. A company can spend from 20 to 25 years between problem identification and solution. Therefore, in recent years very few companies have been able to afford discovery and development of new pesticides. In the area of herbicides, Dupont discovered and developed urea, CIBA-Geigy triazines, Monsanto acetanilides, etc. Each discovery and development of those compounds has contributed considerably to the development of agricultural chemistry and production of fiber and food worldwide.

III. Ownership of the data compiled between Product Discovery and Registration

The pesticide legislation enacted since 1973 has progressed substantially in some Caribbean countries over recent years, but there are still certain points which have not been given the attention they deserve. One of these is the confidentiality and property right of the information supplied in order to meet pesticide registration requirements. The confidentiality of these data has been covered by legislation governing pesticides in Japan, Canada, Western Europe and the United States, further adoption has been proposed by such world organizations such as the FAO, WHO, etc.

The position of the agricultural chemicals industry is that ownership of information furnished for pesticide registration purposes must be treated by the respective governments of Caribbean basin countries under two fundamental but interrelated aspects, namely:

1. Data proprietorship: The industry considers that confidential information supplied for the above mentioned purpose is the exclusive lifetime property of the company which developed it at considerable investments in human and financial resources and that under no circumstances should such provision be interpreted as assignment of that information to the government agency in charge of chemical product registration. This information of great commercial value may not be used by third parties for registration of products they may make and which are similar in chemical structure or toxicology properties or pest control effectiveness. This would create unfair competition as such individuals would not have to invest in product research and development. They would not have to prove that the

agricultural chemical is safe and as such does not pose human or environmental health hazards, nor would they have to invest in pesticide-manufacturing technology.

Thus in order to continue developing new technologies for pesticide manufacture, the industry must be confident that the data they supply for product registration purposes, shall not be used by third parties to register competitive products.

2. Confidentiality: The confidentiality of the information supplied must be maintained for an indefinite period of time, prohibiting its use or disclosure for obtainment of other registrations unless such use or disclosure is authorized expressly and in writing by the proprietor of such information.

   If the information is not given suitable protection, agricultural products manufacturers shall not have the necessary confidence to introduce and register new technologies in a given country because such information may be used by third parties to register their products in that country and elsewhere in the world.

Industry Recommendations

A. Confidentiality and Property Rights of the Data

The chemical industry wishes to propose for the consideration of the Caribbean region governments that an updated version of the law governing pesticides include the following clauses:

1. Information and documents submitted for product registration purposes should be considered the exclusive and sole property of applicants. This being the case, such information may not be utilized or applied for registration of similar products by other manufacturers, who in these circumstances are required to meet the requirements set forth for registration of a different product.
2. Prevention of access by third parties to data considered to be of restricted use by product registration applicants, as such data shall only be furnished with express and written authorization from their proprietor.

   The preceding clauses shall not limit the freedom by agencies of the area's governments to utilize such information for quality control purposes and to preserve human and animal health; or to protect the environment in consonance with respective laws and regulations.

Summary

The development of a commercial pesticide is lengthy and costly process. Research and development may take up to 10 years at a cost of between 30 and 35 million dollars. If costs involved in product marketing and manufacture are added, the cost of the product may increase as high as 100 million dollars.

Another important element is the patent. All commercial agricultural products are covered by a 17 year patent, but if one considers that from the time the patent is granted and that research and development may take up to 10 years, the patent's validity is reduced to less than half.

Consequently, we need to protect the information supplied for registration of our products to enable us to recover our investment and to be able to continue discovering new pesticide technologies more efficient in their agricultural applications and safe for humans, animals, and the environment.

Moreover, usury countries benefit from the existence of responsible agricultural chemicals manufacture as follows: There would be a sufficient availability of high-quality pesticides whenever needed, educational programs teaching users how to apply agricultural products safely and effectively, campaigns to combat product falsification, and the creation of employment opportunities for university-trained professionals

Abstract

The nations of Latin America and the Caribbean are assuming a world leadership role by conducting regional Consultations on the international harmonization of pesticide registration requirements under the auspices of IICA. The concept for harmonization and the attending guidelines for registration requirements were established by FAO in 1977 and finalized in 1982 in international Consultations. Implementations of the concept and guideline requirements are being encouraged by GIFAP, the international Association of agrochemical industries. The establishment of reasonable and enforceable regulations for the registration, labeling, and use of plant protection chemicals in developing countries is prerequisite to providing the authoratative basis needed to meaningfully carry safety considerations into the 1980's for such matters as tolerances, worker reentry intervals, training in its various dimensions, and information exchange among governments and with industry.

Abstract of paper by Dr. William Hollis, Director of Scientific Affairs, National Agricultural Chemicals Association, Washington D.C. U.S.A.

Agrichemical Safety into the 1980's

by Dr. William L. Hollis, Director of Scientific Affairs

National Agricultural Chemicals Association, U.S.A.

I feel especially honored to be given the opportunity to address the distinguished members of the Society for Plant Protection in the Caribbean. The Society, according to its objectives, is a very well-conceived and most essential organization for communicating and coordinating the fundamentals of safe and judicious plant protection measures throughout the Caribbean. I predict an enhancement in the importance of the already responsible role of the Society in light of the international event taking place here later this week. I am encouraged, as I hope you will be, that in this event we will see the establishment of a sound footing on which to build and meaningfully implement safety programs in the Caribbean.

Before elaborating on this event and its implications, may I first describe the organization I represent here today, GIFAP. GIFAP is a French acronym for the International Group of National Associations of Agrochemical Manufacturers. GIFAP represents twenty-five national Associations which in this hemisphere include Canada, the United States, Mexico, Brazil, and Argentina. Member national Associations of GIFAP have common objectives--to promote crop protection by appropriate use of agrochemicals worldwide and to ensure that the properties and application of these products are in conformity with the needs of agriculture and

society, i.e. optimal food and fiber production with minimal hazards for man, animal and environment.

To achieve this, some of GIFAP's aims are:

— To promote the safe and sensible manufacture, handling, packing and transport of agrochemicals by setting, and recommending high standards, in conformity with international acceptable rules.

— To promote the safe and sensible application of agrochemicals, in conformity with national and international standards and regulations for the protection of the user, the environment and the consumer.

— To promote harmonization of national and international legislation and regulations concerning control, testing and approval of agrochemicals.

The international interests of national Associations, such as the National Agricultural Chemicals Association, are manifested through GIFAP which is recognized by international bodies such as IICA, agencies of the United Nations, etc. Although my full-time position is as a staff member of the NACA, I am here today as the acting GIFAP staff representative for the Latin American Working Group.

To understand the objective and potential implications of the international event I mentioned, requires some background so that it may be put into its proper perspective relative to the theme of this meeting and the subject of my presentation.

Aside from those also used for disease vector control, agrichemicals have the singular purpose of assuring the adequate production of safe wholesome food at a reasonable cost to the consumer.

One of the most fundamental characteristics of agriculture anywhere is the ubiquitous presence of economic pests in a wide variety of species that survive on and thereby destroy, damage, and/or despoil the same food source destined for human consumption.

Farmers are universally faced with the same problem--pest control. Because of the universality of the need for plant protection, new control strategies, including synthetic organic chemicals as they evolved, came into wide use being adapted to local conditions.

It is established that the value of plant protection chemicals is in accordance with their toxicological characteristics and is the fundamental reason why they are regulated. Industry supports the institution and enforcement of sound regulations.

It is also established that when plant protection chemicals are used properly, as the scientific data developed by a company for registration directs, there is little likelihood of causing human or environmental harm. A rather elaborate science-based regulatory system has evolved in the developed countries that attends to this important condition. The system wisely includes requirements for continuous assessment of the effects in the field of a product whose uses are regulated.

Recognizing the universal need for plant protection chemicals and that not all nations have equivalent regulatory control measures, the UN Food and Agriculture Organization (FAO), in Consultations held in Rome in 1977 and 1982, encouraged the concept of international harmonization of pesticide registration requirements and established all-inclusive guidelines for this purpose. GIFAP was represented at these Consultations and endorsed the Reports.

There is no question that there are benefits to be derived by governments, farmers, consumers, and industry by the institution of sound agrichemical regulations as set forth in the FAO Reports and guidelines. Meanwhile, the benefits of the FAO proposals remain latent in the absence of some initiative for governments to implement them. GIFAP recognized this and further recognized that industry is the common denominator in this equation and the party best able to provide the initiative.

Consequently, GIFAP took the opportunity in 1979 to enter into discussions with some governments of Latin America through a Consultative forum managed and directed by a neutral organization, the Policy Sciences Center, Inc. (PSC). The issues considered were the safe use of agrichemicals in terms of labeling, formulation, and application. A team of three consultants, two from academia, was employed by the Center and approved by AID to visit the Latin American governments and prepare a report of the status of the issues at hand. The governments and industry prepared summary reports on their position and recommendations which are assembled in the PSC document "Background Information, Meeting of February 25-27, 1981." (A copy of this document is available from NACA on request.) The genesis for harmonization efforts in Latin America may be seen in these reports.

The final Consultation was held in February 25-27, 1981, in Key Biscayne, and a report issued (available from NACA). The industry, in complying with a voluntary commitment made to provide safety information for formulators, issued "Guidelines for the Safe Handling of Pesticides During Their Formulation, Packing, Storage, and Transport." It has been well-received as a useful document. We can expect to see some of the

recommended safety practices being instituted as regulations by some governments.

The Mexican government, in applauding the efforts of the Key Biscayne Consultation, took the initiative to hold a "Consultation on the Proper Use of Pesticides in America and the Caribbean" in Mexico City, March 1982. (The report by this title is available from NACA.)

The Mexico City hemispheric Consultation, attested to the essentiality of agrichemicals in food production, as well as attending problems that need attention. It identified the benefits that would accrue through the harmonization of requirements for registration, labeling, and use. In follow-up, The International Institute for Cooperation on Agriculture (IICA) conducted two successful harmonization Consultations. The first in Cartagena, Colombia, August 1982, included representation from Ministries of Agriculture and Ministries of Health. This Consultation included the Andean countries of Bolivia, Colombia, Ecuador, Peru, and Venezuela. The second Consultation, held in San Jose, Costa Rica, April 1983, included the nations of Mexico, Honduras, El Salvador, Nicaragua, Guatemala, Costa Rica, Panama, and the Dominican Republic.

This unprecedented pioneering venture in international affairs is continuing this week here in Trinidad with twelve nations participating. A final international Consultation will take place later this month in Santiago, Chile, with the nations of Argentina, Brazil, Chile, Paraguay, and Uruguay participating. All of this is of course taking place under the auspices of IICA.

We fervently hope that the Port-of-Spain and Santiago Consultations will be in keeping with the reports of the Cartagena and San Jose Consultations, thereby demonstrating to the other nations of the world

unparalleled international leadership by the nations of Latin America and the Caribbean on a matter of world importance.

GIFAP and its member Associations are sincerely encouraged by these progressive and enlightened government moves toward the orderly regulation of agrichemicals. We see these events as positive steps toward resolving some of the problems for which we all share concern while maintaining the supply and use of these essential plant protection products needed to assure food production.

In looking at some specifics attending these events relative to safety into the 1980's, one of the needs addressed by the FAO guidelines are some means of correcting misuse. Misuse and its attending human and environmental effects do occur, especially in situations of inadequate registration requirements and procedures as they may limit regulatory control. Misuse and its effects are always a matter of concern to our industry and is a main reason we are a proponent of sound and enforceable regulations.

Developing countries who must import plant protection chemicals and who do not have a plausible regulatory system and basic registration requirements in place are occasionally vulnerable to foreign counterfeiters who fabricate look-a-like agrichemicals in small facilities without quality control. They usually can provide no toxicology data of their own, usually no evidence of efficacy, and an establishment number or identification for recourse by users may not be available. They may market at attractive cut-rate prices directly or through some exporter who may or may not be interested in following recognized channels of commerce. Labeling, in some such cases would not signal the dangers associated with the toxic contaminants that occur in the absence of

quality control. It is possible that labels as well as containers may be counterfeits of those of an established company. Established companies intend to stay in business for years and comply with all regulatory requirements. As such, they and their labels are always visible in the marketplace. Developing countries must have the means to evaluate the source and quality of the plant protection products they import as one primary means of overcoming inadvertent misuse.

Industry believes that, while education and training are the mainstays of achieving safety, meaningful and lasting success of these activities will come only after a sound regulatory foundation is established nationally for the registration, labeling, and use of plant protection chemicals.

There is one additional prerequisite, which is clearly noted in the FAO Harmonization Report. That is the need for governments to provide protection for the proprietary rights of a company's scientific data that it must generate and provide to government authorities as a requirement for registration. The significance of this protection is that it offers the opportunity for a company to establish a technical presence in an area or region that can work directly with the government authorities as well as the agricultural science institutions and user communities in the interest of the proper and safe use of a product.

A paramount benefit of these Consultations is the involvement of government policy makers in a setting whereby matters concerning safety are acknowledged and considerations in a government management sense, can be established or otherwise strengthened authoritatively in existing institutions and regulatory agencies. The follow-up of these Consultations is enactment of legislation, if needed, or the establishment of

appropriate regulations or the re-emphasis of national commitments to matters concerning the safe and judicious use of agrichemicals.

By adding the element of governmental authority to training for the safe and proper use of plant protection chemicals within each nation, as is called for in the Consultation Reports, we believe that outstanding programs such as, for example, the Agromedical Approach to Pesticide Management can become more focused in its application and it or its substance may even be mandated.

Established companies doing business in the Caribbean are a resource for valuable safety information and training programs, especially for their products, that national authorities should not hesitate to contact and work with. A copy of the GIFAP Directory of member Associations and their member companies is available from GIFAP, Avenue Hamoir 12, 1180 Brussels, Belgium.

A new training item I would like to share with you is called Project TEACH. It is a training program for teachers of migrant children in the U.S. and is in the final pilot test stage.

Curriculum units have been prepared for teaching migrant children from pre-kindergarten through kindergarten age and may be used for grade school children as well. It's purpose is to teach correct information concerning pesticides, the benefits and hazards. In my opinion, there are adults who could also benefit from the curriculum units that have been prepared. There are fifteen hands-on-visuals that can be used by students. The Pennsylvania State Department of Education administers Project TEACH, which is funded by the U.S. Department of Education, Office of Migrant Education. (A copy of the curriculum units and visuals

are available from Mr. James Sheffer, Project Director TEACH, PA Dept. of Education, 333 Market St., Harrisburg, PA 17108.

I am passing the information I have just mentioned to you to GIFAP. Meanwhile, those of us at NACA who have been briefed and have read the material are much impressed with the excellence of what has been prepared and its potential to be widely useful. If I may, I would very much like to encourage those of you who are in a position to utilize such a training program to contact Mr. Sheffer.

Information exchange as a beneficial activity will move ahead in the 1980's. Information exchange among national authorities and especially with GIFAP becomes more plausible and meaningful in the presence of established registration requirements and regulations. Companies do practice product stewardship in many ways in addition to complying with registration requirements and regulations. Information on these practices are best obtained from companies directly.

GIFAP has published and circulated "Guidelines for the Safe Handling of Pesticides During Their Formulation, Packing, Storage, and Transport. A new publication, about to be released, is titled "Guidelines for the Safe and Effective Use of Pesticides." These should be available in the near future from companies doing business in the Caribbean.

GIFAP has also published a technical monograph (No.8) on "Guidelines on Good Analytical Practice in Residue Analysis and Recommendations for Methods of Analysis for Pesticide Residues." These guidelines have been elaborated by the Codex Committee on Pesticide Residues through its Working Group on Methods of Analysis. It is stated in the forward that, "The guidelines are intended to assist in upgrading the reliability of analytical results in checking compliance with maximum residue limits or

tolerances of foods moving in international trade. This is thought to be essential in protecting the health of consumers and in facilitating international trade." This document alludes to the fact that all nations or groups of nations working cooperatively should have a laboratory and analytical competence in residue analysis to provide assurance that the registered uses of plant protection chemicals are in accordance with label instructions for crop/site use and dosage and preharvest interval observance. This is to help assure compliance with tolerances for the sake of local consumers as well as observing the MRLs of an importing country receiving local production. It can be an economic hardship for exported food, such as a load of bananas to be rejected by an importing country because of excessive residues or a residue of a compound for which there is no tolerance.

Safety, as it pertains to the conditions and observance of tolerances is expertly handled by the Codex Committee on Pesticide Residues (CCPR). The Committee also includes Working Groups in other aspects of safety that have value to developing countries. Safety into the 1980's is well underway in this area of interest. I would strongly recommend that your government authorities consider how the community of Caribbean nations individually and/or collectively can arrange for representation on the Committee. It is open to all national governments. Dr. Pieters of the Ministry of Public Health and Environmental Hygiene of the Netherlands is the Committee Chairman. The next meeting of the CCPR will be held in The Hague this coming October. I have left a copy of the provisional agenda as received from GIFAP with Dr. Brathwaite for your information.

I would mention the matter of reentry times as a means to help assure that the workplace is safe for workers; in this case field work

requiring hand labor in the presence of dislogeable residues of a plant protection chemical that can be dermally absorbed. As developing nations institute registration requirements, the matter of reentry intervals, where needed, is given consideration on the label.

The matter was given widespread consideration in the early 70's in the U.S. There were four OSHA hearings with an administrative law judge presiding, and thirteen EPA hearings across the country. Approximately one-thousand written statements were submitted. EPA then issued rules and reentry times in 1974 that continue today having demonstrated their appropriateness. (A copy of the Federal Register notice for these standards has been given to Dr. Brathwaite for information.) Draft guidelines for determining reentry intervals have been in existence for some time and may be finalized by EPA this year.

I should say that too often worker reentry matters are confused with the misuse of pesticides. For instance, spraying in the vicinity of field workers so that there may be the chance for exposure is not a reentry situation; that is an applicator misuse situation.

A matter for special consideration concerns the subsistence farmer. We believe that the regulations now being harmonized in developing countries will better serve his situation to the extent that the small amounts of agrichemical he may obtain are in accordance with his needs and are of high quality and not contaminated with toxic byproducts. His need for information on the safe and effective use of agrichemicals is perhaps best met with pictorial language, which is already provided by some governments and industry associations. Nevertheless, a wider effort is needed and is the subject of a World Bank project. GIFAP and its

member Associations will be cooperating with the World Bank in the distribution of these pictorial safety pamphlets when they are prepared.

GIFAP is also pleased to be cooperating with the Pan American Health Organization (PAHO), including the review by industry of the WHO Pesticide Data Sheets for some forty-six products for updating as needed. These will be sent by PAHO to all the governments in Latin America and the Caribbean. We fully support this effort of information exchange because the comprehensive compendium of information on each compound should be available to regulatory authorities in each country for their information and decision-making as needed.

Pesticide safety into the 1980's implies a process that is building not just starting. There is much that is useful that was developed in the 1970's that should see expanded implementation in the 1980's. The thrust for the 80's must be on information exchange and implementation.

A major factor that can contribute to enhancing information exchange and implementation of safety measures is the establishment of mutual respect among governments, public institutions, the public, and industry. This will take time because we haven't been too well-acquainted before now.

Since safety in the use of plant protection chemicals, so essential to food production and national economies, is a common goal, it deserves our continuous attention.

PREAMBLE

In recognition of the priority position occupied by agriculture in the development of the countries of the Caribbean Region, and the dominant role played by Crop Protection and particularly chemical control methods in our struggle to produce food and fibre for our people, representatives of the various Governments met in Trinidad, 2 - 5th August, 1983 to consider standards as they relate to the adequate use of Pesticides in the Region.

Delegates considered the proposals emanating from the Contadora (Panama, 1981), Cartagena (Colombia, 1982) and San Jose (Costa Rica, 1983) consultations and agreed in principle to:

1. the necessity for harmonization of pesticide legislation and registration in the Caribbean Region

2. that such harmonization be in the context of a Hemispheric thrust in this direction, and

3. the need for development of the personnel and infra-structural resources necessary for effective implementation of the above, e.g. strenghtening regional laboratory facilities.

RESOLUTION

Whereas all the countries of the Caribbean have common problems with pests and diseases of plants and animals, and

Whereas pesticides have proved useful in the control of these pests and diseases, and

Whereas it is recognised that laws and regulations for the control of pesticides have proved useful in restricting the misuse of pesticides, and

Whereas all the countries of the Caribbean do not now have Pesticide Legislation
be it resolved

That those countries that do not now have legislation seek, as a matter of urgency, to enact such legislation using the Pesticides laws of Barbados, Jamaica and Trinidad and Tobago as models or guidelines.

RECOMMENDATIONS

RECOMMENDATIONS

The government officials of the Caribbean countries, after due discussions and deliberations on the proposals on proprietary rights, registration and labelling made by industry, accepted and recommended the following:

A. Confidentiality

1. Consider the information and documentation submitted for the registration of a product as the exclusive property of the registrant company. Therefore, these cannot be used for the registration of similar products of other companies, which, in this case, will have to comply with all the requirements requested, as if it were a different product.

2. Provide for protection and non release to third parties of the data considered of restricted use by the registrant company. The data can only be released with expressed and written consent of the proprietor of such information.

B. Toxicological Classification

1. Adopt in principle the W.H.O. toxicological classification proposed with the addition of:

   (a) the symbols $\leq$ (less than or equal to) $>$ (greater than) in the values corresponding to the toxicological classes.

   (b) that an expert group be convened to advise on the use of secondary criteria for classifying pesticides and other agricultural chemicals into hazard groups based on the availability of antidotes and other criteria.

   The Trinidad and Tobago "Guides on Classification of Pesticides and Certain Toxic Chemicals (1980)" should be used as a working document.

C. Labelling

1. Accept the standard label format proposed by industry

2. Accept the colours proposed to identify the four toxicological

classes or categories already approved, as follows:

Red	-	extremely hazardous
Yellow	-	highly hazardous
Blue	-	moderately hazardous
Green	-	slightly hazardous

The identification of the colour will be a band with the appropriate colour along the base of the label and it will be 15% of the height of the label. The colours red, yellow, blue and green should follow the colour tones accepted internationally.

D. Registration

1. To accept the Certificate of Origin or its equivalent, issued by the basic manufacturer.

2. Recommend that the countries consider the convenience of the validity of registration of a product up to a maximum of 3 years, starting from the day the registration is granted.

3. That the analytical samples be supplied by the Registrant whenever it is required by the Government or duly appointed national authority.

4. That no product should be accepted for registration without the accompanying toxicological data.

5. Accept that the pre-harvest interval be proposed by the registrant company, for approval by the government registration authorities.

6. To request the local importer of a formulated or technical product to present a certificate issued by the basic producer in which it is stated that the product being imported corresponds in quality and characteristics to that already registered in the country.

7. To urge IICA to continue and expand the coordination between industry and governments, to develop any type of action leading towards a better use and handling of pesticides in the Caribbean region.

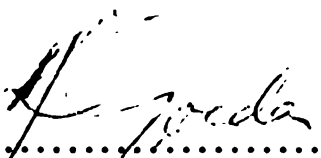
E. Other Proposals

1. It is further proposed that an annual meeting of the Directors or Chairmen of Pesticides Boards be convened under the aegis of Caricom, or some appropriate regional agency, for the purpose of reviewing and monitoring changes that may have occured during the interim period.

2. It was considered that a series of Regional Training Programmes (at the appropriate level) in Pesticide Management and Safety was absolutely essential to the implementation of Pesticide Legislation and of the foregoing recommendations, and to this end we request I.I.C.A. to solicit the assistance of P.A.H.O., W.H.O., F.A.O. and other pertinent agencies to facilitate these programmes.

APPROVAL

In accordance with the formal request by the Inter-American Institute for Cooperation on Agriculture (IICA) to attend a Consultation on the Harmonization of Pesticide Legislation and Registration and in accordance with the guidelines set out by International Organizations, FAO and WHO and to comply with the mandate of the third Consultation on the appropriate use of pesticides in Latin America and the Caribbean held in Mexico in 1982, the Directors of Plant Protection and Heads of Pesticide Boards in the Caribbean, hereby agree to accept the recommendations set out above and to transmit the same to our respective Governments for their appropriate action. We also urge the Inter-American Institute for Cooperation on Agriculture to take these recommendations to the Inter-American Board for their approval and to seek whatever avenues are available to ensure implementation of these recommendations. Signed this 3rd Day of August, 1983 in Port-of-Spain, Trinidad and Tobago by:



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Mr. Ronald Goedar - Delegate of Suriname

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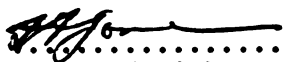
Mr. John Percival Jeffers - Delegate of Barbados

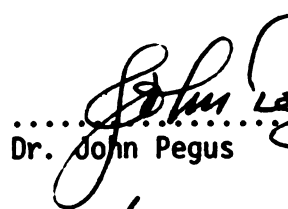


Mr. Frederick Jones - Delegate of Guyana

Mr. Milton Lawrence - Delegate of Dominica

Mr. Henry Lubin - Delegate of St. Lucia

Mr. James Marrast - Delegate of Grenada



Dr. John Pegus - Delegate of Trinidad & Tobago

Mr. Henry Turrene - Delegate of Haiti

Mr. Walter VanWhervin - Delegate of Jamaica

MEETING OF THE SOCIETY FOR PLANT PROTECTION IN THE CARIBBEAN

New Perspectives in Pesticide Development and use and the Relevance to Caribbean Agriculture

by Dr. Gene V. Pollard, Department of Biological Sciences, University of the West Indies, Trinidad

Introduction

Man has always been in competition with other organisms for food, moreso once he began to practice settled agriculture, perhaps about 10,000 years ago; he must have soon learnt that pests and diseases had to be controlled if he were to reap the full benefit of his efforts. Equally important was the control of the many insect vectors of diseases of man and livestock. For example such vectorborne diseases as malaria, yellow fever, trypanosomiasis and the plague have all extorted a heavy toll on human life over the years and had to be controlled if man were to optimally exploit his environment.

Despite the seriousness of pest and disease attack in both agriculture and on human health, man's early efforts at control, in fact even well into the 19th century, were basically primitive and relatively ineffective. Early pesticides have been referred to as "...obnoxious, odoriferous and irritating materials" consisting of such unlikely materials as dung, urine and ashes (Akesson and Yates, 1979). By the late 19th century and early 20th century the use of copper fungicides, the arsenicals and the naturally occurring rotenoids

and pyrethroids was fairly widespread. However, the variety of chemical pesticides available was very limited. In fact as late as 1939, only thirty pesticides were registered for use in the United States (Mc Ewen and Stephenson, 1979).

It was about this time and in this context that the insecticidal properties of DDT were discovered - the dawn of the age of synthetic organic chemicals. Metcalf (1980) has described these last four decades since as comprising three periods. From 1940 - 1962 was the Era of Optimism when, in the first flush of success, DDT and subsequently developed organic synthetic compounds were thought to have heralded the end to all pest and disease problems facing mankind. This, however, gave way to the Era of Doubt (1962 - 1976) when various environmental hazards of pesticide residues as well as resistance development in many pest species were recognised. The very success of pesticides led to their overuse and abuse which characterised this period. Within the last decade (1976 - present) has emerged the Era of Integrated Pest Management; here the role of pesticides, and insecticides specifically, has been reassessed in the complete strategy of pest suppression with chemicals simply being one weapon in a multi-faceted attack on pest and disease problems.

There is no doubt as to the efficacy of the earlier organo-chemicals in pest and disease control. Equally without doubt is the contribution which these chemicals will continue to make in increased food production and improved human health in the years ahead. However, there need to be developed both new types of chemicals without the accompanying disadvantageous effects of the earlier organic

synthetics as well as new strategies for the safe use of the latter. This paper will summarise some of these attempts and at the same time presume to forsee their relevance to Caribbean agriculture.

PESTICIDES AND FOOD PRODUCTION

Insect pests and diseases are the major contributors to crop and animal loss. Mean pre-harvest crop losses are estimated at 35 percent per annum worldwide. Even in the United States of America with its highly technological crop production systems, including crop protection, annual pre-harvest losses may range from 25 - 30 percent. Post-harvest losses too are also high, averaging about 20 percent globally and may even rise above 50 percent in some developing countries. Taking pre- and post-harvest losses into consideration, the total annual loss may amount to about 45 percent; and this is in spite of pest control systems in operation. This is a very significant loss of food.

The world demand for crop and animal products was 2.6 Billion tons in 1975 and was expected to increase by almost 50 percent to 3.7 Billion tons by 1985 - a per capita daily demand of 4.4 lbs (Revelle, 1974). Related to this demand is the ever-increasing human population expected to stand at between 6000 - 8000 Million by the end of the century. There are two options which readily come to mind in order to alleviate the expected shortfalls in production, bearing in mind as well that nearly 50 percent of food produced is lost to pest and disease attack. One such option is to put more land into production. It has been estimated that there are over 600 Million

hectares of potentially arable land available in Africa and South America, with another 300 Million in Australia and North America, both already high producing areas (Revelle, 1974). However, there are a number of problems, particularly in Africa and South America, which militate against the realisation of this potential and all are mainly socio-economic in nature perhaps more economic than social. The other option available is the direct reduction of pest and disease loss. This too is quite expensive but more feasible perhaps than the former option. At the manufacturers' end it is estimated that current research and development costs to produce a new pesticide amount to US$20.0 Million, nearly 20 times those of 25 years ago (Table 1) (Herrett, 1980; Metcalf, 1980). Quite significant too is the time to get a new product to the market - nearly eight years after discovery, and the number of compounds which must be screened for each successful pesticide developed. Such high research and development costs however are not reflected in the demand for pesticides.

Table 1: Probabilities, Time and Costs associated with the introduction of a new pesticide (Herrett, 1980).

	1956	1969	1972	1980 (est.)
Survival Rate[1]	1,800	5,040	10,000	25,000
Time[2] (months)	58	60	110	95
Costs[3] (US$M)	1.2	4.1	10.0	20.0

[1].... Number of compounds screened to achieve one commercial product.

[2].... Elapsed months from discovery to first commercial sale.

[3].... Uninflated costs of research and development for each commercial success, exclusive of production capital costs, which can exceed R/D costs three- to five-fold.

On a global scale there is still an increasing demand for pesticides mainly in developing countries and in some developed countries like Japan and the USSR. Generally though the more developed countries have reduced their demands due in part to the very stringent regulations which now govern pesticide usage, as well as the fact that markets are becoming saturated. Forecasts, according to a recent study quoted, (Anon, 1982) indicate that world consumption levels for pesticides would approach 6.5 million tonnes by 1995, an increase of 45 percent over the 1980 level of 4.5 tonnes. This represents an annual increase of 2.3 percent over the period (Table 2). Fungicides, herbicides and insecticides will all show a slower rate of growth compared with rodenticides and fumigants. Both the actual and projected increases of the latter groups are likely to be due to the increasing attempts at the control of stored product pests and at soil fumigation. The

Table 2: Current and projected world demand for pesticides (Anon, 1982)

	World Pesticide consumption (thousand tonnes)			Annual growth rates	
	1965/69	1980	1995	Historic: 1965/69 to 1980	Projected: 1980 to 1995
Fungicides	742	1094	1485	3.0%	2.1%
Herbicides	767	1590	2225	5.8%	2.3%
Insecticides	1086	1590	2235	3.0%	2.3%
Rodenticides, Fumigants & Other	157	297	500	5.0%	3.5%
Total consumption	2753	4571	6445	4.0%	2.3%

reduced demand for fungicides, herbicides and insecticides is due to a combination of factors among them the stricter governmental regulations as mentioned above, the development of more effective compounds and formulations as well as increasing use of integrated pest management systems (Anon 1982). Even with these constraints however the actual value of world demand for pesticides by 1984 has been estimated at over US$ 11,000 million (Herrett, 1980).

In the Caribbean region there also appears to be a similarly increasing trend in pesticide usage. Actual usage data for the region as a whole however are not very easily available, though some indication of the amounts of pesticides (exclusive of rodenticides) imported into Jamaica, Barbados, Trinidad and Tobago and Guyana for the period 1972-1977 has been presented (Pollard, 1980). For this same period mean annual importation of pesticides amounted to 774,710 kg in Trinidad and Tobago while for 1980 1.8×10^6 kg were imported at a cost of TT$ 20.0 million (US$ 8.3 million). For the period 1979-1981 St. Vincent and the Grenadines imported annually 349,082 kg at a mean value of EC$ 1,725,683 (US$718,600) (S. Lynch, pers. comm.) while similar data for Grenada for 1982 show a pesticide import bill of EC$ 842,369 (US$ 314,320) for 139,901 kg. These data, though only fragmentary, do indicate nonetheless that usage of pesticides in the region is quite substantial.

What is the impact of these chemicals on agriculture production in the West Indies? In 1953, R.G. Fennah, an emminent entomologist working in the region, considered a similar question and expressed the view that "....in the present circumstances the use of insecticides,

even where highly effective, only touches the fringe of this problem (i.e. increasing yield). The dominating feature of West Indian agricultural economy - directly in crop cultivation and indirectly in stock farming - is low crop yield" He was further of the view that at the time the limiting factor was " .. retarded or unbalanced metabolism of the product whether plant or animal" and that this resulted ".... from the inefficacy of current agronomy in coping with the difficult conditions imposed by the physical characteristics of the environment" (Fennah, 1954). While there has been much study of the agronomic requirements of many of the crops grown in the region today since 1953, Fennah's viewpoint may still be somewhat valid. He had also suggested that the most outstanding successes of insecticide use in the region up to then were the control of froghopper *Aeneolamia varia saccharina* Dist. in sugar cane in Trinidad and the simplification of leaf-cutting ant control. Yet at present estimated annual losses due to froghopper damage in sugar cane in Trinidad amount to 3000 - 4000 tons of sugar despite the expenditure of US$ 750,000 in chemical control (T. Gopee, pers. comm.) while leaf-cutting ant damage in citrus and cacao in Trinidad is estimated at between US$ 37,000 (Lewis and Norton, 1973) and US$ 250,000 (Cherrett and Sims, 1968), and this is exclusive of yield loss. Therefore the question that was posed earlier of the impact of the ever increasing amounts of pesticides on agriculture in the region is extremely relevant and must be addressed especially in the context of the increasing documented reports of crop losses due to pest attack in the region (Brathwaite, 1980; 1982).

CONTEMPORARY PESTICIDE USAGE

Traditional Pesticide Usage

The abuse of organosynthetic pesticides over the last three or four decades has resulted in such disastrous side effects that an outright ban or severe use restrictions were placed on many of these earlier successful chemicals, particularly the very stable organochlorines (Anon, 1979). These restrictions have led manufacturers to search for new chemicals to satisfy the new and stricter regulations which are now found in most countries. This, as indicated above (Table 1) is now quite expensive not only for the manufacturer but for the consumer who as well must pay more to purchase his chemicals. These costs are even higher in developing countries which must import their pesticides. One study has shown that pesticides may represent over 40 percent of purchased inputs in crop production in developing countries as compared with only six percent in developed countries (Adam, 1977). To corroborate this viewpoint Evans (1982) quoted data which indicated that vegetable farmers in the Aranguez district in Trinidad were spending between TT $30 to $50 (US $12.50 to $21.00) per acre on pesticides in vegetable production in 1967 but in 1975 these inputs had risen to TT$ 960 (US$ 400) per acre for tomatoes and TT$ 620 (US $260) per acre for cabbages. These increases reflected both the increased cost of pesticides as well as the increased frequency and variety of pesticides applied. The majority of farmers in the Caribbean and in developing countries generally cannot afford such high pesticide inputs in food crop production.

Compounding the high cost of pesticide inputs is the fact that in many instances these chemicals are very inefficiently applied One report quoted by Adam (1977), investigated some major pest control programmes in 21 developing countries. These investigations indicated that 32 percent of these programmes were not effecting control to sub-economic levels and that 52 percent of the identified deficiencies in the programmes were due to shortcomings in application technology

Non-traditional and Unconventional Pesticides

The past few years have seen increased research and development efforts of several alternatives to the traditional synthetic organo-chemicals. The general thrust has been towards natural pest control agents or their synthetic analogues especially as regards insecticides and fungicides (Hedin, 1982). Compounds belonging to the former group have sometimes been referred to as third and fourth generation insecticides of which morphogenetic agents or insect growth regulators and sex attractants show the greatest potential. More recently two other groups of compounds - antifeedants and phytoalexins - have come to prominence and are likely to play a greater role in crop protection in the future.

(i) Morphogenetic Agents

These are chemicals which interfere with the normal growth and development of insect species and hence are also referred to as insect growth regulators. These are based on juvenile hormone (JH) and ecdysone or moulting hormone, both natural compounds regulating growth

and development in insects. However from a pest control point of view it is only the juvenile hormones which have received attention. Since the identification of the chemical nature of the natural juvenile hormones, which incidentally were quite expensive to synthesise, a number of compounds with similar activity but cheaper and easier to synthesise were developed. These are the juvenoids or juvenile hormone analogs (JHA) According to Staal (1982) thousands of such compounds have been manufactured and tested in the last two decades but only two have found commercial application and even so not for field crop protection. Staal (1982) has listed the necessary conditions for the successful application of juvenoids but in summary such compounds will only be of practical use ".... where instantaneous control is not needed and the residual effect can persist long enough by virtue of a sheltered or enclosed environment aided by short development cycles and a perception of damage that does not require near total extermination of existing larval populations." In other words although JHA disrupt metamorphosis, eventually causing death, they only do so after inducing supernumery moulting in the target insect. The implication of this is that the immature life of the insect, which is usually the feeding and pest stage, is extended so causing greater crop damage. JH mimics however have proved to be excellent in public and veterinary health use, for example in the control of mosquitoes and flies; here the mature stage which is the pest stage is the one eliminated (Bowers, 1982).

Another group of growth regulating compounds has shown good promise as pest control agents. These are compounds which inhibit or are antagonistic to JH and cause precocious development of immature

stages or sterility in adult insects. These compounds have been termed precocenes (Bowers, 1982). Both the latter group as well as JH themselves are thought to offer very exciting tools for insect control in the future, the view having been expressed that "Any method of interfering with insect moulting would be a highly superior insecticide" (Bowers, 1982).

(ii) Sex Attractants

These are insect pheromones, chemicals released by one organism to affect the behaviour of another individual of the same species. Sex attractants are usually secreted by virgin females to attract males for mating. These are quite effective, one trapped virgin female of the pine sawfly, *Diprion similis* (Hartig), for example reportedly attracted 11,000 males (Coppel and Mertins, 1977).

While quite a number of sex attractants have been identified and synthesised, mainly from the order Lepidoptera, they have found only fairly limited use in pest control. So far their major use has been in the monitoring or surveying of pest populations as part of insect pest management systems where an up-to-date status of the pest population is essential in order to make a decision on whether to apply some control strategy or not.

Attractants have also been frequently employed in traps for the early detection of introductions of pests. This has been well documented for various fruit fly species and this strategy is usually a regular aspect of plant quarantine action against this pest. In fact the use of baited pheromone traps or baited sprays with an

attractant as the bait are regarded as the best methods for tephritid fruit fly eradication.

The broadcast of sex pheromones in the environment so as to confuse the male is also another strategy which has shown some promise in pest control. Under such circumstances the males seem unable to locate females for mating; excessive amounts of attractant appear to disrupt the mating pattern (Hedin, 1982). Various examples of the use of pheromones generally in pest monitoring, trapping and in mating disruption have been summarised by Metcalf and Luckman (1975) and Coppel and Mertins (1982).

(iii) Antifeedants

These belong to a general class of compounds referred to as allelochemics. These are usually secondary plant compounds. Antifeedants prevent or interrupt feeding activity when contacted by an insect (Schoonhoven, 1982); they therefore have the advantage of limiting damage to the plant since the insect is deterred from feeding. They are thought to act at the neurophysiological level by "....irreversibly blocking the sense of taste" of the insect (Hedin, 1982). Ideally such compounds should show systemic activity and so affect eating, sucking or boring insects as well as protecting new flushes on the plant. Systemicity also implies of course that such compounds are water soluble and are not phytotoxic (Schoonhoven, 1982).

(iv) Phytoalexins

These are antibiotic compounds which are induced in plants when subjected to some stress factor, whether biotic or abiotic. Ultra-violet light or heavy metal ions, for example, may induce phytoalexin formation. Usually though plants are stimulated to produce these compounds in response to pathogenic attack and, as has been more recently shown, to insect attack as well (Hedin, 1982). Certain plant growth regulators have also been shown to stimulate the biosynthesis of secondary plant compounds which confer to the plant resistance to insect attack. Hedin (1982) refers to the increased synthesis of terpenes by citrus species under the influence of α-Naphthalene acetic acid and which results in reduced fruit fly attack.

(v) Trends in plant disease control

In plant disease control most of the recent developments relate to fungicidal compounds and to a lesser extent nematicidal chemicals. The latter though appear to have paralleled the development of insecticides, i.e. insect growth regulators, sex pheromones etc. and, in fact, many of the newer traditional organochemicals have both nematicidal and insecticidal action, for example, Furadan. At present viral diseases of crops cannot be controlled by chemicals except the likely insect vector is identified and controlled. Various antibiotic compounds against some fungal and bacterial diseases have also been utilised.

In relation to fungicide trends Hedin (1982) makes the point that most modern organic fungicides have been biorationally

developed from the early copper and sulphur compounds although more recently many metals have been investigated. There has also been greater investigation of systemic compounds, e.g. Benomyl (Benlate). Hedin (1982) also suggests that apart from fungitoxic compounds acting either on the surface of the plant or penetrating through the cuticle there is likely to be a greater use of compounds which are not toxic but rather pathogenic to the fungus. On stimulation by the fungus such chemicals will "....elicit the formation of compounds that block vital fungal mechanisms". One such group is the dichlorocyclopropanecarboxylic acids which induce the host plant to produce compounds inhibiting the spread of the fungus.

THE RELEVANCE OF RECENT TRENDS IN PESTICIDE DEVELOPMENTS TO CARIBBEAN AGRICULTURE

Brader (1982) has argued that current pest control technology utilising pesticides was developed specifically for "....the needs of the highly capital-intensive agriculture of the Western World" and which was later introduced to the tropics to service the needs of cash crops. He further argues that "....chemical pest control does not offer small farmers an acceptable way to substantially improve their production" and that "....production gains made in food crops are normally too low to compensate for the cost of applying insecticides over a whole field". He concludes that "....pesticide use in the tropics has primarily been of benefit to large farmers and cash crops that can bear the expense of these inputs". This final conclusion,

perhaps, may be substantiated by the fact that most of the pesticides imported by developing countries are used in export cash crops or in vector control (Furtick, 1976; Brader, 1982). In Trinidad and Tobago, for example, it is estimated that nearly 80 percent of all pesticide imports are utilised in the sugar cane industry (T. Gopee, pers. comm.). It is likely that a similar situation exists with other cash crops in various countries in the region, for example, in the banana industry in the northern Caribbean islands. With this kind of viewpoint, what then is the future role of pesticides in food production in developing countries generally and in the Caribbean more specifically? As it has been pointed out above, even with the existing relatively high pesticide usage pattern in the region, there are still a number of pest and disease problems causing serious yield losses in all the major cash and food crops. This kind of situation is not unique to the region and it has been suggested that if pesticides were to have an impact on food production in developing countries their use should increase by five fold in 1985 over the 1973 level of eight percent of world production (Adam, 1977). Such a projected use pattern is unlikely to be attained by the local farmer should the current inflationary pattern continue, notwithstanding the increasing trend in usage as indicated earlier.

With regard to the newer non-traditional or unconventional compounds even in developed countries there is a very limited use projected for these chemicals. The major reason for this according to Hedin (1982) is the fact that "....the specificity of the agents preludes broad spectrum application and thus limits opportunities

for profits". This is the crux of the matter. Kohn (1975) cites the case of the discovery of an excellent mosquito larvicidal compound which was quite exciting since most mosquito control programmes aim at the adult stage. However a study of the world market by the manufacturer indicated that it was much too small to be an economically feasible investment.

Utilisation of the newer non-traditional chemicals however is expected primarily to be part of integrated pest management programmes. The point has been made that integrated pest management is a complex technology (van den Bosch, 1978) and like all imported technologies carry a high cost. Can we bear these costs in the region?

What then is the future of pesticides in the region? It would seem to me that the traditional chemicals will have a continued role for a number of years to come. What is essential though is a much more efficient use of these compounds through improved formulations and application technology. Reference was made earlier to an investigation into pest control programmes in 21 developing countries where nearly one-third of the programmes investigated were ineffective. Investigations further revealed that this was due in large part, to deficiencies such as faculty selection, use and maintenance of equipment; inadequate calibration; inadequate mixing of pesticides; faulty flagging for spray aircraft; inadequate knowledge of environmental factors affecting spray application, to name some of the most important (Adam, 1977). These are all shortcomings which can be readily rectified by proper training of personnel involved in crop protection activities. To my mind this is the primary

option which we have to deal with in the Caribbean - *proper and relevant training in application technology.* There is no point in attempting to implement the newer technologies available in crop protection, including the use of various novel pesticides, unless we can come to grips with the basic technology of pest control.

I think then, that with a more scientific approach to pest control and a greater awareness of the more efficient management of pesticides, we can continue to depend on some of the chemicals we have come to know and rely upon over the years. This new approach though, depends as well on an acceptance of the concepts embodied in the integrated control of pests and diseases - what we know as pest management.

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Pest Control in Bananas

A Case of the Cost/Benefit Challenge in Pesticide use

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Introduction

Banana is a major crop in the region, both for domestic consumption and for export.

Jamaica produced an estimated 300,000 tons in 1970 of which half was exported. Export production has since declined to 20,000 tons as overall yields were reduced by lack of inputs and increasing domestic consumption. The Windward Islands produce between 110,000 and 140,000 tons of export bananas - but here, too, production has been hindered by unavailability or financial cost of inputs.

The major objective, therefore, is to help assure adequate production of bananas as a safe and wholesome food and to do this at reasonable financial, human and environmental cost.

Pests and Diseases

One of the fundamental characteristics of banana production in our tropical environment is the ubiquitous presence of economic pests causing extremely severe damage to yields or quality of fruit. Nevertheless, production, particularly for export, must be competitive in cost and quality on the U.K. market.

Banana farmers are faced continuously with the same problem - how to control the pests that ravage his crop? Use of plant protection chemicals have had a long history in banana production from the days of widespread use of Bordeaux mixture for Sigatoka control in the 1930s and DBCF for nematode control in the 1960s. It is appreciated that pesticides are valuable for their activity against fungi, insects, nematodes and weeds. It is also well established that when used correctly there is low probability of their causing human or environmental harm, in spite of their toxic nature.

In Table 1 is a list of pesticides used for control of various pests on bananas.

Table 1. Pesticides used in the Caribbean on Bananas and Plantains

Insects	
Cosmopolites sordidus (stern borer)	Primicid (pirimiphos ethyl)
Nematodes	
Radopholus similis (burrowing nematode)	Macap 10G (ethoprop) Furadan 10G (carbofuran) Vydate L (oxamyl)
Fungi	
Mycosphaerella spp (Sigatoka)	Benlate OD (benomyl) Manzate 200 (mancozeb) Sigma (methyl thiophanate) Calixin (tridemorph) Oil
Crown rot fungi	Mertect (thiabendazole)
Weeds	Paraquat Diuron

Nature of Hazards

The level of pesticide hazard of pesticide hazard to humans depends on the toxicity of the formulation, method of application and the length of time the worker is exposed.

Pesticide injury can occur at different times e.g. during

transportation

storage

mixing and loading or filling

applying

cleaning equipment, spills

disposal of surplus or

consumption of treated fruit

Formulations with the lowest LD_{50} are potentially the greatest health hazards. The toxicity of the major banana pesticides are given in Table 2.

Table 2. Toxicity of pesticides used on Bananas in the Caribbean

Pesticide	Oral LD50	Dermal LD50	Classification[3]	EPA Status
Benlate 50%	(10,000)[1]	(10,000)	O-III-slight	G
Calixin 75% EC	650) 1,112	-	O-II -moderate	G
Diuron	(3,400)	-	O-III-slight	G
Furadan 10G	(8) 132	10,200	O-IB -high	G
Manzate 200	(8,000)	-	O-III-slight	G
Mertect	(3,300)	-	O-III-slight	G
Mocap 10G	(62)	(26)	D-I -high	R
Oil[2]	-	-	-	-
Paraquat	(150)	-	O-II -moderate	R
Primicide	(140)	1,000	O-IB -high	-
Sigma 40F	(6,000) 7,500			
Vydate 24%	(6) 37.0			

1 Active ingredient toxicity is in parenthesis - source FAO Plant Protection Bulletin, Vol. 28, No. 1, 1980.

2. Spraytex banana spray oil has not been considered by USDA or EPA as an economic poison and so registration has not been required.

3. WHO classification of toxicity. This is based primarily on acute oral and dermal toxocity using rats as test mammals.

In Table 2, the greatest care is to be exercised with products in Category I of WHO classification. These are highly toxic pesticides. Oral toxicity is indicated by O, unless the dermal route (D) places the pesticide in a more hazardous class.

Within this group, EPA in the U.S.A. regards some as restricted use pesticides, e.g., Mocap and paraquat. In the U.S.A., they would be available for use only by certified applicators. Certified applicator service is not available in the Caribbean, except perhaps for Sigatoka control. By contrast, the other general use pesticides can be purchased and used by anyone as is currently the practice.

Pest Control

Pest control with pesticides is widely practiced in bananas because definite benefits accrue from high production and a viable industry. There are two categories of use: supervised use as in Sigatoka control and in the recent past in DBCP application for nematodes, and general use of pesticides such as Primicid and paraquat. Some of the measurable benefits from pesticide use are:

(a) Attainment of higher yields and better quality. Superior technology in banana production in Central America by the large fruit companies is based in part on more widespread use of chemical inputs. Is there a greater hazard? Apparently not. Yields of 40 tons/ha are achieved compared to 10-15 tons in the Caribbean.

(b) Source of income for farmers which permits them to enjoy a better quality of life and enables the industry to provide employment to various people - managerial personnel, technical staff, farm and shipping labour. In some of our countries bananas are the most important source of foreign exchange inflows.

(c) Increasing food self-sufficiency with bananas and plantains. Demand for Sigatoka control fungicides and other pesticides will rise as populations increase.

(d) More intensive use of fertile banana acreages is possible as population increases will reduce available arable land. Pressure for better utilisation of existing banana lands will be facilitated by judicious use of pesticides.

(e) Soil erosion and increasing pest problems from old fields can be offset in part by fertilisers and other inputs.

(f) Improved root growth from nematode and borer control. Better anchorage and water uptake is especially important in areas without irrigation.

(g) Reduction of crop losses due to pests and diseases estimated at between 35 and 50%. When post-harvest losses are added - maybe half or more of the crop is being consumed or destroyed by pests and diseases. Pests are competing directly with us for food.

(h) Greatest banana losses are in the Caribbean relative to Central America. The Caribbean producers cannot meet the demand for bananas in their own protected U.K. market and this opens the door for more efficient competitors, who regard chemical inputs as necessary for high yields and to avoid frequent replanting.

It is to secure these benefits that banana producers must wage a war against insects, nematode pests, weeds and fungi on banana and they must use all the control techniques available to them.

Disease and pest-resistant cultivars would be desirable. Unfortunately, in spite of long-term breeding efforts no commercially acceptable cultivars have emerged - except, perhaps, some cooking bananas. At the present time, the fate of banana breeding is uncertain.

Pesticides, then, remain the main method of control supplemented by cultural, biological or mechanical-physical techniques. Replanting and following of land are cultural methods to control nematodes while predatory insects and seasonal changes are depended upon for foliar mite infestations. Mechanical techniques include bunch sleeving as a barrier against insect and fungal invasion and propping to reduce nematode and borer toppling. Also, field sanitation is practice to reduce fungal inoculum for Sigatoka and fruit rot control. Legal controls operate through the enforcement of quarantines, or compulsory crop destruction, for example, restrictions on movement of banana material to prevent entry of Black Sigatoka and rogueing in Grenada to eliminate reservoirs of Moko disease.

Reduction of Risk

Dependence on pesticides necessitates effort to reduce risk to humans and the environment, although it would be difficult if not impossible to reduce risk to zero.

Risk is reduced by following certain steps in the importation and use of pesticides.

(a) Establishment of a well-thought-out, workable regulatory system. The system should assess practical uses of pesticides and the positive and negative effects of the products to be regulated.

(b) Adequate identification of manufacturer or supplier. The alternative to responsible manufacturing source could be unsatisfactory quality control, no toxicological and residue data no evidence of efficacy, vague product identity and inadequate labelling. Product may be cheap but there would be no recognised channel of distribution for resolving problems. Established companies wishing to remain in business have to comply with the regulations. Because of this, their representatives are conspicuous in the market place and often are scapegoats for other people's mistakes.

(c) Pesticide registration by governments with regulations requesting submission of valid evidence for safety and efficacy.

(d) Laws and regulations in the country of manufacture. In 1978, Congress amended certain sections of FIFRA to require the same quality assurances and labelling requirements for exported products as required for the U.S.A.

(e) Assistance in the area of education and information in the proper handling of agrichemicals. Primary consideration is to use pesticides (a) where and when they are needed, and (b) where and how they can be used safely.

(f) Users should have knowledge of the many terms used to describe when and how to use pesticides. Information is available in literature from manufacturers such as technical bulletins and brochures, product labels and extension leaflets from Research Departments in the islands.

(g) Pesticide use should be avoided where it is not recommended for bananas.

(h) Apply at the rate and time suggested for that pest. Most pesticides work at low use rates. Do not overuse. Pesticides work best when applied at specific times. Applying before or after may reduce their effectiveness and result in more applications to bring the pest under control. Also be careful to treat the intended target. In aerial applications as much as is feasible avoid spraying houses, laundry, rivers.

(i) Consider soil, topographic and climatic factors. Coarse soils may facilitate vertical and lateral movement of chemicals much more than clay soils. Sloping ground and heavy rainfall will have similar effects.

(j) Monitor for resistance to pesticides to avoid crop failure or excessive use of the same pesticide.

(k) On labels, check particularly for instructions on medical management of poisoning if it should occur accidentally. Signal words indicate how toxic the chemical is to people. For example, Danger and the symbol skull and crossbones indicate that such pesticides should be handled with extreme caution.

(l) Other useful information on the label are statements concerning hazard to humans and domestic animals (e.g., primary route of entry and kind of protective clothing), environmental hazards (e.g. to bees, birds, contamination of water), physical and chemical hazards (fire or explosion hazards), use classification (e.g., general or restricted use), directions for use (e.g. how much to use and when), storage and disposal directions (e.g., burying, burning, etc.).

(m) Use dust mask and wash immediately after work. Mixers, loaders, pilots may suffer injury if they breathe pesticide dust or get it on their skins.

(n) Be aware of symptoms (headache) or signs (vomiting) of pesticide poisoning. Supervision is to be advised to get medical help if someone has been affected by a pesticide. Supervision know and be able to apply first aid procedures.

(o) Pesticides can enter the body through the skin, inhalation or swallowing. Protect the body by using long-sleeved shirt and pants, rubber boots, gloves, hat, goggles and respiratory protective devices when the label directs that this should be done.

(p) Pesticides can cause harm to plants and animals, leave residues in soil, water, etc. Avoid injury to non-target crops or animals. Drift may kill nearby plants, bees, or runoff from a treated field can kill fish in nearby rivers or through draining or careless container disposal

To further reduce risk and in the light of new information, USEPA undertakes further review even after a product has been registered. The agency does this through the RPAR (Rebuttable Presumption Against Registration). The manufacturer must rebut the alleged risks or presumptions that triggered the RPAR by supplying strong evidence or new data. The EPA may require label modifications following review.

You will recall that it was through similar review that DBCP and Kepone were legally banned and ceased to be available to the banana industry.

There has been concern about the hazards of paraquat - a herbicide which is widely used in banana production, and the use of banana nematicides has been evaluated.

Laws and Regulations

Without judicious use of pesticides, we would not be able to produce the quantity of bananas and other foods we need. But awareness of the risks have persuaded many of the Caribbean governments to pass laws and to set up procedures for safe use of pesticides. These laws try to balance the need for pesticides against the need to protect people and the environment from their misuse.

In the U.S.A., pesticide use is regulated by FIFRA (Federal Insecticide, Fungicide and Rodenticide Act). This law requires that all pesticides be classified as general or restricted use and provides penalties for people who misuse or abuse or otherwise do not obey the many provisions of the law. EPA is responsible for enforcing these laws.

Other regulations relate to shipment of pesticides which is the responsibility of the Federal Department of Transportation (DOT).

Aerial application is regulated by the Federal Aviation Administration (FAA) and worker safety comes under the Occupational Safety and Health Act which is administered by the Occupational Safety and Health Administration (OSHA).

Residues in or on raw farm products or processed foods are similarly regulated by EPA which sets tolerances under regulations authorised by the Federal Food, Drug and Cosmetic Act. For bananas intended for export, import tolerances are necessary to allow entry into the U.S.A., United Kingdom or other countries. Most if not all pesticides used on bananas are registered in their countries of origin and import residue tolerances have been established by the EPA and WHO/FAO.

In the Caribbean, Pesticide Control Acts have been formulated to provide for control of the manufacture, importation, sale, storage and use of pesticides. The activities of the Pesticide Control Boards and the awareness created by the agromedical movement in the region have already had an important and useful impact on pesticide management.

Responsibilities

Cooperative effort is obviously better than infighting when there is a common objective. The chemical industry is committed to producing effective pesticides with minimum and definable risks to humans and the environement. The results from field tests, toxicological studies, residue and environmental studies are submitted to the EPA and similar governmental agencies. As much as $25-30 million and 5-10 years of work may be involved before a product reaches the grower.

Future

In the immediate future, small farmers will require special consideration. In some cases, they may require supervised use of pesticides. Efforts at harmonising registration procedures now under way will better serve his

situation by way of colour designations on labels, use of pictorial language and other ways.

Longer-term, the agrichemicals industry is actively pursuing research with tremendous investments to secure another "green revolution" for future generations with, we hope, much less risk. The search is for growth regulators, which will improve plant metabolism and hence increase yields; bacteria and viruses that specifically kill only harmful pests; environmentally safe pesticides isolated from tropical plants; and new attractants for insects to ingest toxins that will lead them to untimely deaths.

Beyond that, researchers are applying recombinant DNA (deoxyribonucleic acid) technology to crops. They are able to move pieces of DNA from one organism to another in order to develop crop varieties that will be more productive, disease-resistant, salt tolerant and require less fertiliser and water.

There is every expectation that these developments will have application for bananas as well as for other tropical crops.

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The Application of Pesticides in the Control of Vector-Borne Diseases of Tropical Crops

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Whereas 'disease' denotes a condition of malfunctioning in the plant occasioned by continuous irritation due to the pathogen, the term 'vector-borne disease' must be taken as a short-cut definition to imply diseases due to pathogens which are insect-borne. Thus, implicity, one is concerned here only with such pathogens and their vectors. The topic, therefore; 'The application of pesticides in the control of vector-borne diseases' should now be clearly envisaged with this slight functional emendation.

Principle in control measures

In principle, one may reasonably consider the probability of controlling such diseases via either the vector or the pathogen; or, logically when possible also, by both simultaneously. Theoretically, one seeks usually the weakest link in the chain of transmission events to restrict economically, the spread of the particular disease. Eventually, one aims to preclude any source of the inoculum to the healthy suscept. This last measure might lead into the realms of an alternative plant host and even a different primary vector associated with this collateral species.

The possible combinations of all the above elements exist naturally; often they are based on the nature of the relationship between pathogen and vector in the first place, at the level of the crop as an agroecosystem with all its intrinsic peculiarities. But when it is based also on the relationships of a collateral host with its own microsymbiont-vector, and these may include a different habitat, then new factors come into play such that the type of pesticide required might be in a completely different category: a herbicide instead of an insecticide, for example.

I have to emphasize one other feature to which this paper addresses itself. That is the aspect of 'tropical crops'. What is really important here is the tropical environment. The distinct feature is the continuity and abundance of active animal and plant life at virtually the same level throughout the tropical year; whereas in the temperate zones the partition provided by the low temperatures of winter often allow for sufficient phenological prognostication when the ambient temperature rises and allows for entomological and phytopathological work to be normalized at a calendar basis. Phenograms may be made which allow one to predict periods of maximum emergence of insect vectors or their hosts, primary or alternate, and also the periods for infection.

One can still, however, find a suitable parallel in the actual production of a tropical crop. Some crops like rice, Oryza sativa, pigeon peas, Cajanus cajan, are naturally photoperiodic and so flower at distinct times of the year only. This allows for easy prediction as to the advent of pod-borers and any such vector that depends on flowers and fruits in their life-cycle. Generally, there are in fact simple organized growing seasons for numerous short-term annuals like tomatoes, peppers and cabbage

in the drier days with cooler night temperatures enough to allow some seasonal prediction on the basis of the crop itself though not necessarily on the entire environment as in the temperate regions. In the case of perennial crops, however, their agroecosystems represent remarkably stable tropical communities of interdependent flora and fauna, with continuous energy for growth and perhaps with many external linkages for general maintenance. Prediction here deals with the understanding of the dynamics of the populations under surveillance instead of climatic fore-casting.

It is this fundamental principle which overrides any other in the understanding of the control of vector-borne pathogens and their vectors in tropical agriculture. Features as the threshold density of a vector for transmission to come about, genetic potential for transmission, and the joint abundance of other insects and the nature of the pathogen-plant relationship become more relevant than simply the presence of the vectors and the presence of the plant suscept.

Perhaps I should illustrate this important principle by an example with which I am personally acquainted. Red Ring disease is a fatal disease of the coconut palm in the West Indies and Latin America. The causal agent is the nematode Rhadinaphelenchus cocophilus and the vector is the palm weevil, Rhynchophorus palmarum. Before the palm weevil was confirmed as the vector, correlation studies were done by Hagley (1963) to compare the abundance of the palm weevil population with the abundance of diseased coconut palms. There had always been a positive correlation. Naturally, therefore, controlled reduction in the population of the palm weevil should mean a consequent reduction in the abundance of diseased trees in a given time. But experimentally,

by the use of different insecticides, this did not turn out to be so. Similar studies were done later by Fenwick (1967) utilising different insecticides which gave a definite reduction in insect numbers, but no reduction at all in the rate of infection and the abundance of diseased trees, despite the variety of application rates and frequencies of the treatments. Later (Griffith, 1968) it was found out that only about 8% of the palm weevils were in fact capable of being vectors and these generally emerged earliest to infect the healthy palms. The answer to the problem was really that the insecticides never reached their targets, i.e. the actual vectors of the nematode.

Now, this phenomenon that only a certain number of insects of a vector species is sometimes capable of transmitting the pathogenic organism is not a tropical phenomenon, it is instead an entomological reality of widespread occurence; but the salient feature in the control of vectors to red ring disease is the principle of diversion. Vector insects had to be diverted away from the leaf-axile of the coconut palm where they normally introduced the inoculum to the tree. Such was done by the use of attractive coconut tissue and an insecticide like Lannate (R) which did not interfere with the attractant alcohols emanating from the tissue. The guard-basket was therefo-e an effective diversion principle and a selective trap for all the palm weevils on an estate including those few insects which were the vector types.

In another regard, the nature of the selective mechanism which produces vectors from a population of non-vectors is of special importance. In the above example, we considered non-vector insects as the normal population. There are of course situations where vector insects are the most frequent

and abundant of the normal population. The process by which this position is generated naturally can explain its importance in the agroecosystem. Let us examine a temperate example. The transmission of Curly top virus to sugar beets in the field by the beet leafhopper, Circulifer tenellus (Baker), is influenced among other things by the vector population during summer, the percentage viruliferous and the abundance of plant reservoirs of the virus. Viruliferous leafhoppers may sometimes constitute between 0-90% of the population and the proportion of the viruliferous insects increases during the summer with the overwintering females retaining their infectivity. It is clear that in this case for control of the disease though the control of the vector, that insecticides have to be applied to the breeding ground of the insect before it is able to move out to the cultivated fields in the spring (Shands, 1964). This picture of course changes with another vector and virus combination as with Macrosteles fascifrons (Stal) and aster yellows virus. The six-spotted leafhopper, as it is called, sometimes is between 5-14% viruliferous in June in Wisconsin, and in September, 0-1% only. Obviously, the mechanisms by which these two situations are effected appear quite different. But, for the moment consider either of these two situations in a tropical orchard where there is no dormancy of winter to regulate the numbers of the vectors.

Let us refer again to red ring disease as a working example. The mechanism which allows for the transmission of the nematode might be considered as a lapse in the defense mechanism of the insect. Essentially, when the larvae of the palm weevil develops in the diseased coconut palm, hundreds of red ring nematodes are ingested with the stem tissue on which the larvae feed. These nematodes penetrate the gut wall and enter the

haemocoel where they are normally lysed by enzymic mechanisms located in the blood of the insect. The enzyme appears to relate to one gene. When the allele is dominant, even heterozygous, the larvae normally destroy the visiting nematodes which in fact would subsist as parasites in the insect but not reproducing. However, when the homozygous recessives are present, the enzyme mechanism is absent and the developing insect is defence-less against the invasion. These nematodes remain during the metamorphosis to the insect and are present in the ovipositor of the starved diminutive adult female with a few eggs to be introduced into the healthy coconut palm. Thus, the tendency is for vector populations to be self-limiting in certain contrived conditions.

Source of the pathogen and control measures

Effective removal of the source of a pathogen to a crop plant is really the key to the control of the disease since by definition disease is incited by the pathogen. The source may be within the crop agroecosystem in the diseased crop-plant or a weed, as an alternate host, or the insect vector when the vector-micro symbiont relationship borders on mutualism. In virus diseases, propagative viruses which are tansoverial from generation to generation represent a continuous source of inoculum to the plant. Green rice leafhoppers in tropical Japan spread certain virus diseases and also mycoplasma-like organisms. Nephotetix spp transmits a nonpersistent virus, tugro disease, and are predominantly and economically important species. The maintenance of the virus is either in the host insect or the rice plant. To reduce and eliminate the inoculum sources of virus, the removal and destruction both of diseased plants and ratoons are practiced. In any event, both long term and short term measures are employed with resistent varieties in mind. Short term practices do not alone control the disease

because of the inability to remove completely the source of inoculum.

In the case of certain tree-crops where the source of the pathogen is really the diseased plant, destruction of the diseased tree reduces the spread of the disease. Notable examples of this are the poisoning of red ring diseased trees, and sanitary measures in swollen shoot disease of cacao. In these two examples for the treatment to have any permanent value the unanimous cooperation of all the farmers must be had. To this end, the expedient of a 'cordon sanitaire' was exercised in Ghana. The pesticides utilised here are herbicides instead of insecticides. This practice in certain diseases can be effective and almost final when the insect vector also develops within the diseased tree. This is the case of red ring disease. Therefore, properly timed poisoning also eliminated the actual vectors before they are released to the field.

On the other side of the picture, tree poisoning is practically useless when the source of the pathogen is not the diseased tree. One example of this is the picture of lethal yellowing disease in Jamaica and Florida. Often, onset or the disease begins with a single diseased tree or two in an area. Generally a pattern of tree-hopping obtains. The second phase of the disease may occur 6-12 months after near the infected tree. The poisoning of these diseased trees never halted the disease. It would appear instead that the in coming vectors are capable of multiplying in the coconut field and transmitting their infection from one generation to another over a certain period of time. It would appear then that control measures which utilize insecticides are utilized also for that crop in the lower storey.

The effectiveness of such control measures based on source climation can be more fully appreciated with this example, again from coconuts, a crop with which I been working for the last sixteen years. The identical poisoning measures using 'Silvisar 510' were utilized for all diseases resembling Red Ring Disease in Trinidad. However, in one region, Cedros, the method was not working anymore or so it appeared. Two estates had an alarming and unusual increment of disease despite the control measures: respectively 2518 and 2519 diseased trees. On closer examination, this was discovered to be another disease caused by a trypanosomatid protozoan where the source was a weed in the field, Asclepias curassavica, with its own insect fauna, Oncopeltus cingulifer which visited the coconut palms for incidental feeding only. The coconut palm was a new host for the protozoan flagellate and was fatal to the tree whereas there was no effect on the weed. Control of this disease was the elimination of the source plant from the field.

The utililization of pesticides only in control measures

In tropical life, the importance of the agroecosystem is obvious as a controlling factor to insect population growth; when the use of pesticides disturbs the pattern of energy flow and control is modified serous problems occur especially so with the case of vectors and their pathogens. Adjustments can only be made in the longun since there is no winter period which might naturally rectify, to some measure, the change.

Consider now the effects of the utilization of various insecticides against the palm weevils in these coconut agroecosystems. Resistance to the insecticides will develop. How it will turn out is anybody's guess. One thing is certain though, the vectors will not be destroyed as was previously shown. But the palm weevil can be a pest in its own right. The use of insecticides in the wrong way can in fact cause this as parasites and predators are gradually removed. This may be a pest flareback of a different nature. One general feature about vectors is that they, on their own, do not normally cause damage to the crop, but the constant use of insecticides to prevent disease can cause new pests to appear in the tropics very readily on a crop with a vector-borne pathogen.

Commercial use of Nematicides at Worthy Park Estate, Jamaica

by Trevor Falloon, Sugar Industry Research Institute, Jamaica

Abstract

Acting on the results of experiments since the 1950s, designed to combat a root condition causing low plant cane yields, Worthy Park began commercial nematicide applications to affected fields in 1976. Initial treatments with D-D and Telone II, liquid fumigants, were laterly replaced by Furadan granules. Preliminary assessments indicate a yield response in the region of 27%. The operation can, however, result in economic loss in severe drought conditions.

Introduction

Low plant cane yields have been a cause of concern at Worthy Park since the 1950s. [3,4] Considerable research has been conducted into the cause of the problem which appeared to be soil related. [3,4] Indications were that the problem was due more to biotic factors than to soil physical or nutritional characteristics. [3,4] The Luidas gravelly clay loam, which constituted roughly one-third of the Estate's 1600 acres in cane, and which is among the most productive of Jamaican cane soils, was considerably more prone to the problem than the Pennants clay loam which predominated.

Two cane varieties, B4362 and B51415, were particularly susceptible to the root condition. Others such as BJ63132 and B51129 could be grown without noticeable effect. B4362 was, however, among the highest yielding varieties in Jamaica in the 1960s and early 70s, and therefore, Worthy Park would have benefited from being able to grow the variety successfully. [3]

Much effort was therefore directed at devising treatments to modify the soil meso fauna and micro flora in order to induce a yield response. Treatment tried over the years include the following:-

Nematicides: D-D, Telone II, Dowfume, Dorlane, Fumazone, Nemagon, Furadan, [1,2] Nemacur [1,2] and Mocap. [1,2]

Insecticides: Chlordane, Endrin, Telodrin, B.H.C., Basudin and Dieldrin.

Fungicides: Captan, Perenox, Zineb, Terraclor, Crothane, Dexon, and Allyl alcohol.

Insecticide/Fungicide combination: Endrin/Terraclor.

Soil Additives: Filter press mud, molasses, bagasse, dunder and chip stones.[3]

Results of trials, although somewhat inconsistent, indicate the best yield response to D-D of up to 17 tons cane per acre (TCA), significant to 1% level. Chlordane in one trial resulted in a 12 TCA increase.

Nematodes, e.g. Pratylenchus sp. and Helicotylenchus sp., parasitic fungi, e.g. Rhizoctonia sp. and Pythium sp. meso-arthropods, e.g. certain of the Collembola and Symphyllida have all been implicated as possible participants in this "disease complex".

It has been assumed, therefore, that the yield response to fumigrants is due to more that control of nematodes, whose populations are relatively low and which show no direct relationship between quantity and cane condition.[4]

Commercial Applications

By 1976, guided by experimental results, the Estate undertook limited commercial treatment of fields being replanted on the affected Lludias gravelly clay loam.[2] Initially, the liquid fumigants D-D, at 45 gal/ac, and Telone II, at 25 gal/ac were used. The chemicals were gravity fed to a

9 inch soil depth through plastic tubes leading from a tractor-mounted tank, to the back of spring tynes spaced 12 inches apart. The holes were sealed by a roller pulled behind. The setts were planted 2 weeks later.

Sharp increases in the price of liquid fumigants, consequent on the oil crisis, led to a phasing in of the granular formulations. By 1981 all treatments were by granular 10% Furadan, applied in a fertilizer mix, at planting.

Constraints

An accurate assessment of the effect of nematicides under commercial usage is constrained by so many factors that an attempt is being made to develop a suitable computer model by which the effect may be more properly quantified.

Rainfall - Worthy Park is rain fed and conducts negligible irrigation in times of drought. Rainfall therefore has a great impact on cane yield, and, in years of extremes, can mask the effect of all other factors.

Planting time - The month of the year when cane is planted has a significant influence on yield through the inter-relationship between the grand period of growth and the April to June rainy season. Thus, the early planted fields have a considerable advantage over the later to the extent that July planted fields yield, on average, some 65% less than fields planted in January, (Table 1).

Table 1: Average plant cane yield, by month planted, over the period 1962-1980, at Worthy Park

	Jan.	Feb.	Mar.	Apr.	May	June	July
TCA	37.54	32.14	30.61	27.79	26.59	19.18	13.40
	100%	85.6%	81.5%	74.0%	70.8%	51.1%	35.7%

Variety - B4362 and B51415 have proven more responsive to nematicide treatment than others. Inherent varietal characteristics would therefore contribute to yield differences.

Disease - The rust outbreak in 1978 would have added another complicating factor as the two most susceptible varieties turned out to be B4362 and B51415.

Random variation - This not being a controlled experiment, there would have been an extremely high degree of random variation to cloud the results.

Method

In the absence of suitable untreated plant fields, or even untreated portions of fields, with which to make comparisons with treated fields planted to the same variety, at the same time of year, etc., other means of assessing the effect of the treatments had to be devised. One method was to compare yields of particular fields, from the records, in the treated cycle with their average plant cane yields prior to that. Another was to compare yields in the treated cycle to the immediate cycle prior to treatment. Yet another was to compare treated field yields in any given year with the corresponding estate average yields.

Results and Discussion

It was found that cultivation practices, such as pre-harvest burning and varieties had changed so much over more than two plant cycles that it would be invalid to compare yields between say, the 1950s. and 1970s with the hope of isolating the effect of a particular treatment. Also, the Estate plant cane averages, because they would have included fields on the unaffected Pennants clay loam, would also be unsuitable for comparison. Untreated plant cane fields on the Lludias gravelly clay loam were largely unavailable as, more often than not, all fields replanted on this soil type in any given year were treated. This left only the comparison of yield of individual treated fields with their immediately previous untreated yields. Even this had its drawbacks as often it involved variety changes, planting at different times of the years, with quite different rainfall patterns, etc.

Very early in the exercise it was recognised that in 1976, during which the Estate received a mere 36 inches of rain as against an average of 68 inches during the 60s and 70s, the impact of the drought was so great that the yield data unduly influenced the overall averages. The data from that year was therefore not included in the calculations. This apart, the overall results would appear, quite strongly, to justify the treatments. Roughly, a 9 ton increase in cane yield per acre was realised, or some 27% over the previous untreated cycle.

Of the 13 field treated between 1977 and 1981, there was only a single instance in which treatment was not associated with a yield increase, Table 2. The particular field, Therford 1, however, was planted late (June) and in addition, the highly susceptible variety, B4362, was hit by rust

Table 2: Re

Field
Scarlett Pce
Lime Kiln 2
Garden Pce 2
Grandy Pond
Thetford 1
Thetford 3
Banana Walk
Banana Walk
Banana Walk
Garden Pce 3
Scarlett Pce
Thetford 1
Thetford 8
Nursery
Rocky Pt. 2
Craddock
Spring Pce
Valley 3 &
Blithe Pce

disease which struck in that year, 1978, before the cane had developed beyond its more susceptible stage.

Although B4362 was reputed to be most prone to the root condition, the best response, of up to 45.2 TCA was obtained from BJ63132, which is unfortunately susceptible to sugarcane smut disease.

The results also indicate no less a response to Furadan than to D-D or Telone II and so the relative ease of application, and probably lower cost, ought to be encouragement to proceed along that line.

Conclusion

Commercial application of nematicides to the Lluidas gravelly clay loam soil type at Worthy Park has shown encouraging results. There is some risk associated with the practice in that a severe drought, as occurred in 1976, could result in economic loss. The 27% TCA increase so far realised would, however, vindicate the practice. With Worthy Park's traditional good juice quality, this means that more than an extra ton of sugar per acre can be so produced.

Acknowledgements

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APPENDICES

Fourth Session First Parliament Republic of Trinidad and Tobago

REPUBLIC OF TRINIDAD AND TOBAGO

Act No. 42 of 1979

AN ACT to regulate the importation, storage, manufacture, sale, use and transportation of pesticides and toxic chemicals and to provide for the establishment of the Pesticides and Toxic Chemicals Control Board and for matters incidental thereto.

[*Assented to 17th December*, 1979]

ENACTED by the Parliament of Trinidad and Tobago as follows— Enactment

1. This Act may be cited as the Pesticides and Toxic Chemicals Act, 1979. Short title

Interpretation

2. In this Act—

"advertisement" includes any representation by any means whatever for the purpose of promoting directly or indirectly the sale, disposal or use of any controlled product;

"agriculture" means the production and storage of any produce which is grown for consumption or any other purpose and includes the use of land for grazing, forestry and woodland, fish culture, bee culture, market gardening, horticulture and nurseries and animal husbandry;

"analyst" means any person so designated under section 6;

"antiseptic" means any substance or mixture of substances sold or represented principally for its germicidal or anti-microbial use on the skin of man or animal;

"article" includes—

(*a*) any controlled product or any produce to which a pesticide is believed to have been applied, or anything that may have been contaminated with a controlled product;

(*b*) anything used for the manufacture, packaging, storage, application or use of a controlled product; and

(*c*) any labelling, packaging or advertising material used for, or relating to, a controlled product;

"Board" means the Pesticides and Toxic Chemicals Control Board established under section 3;

"carcinogen" means any controlled product that is known to cause or is suspected of causing cancer;

"controlled product" means any pesticide or toxic chemical;

"disinfectant" means any substance or mixture of substances sold or represented principally for its germicidal or antimicrobial action on inanimate objects;

"drug" includes any substance or mixture of substances manufactured, sold or represented for use in—

(*a*) the diagnosis, treatment mitigation or prevention of a disease, disorder, abnormal physical state, or the symptoms thereof, in man or animal; or

(*b*) restoring, correcting or modifying organic functions in man or animal;

"employer" means any person who employs a worker;

"extermination" means the use of a pesticide for the destruction or control of pests in any land or premises or in a vehicle, whether on land or any other place;

"food" has the same meaning as in the Food and Drugs Ordinance, 1960; No. 8 of 1960

"formulating" means the act of preparing or compounding a pesticide in a form in which it is sold or distributed to persons using the pesticide for an extermination;

"importer" in relation to any imported article, includes any person who, whether as owner, consignee, agent or broker is in possession of the article or in any way entitled to the custody or control of it;

"inspector" means any person so designated under section 6;

"label" means any legend, word or mark, symbol or design applied or attached to, included in, belonging to, or accompanying any controlled product or a package thereof;

"manufacture" includes the synthesizing, formulating and packaging of any controlled product;

"manufacturer" means a person who manufactures a controlled product for his own use or for sale;

"medical examiner" means any person so designated under section 6;

"Minister" means the member of the Cabinet for the time being charged with the administration of the subject of Health;

"package" includes anything in which a controlled product is wholly or partly contained, placed or packed;

"pest" means any insect, bird, rodent, fish, mollusc, nematode, fungus, weed, alga, micro-organism or virus, and any other kind of plant or animal life that is injurious, troublesome, or undesirable to any crop, stored produce, food, feed, wood, clothes, textiles or other fabrics, and any other inanimate objects, or which are objectionable from the point of view of public health or hygiene, and includes any ectoparasites of man, and ectoparasites and endoparasites of animals, except that by regulations any pest may be specifically exempted or excluded;

"pesticide" means any substance which by itself, or in combination with other substances, is proposed, represented, or used for destroying or controlling pests but does not include any antiseptic, disinfectant, drug or preservative;

"pest control operator" means any person who, by himself or his employees, assistants, workers or agents applies pesticides or carries out an extermination for a remuneration;

"preservative" has the same meaning as in the Food and Drugs Regulations, 1965; G.N. No. 130 of 1964

"produce" means any crop grown for consumption or other use after severance from the soil, and includes anything ordinarily used, or that may be used in

the composition of food for man or feed for domestic and farm animals, but does not include growing crops;

"Registrar" means any person designated to be Registrar of Pesticides and Toxic Chemicals under section 5;

"regulations" means regulations made by the Minister under section 12;

"sell" includes offer for sale, expose for sale, have in possession for sale, and distribute;

"toxic chemical" means any disinfectant, and any other substance known to be poisonous, corrosive, irritating, sensitizing or harmful to man or animal that is used in agriculture, the arts, commerce or industry, or for any domestic or other purpose but does not include an antiseptic, drug, pesticide or preservative;

"vehicle" includes any vessel, aircraft or container;

"vessel" means anything constructed or used for the carriage on, through or under water of persons or property and includes aircushioned and amphibious vehicles, hydrofoil craft and hovercraft;

"worker" means a person employed under a contract of service or apprenticeship, whether such contract is expressed or implied, or oral or in writing, in any work involving the using or handling of or exposure to any controlled product.

Establishment of Board

3. (1) There is hereby established for the purposes of this Act a Board to be known as the Pesticides and Toxic Chemicals Control Board.

(2) The Board shall consist of the following members:—

(*a*) the Chief Medical Officer;

(*b*) the Chief Technical Officer, Ministry of Agriculture;

(*c*) the Chief Chemist and Director of Food and Drugs;

(*d*) the Director of the Bureau of Standards;

(*e*) the Industrial Inspection Supervisor;

(*f*) not more than four other persons whom the Minister may from time to time appoint as members, of whom—

(i) one shall be a representative of an organisation of workers;

(ii) one shall be a representative of an organisation of employers;

(iii) one shall be a person with specialized knowledge of occupational medicine or industrial hygiene; and

(iv) one shall be a person with specialized knowledge of a branch of agriculture involving the use or effects of pesticides.

(3) In respect of each member of the Board referred to in subsection (2)(*a*) to (*e*), the Minister may appoint an officer from the respective Ministry or the Bureau of Standards, as the case may be, as an alternate member, who may act instead of the respective member at any meeting of the Board.

(4) The appointment under subsection (2)(*f*) or subsection (3) of any person as a member or alternate member of the Board, as the case may be, shall be for such period not exceeding three years as the Minister shall specify at the time of the appointment, but any such member or alternate member shall be eligible for re-appointment.

(5) The Chief Medical Officer and the Chief Technical Officer, Ministry of Agriculture, shall be the Chairman and Deputy Chairman respectively, of the Board.

(6) The Chairman, or in his absence, the Deputy Chairman shall preside at meetings of the Board and where both the Chairman and Deputy Chairman are for any reason unable to preside over a meeting, the members present may appoint a member to preside over that meeting.

(7) The Chairman, or in his absence, the Deputy Chairman or where both the Chairman and the Deputy Chairman are absent, the member appointed under subsection (6) to preside over a meeting, and three other members shall form a quorum.

(8) The decisions of the Board shall be by a majority of votes of members present and in addition to an original vote, in any case in which the voting is equal, the Chairman or Deputy Chairman or the person appointed under subsection (6) to preside over a meeting, as the case may be, shall have a casting vote.

(9) The President may in his discretion direct that such remuneration as he may determine shall be paid to members of the Board.

(10) A member of the Board appointed under subsection (2)(*f*), may resign his office at any time by giving notice to the Minister through the Chairman.

(11) The Board may regulate its own procedures.

Functions of the Board

4. (1) The functions of the Board shall be—

(*a*) to advise the Minister on matters relevant to the making of regulations under this Act;

(*b*) to advise on and monitor the implementation of those regulations; and

(*c*) to furnish such returns as the Minister may from time to time require.

(2) A member of the Board who is a public officer shall have and may exercise in like manner all the powers conferred upon an inspector by this Act.

(3) In the performance of its functions under this Act, the Board shall be subject to such general or special directions as the Minister may give from time to time.

Registrar of Pesticides and Toxic Chemicals

5. (1) The Minister shall designate an officer in the Food and Drugs Division to be the Registrar of Pesticides and Toxic Chemicals.

(2) The Registrar shall be the Secretary of the Board.

(3) The Registrar shall—

(*a*) keep and maintain a Register of Licences, a Register of Pesticides and a Register of Toxic Chemicals;

(*b*) enter in the registers such information as may be prescribed by regulations;

(*c*) give to the inspectors such information as may be necessary for carrying out the purposes of this Act; and

(*d*) perform such other duties as may be imposed upon him by this Act, or in so far as subsection 2 of this section applies, by the Board.

Designation of public officers as analysts, inspectors and medical examiners and appointment of other officers

6. (1) The Minister may designate public officers to be—

(*a*) analysts and inspectors according to their qualification;

(*b*) medical examiners who shall be members of the Medical Board,

for the purposes of this Act, and shall furnish every such analyst, inspector and medical examiner with a certificate of his designation as such.

(2) There may be appointed in the manner authorised by law such number of other officers as may be necessary for the purposes of this Act.

(3) The officers appointed under subsection (2) shall be public officers.

Securing services of consultant

7. The Minister may whenever he considers it necessary cause to be secured the services of a consultant who shall be a person possessing specialised knowledge as to the use and effects of controlled products or any class thereof for the purpose of advising the Minister or the Board in relation to any matter arising under this Act or the regulations.

Powers and duties of inspectors

8. (1) Subject to subsections (2) and (3), an inspector may for the purpose of exercising any of his powers under this Act or the regulations enter at any reasonable time—

(*a*) any vehicle—

(i) in which an extermination is about to be, is being or has been carried out;

(ii) in which a controlled product is about to be, is being or has been transported; or

(iii) in which he has reasonable cause to believe a breach of this Act or the regulations is about to be, is being or has been committed.

(*b*) any land or premises—

(i) on which a controlled product is being or has been, or is about to be used, manufactured, sold, packaged or stored;

(ii) which is being, or has been, or is about to be used for a purpose connected with the use, manufacture, sale, packaging, or storage of a controlled product;

(iii) on which things required by the regulations to be provided or done have been provided or done; or

(iv) which he has reasonable cause to believe to be land or premises falling within subparagraph (i), (ii), or (iii).

(2) Subject to subsection (3), an inspector shall, before entering any vehicle, land or premises mentioned in subsection (1), produce, if so required, to the occupier or person in charge thereof, his certificate of designation or some other duly authenticated document showing, that he is an inspector.

(3) An inspector shall, before entering any premises being a dwelling house, other than a dwelling house in which there are, or are reasonably believed by him to be washing facilities or other things provided in pursuance of this Act or the regulations for the use of persons not living in such dwelling house, cause twenty-four hours' notice in writing of the intended

entry to be given to the occupier or other person in charge of such dwelling house.

(4) An inspector shall have power to do all or any of the following things for the purpose of the execution of this Act or the regulations, that is to say—

(*a*) if he considers it necessary, take with him when entering any vehicle, land or premises mentioned in subsection (1), a police officer, a medical practitioner, a public health inspector and any person who possesses expert knowledge of the use or effects of controlled products or any class thereof;

(*b*) to require the production of, or to seize, inspect and examine, and to copy registers, records, or other documents kept for the purpose of, or require to be kept by the regulations;

(*c*) to make such examinations, inspections, investigations and inquiries as may be necessary to ascertain whether this Act and the regulations are being complied with;

(*d*) to require any person whom he finds in such vehicle or on such land or premises as are mentioned in subsection (1) to give such information as it is in his power to give as to who is the occupier thereof or the employer of workers employed to work thereon;

(*e*) to examine, either alone or in the presence of any other person as the inspector thinks fit, with respect to the observance of the provisions of this Act or the regulations, any person whom he finds in such vehicle or on such land or premises as are mentioned in subsection (1), or whom he has reasonable cause to believe to be, or to have been within the preceding two months, employed thereon, and to require any such person to be so examined and to sign a declaration of the truth of the matters respecting which he is so examined; so, however, that no person

shall be required under this provision to answer any question or to give evidence tending to incriminate himself;

(*f*) to open and examine any package that on reasonable grounds he believes to contain any controlled product;

(*g*) to seize and detain for such time as may be necessary any article by means of which, or in relation to which he reasonably believes any provision of this Act or the regulations has been contravened;

(*h*) to take, without payment, samples of any article where such article is being sold, used or transported or is in storage, and submit them to an analyst for analysis or examination; and

(*i*) to take, without payment, but with the approval of the Comptroller of Customs and Excise, samples of any article when imported into Trinidad and Tobago but not delivered to the importer out of the charge of Customs, and submit them to an analyst for analysis or examination.

Analysis

9. (1) Where an inspector submits to an analyst any sample obtained in accordance with section 8(4)(*h*) and (*i*) the analyst shall make an analysis or examination and issue to the inspector a certificate or report setting forth the results of his analysis or examination.

(2) In this section and in section 18(1), a reference to an inspector shall be construed so as to include a reference to a member of the Board referred to in section 4(2) and to a medical examiner.

Powers of medical examiner

10. (1) A medical examiner shall have and may exercise in like manner all the powers conferred upon an inspector by this Act.

(2) A medical examiner may, with the oral or written consent of any person who he reasonably believes has been harmed by any controlled product or is exposed to any risk or harm by any controlled product, carry out a medical examination of that person and take samples of blood, urine, or any biological material from that person.

(3) A medical examiner may request any medical practitioner to assist him in dealing with poisoning suspected to have been caused by a controlled product.

Detention and forfeiture of articles seized

11. (1) Any article seized by an inspector under this Act may, at the option of the inspector be kept or stored in the building or place where it is seized or be removed to any proper place.

(2) Where an article is seized under this Act, the inspector shall give to the owner or the person in whose possession the article was at the time of the seizure, written notice of the grounds upon which the article was seized and, where appropriate, specify in such notice what might reasonably be done to comply with the provisions of this Act and the regulations.

(3) Subject to subsection (4)—

(*a*) an inspector shall release any article seized by him under this Act when all the provisions of this Act and the regulations with respect thereto have been complied with;

(*b*) where an inspector seizes an article under this Act and the owner thereof or the person in whose possession the article was at the time of the seizure consents in writing to the destruction thereof the article shall thereupon be forfeited to the State and may be destroyed or otherwise disposed of as the Minister may direct on the advice of the Board or as prescribed by the regulations.

(4) Where proceedings have been instituted in respect of a contravention of this Act or the regulations the article seized shall not be released or destroyed before the proceedings are finally concluded.

Regulations

12. (1) The Minister may make regulations for carrying into effect the provisions of this Act and, in particular, may make regulations—

(*a*) prohibiting the manufacture, importation, sale, advertisement and use of any controlled product or any class of controlled products;

(*b*) for controlling the manufacture, importation, method of packaging, labelling, transportation, advertisement, sale, and use of any controlled product or any class of controlled products;

(*c*) for controlling the use of pesticides in agriculture generally, or in particular crops or pests, and for controlling the use of toxic chemicals in agriculture the arts, commerce, industry, or for any domestic or other purposes;

(*d*) for controlling the use of pesticides on produce during its storage or transportation;

(*e*) for controlling the conditions under which controlled products are stored;

(*f*) for protecting workers against the risk of poisoning by controlled products when working in connection with the use of controlled products or when working on land or in any premises on or in which controlled products have been, or are being used, stored or manufactured;

(*g*) for protecting the interest of owners, occupiers, or users of land or premises adjacent to land or premises on or in which controlled products are used, stored, or manufactured;

(*h*) prescribing the maximum permissible levels of any controlled product in any particular kind of produce at the time of marketing or sale, which in the case of food, shall not be inconsistent with any provision of the Food and Drugs Ordinance, 1960 or any regulations made thereunder;

(*i*) respecting the quantities of controlled products which may be imported or manufactured, the types of packages in which controlled products may be imported, transported or sold, and as to the disposal of such packages after use, and as to the disposal of unwanted stocks of

controlled products and of waste materials containing controlled products;

(*j*) requiring the keeping of records by specified persons, the inspection of records, and the furnishing of returns by specified persons of the sales, stocks, and use or disposal of controlled products and other relevant information;

(*k*) imposing restrictions on specified persons or conditions as to the purpose for which, the circumstances in which, or the methods by means of which any controlled product or any class of controlled products may be used, including restrictions or conditions involving a prohibition of the use thereof in particular circumstances;

(*l*) prescribing the procedure for granting licences to operate as pest control operators and imposing restrictions and obligations on pest control operators and their employees;

(*m*) imposing obligations on employers of workers employed to work as described in paragraph (*f*), and on such workers themselves and on other persons using or causing to be used any controlled product;

(*n*) requiring the provision by employers, manufacturers, or workers, and the keeping in good order, and the production when required by an inspector, of protective clothing and equipment, of facilities for washing and cleaning, and of other things needed for protecting persons, clothing, equipment and appliances from contamination by controlled products, or for removing sources of contamination therefrom;

(*o*) requiring the observance of precautions against poisoning by controlled products, including the use of things provided in accordance with the regulations, and the

abstention from eating and drinking, and the use of tobacco in circumstances involving the risk of poisoning;

(*p*) for securing intervals between or limitations of periods of exposure of workers to controlled products to minimize risks of poisoning;

(*q*) requiring the observance of special precautions in the case of persons who by reason of their state of health, age, or other circumstances are subject to particular risks of poisoning by controlled products, or imposing in the case of persons so subject prohibitions whether temporary or permanent, or restrictions on employment for working as described in paragraph (*f*);

(*r*) prescribing measures for investigating or detecting cases in which poisoning by controlled products has occurred or may reasonably be thought to have occurred, including the collection of samples, the making of analyses, and the carrying out of medical examinations, and of blood tests;

(*s*) requiring the provision and keeping in good order and use of facilities for preventative and first aid treatment for poisoning by controlled products;

(*t*) requiring the provision of, and submission to instruction and training in the use of things provided in pursuance of the regulations and in the observance of precautions;

(*u*) prescribing standards not inconsistent with any compulsory standard declared under the Standards Act, 1972 for the composition, or any other property or method of analysis or test of controlled products, and setting limits as to the amount of controlled products that may be present in the air of premises where controlled products are used, manufactured, or stored, or in water or in waste material coming from such premises; Act No. 38 of 1972

(*v*) prescribing the manner and content of any advertisement of a controlled product;

(*w*) prescribing the procedure for seeking registration of any controlled product, and the granting of licences by the Board for the importation or manufacture of any controlled product;

(*x*) regarding the powers and duties of analysts, inspectors and medical examiners and the sampling, seizure, detention and confiscation of articles and the disposal of articles that have been seized or confiscated;

(*y*) requiring the keeping by employers of records of the exposure of workers to controlled products and the keeping of records of medical examinations of workers handling or exposed to controlled products and providing for the availability of such records to workers whether or not still employed by the employer;

(*z*) requiring employers and medical practitioners to report to the Board cases of death, poisoning, injury, incapacity or illness caused by any controlled product;

(*aa*) requiring employers to warn workers orally and by printed notices of the hazards involved in handling controlled products and of the precautions to be taken;

(*bb*) prescribing forms for the purposes of this Act and the regulations;

(*cc*) prescribing the fees to be paid on application for the grant or renewal of a licence or for the registration of a controlled product;

(*dd*) prescribing anything authorised or required to be prescribed under this Act.

(2) Regulations made under this section may—

(*a*) where they relate to the control of the manufacturing, importation, packaging,

labelling, transportation, advertisement, sale and use of any controlled product or any class of controlled product, provide for the establishment of licensing procedure;

(*b*) make different provisions to meet different circumstances, and in particular differences in composition, method of manufacture or use of controlled products dealt with and their poisonous effects under different conditions and on different classes of persons; and

(*c*) provide for the exemption of persons or institutions concerned with scientific education or research in the field of pesticides and toxic chemicals, from the operation of all or any of the regulation where the controlled product is required for the purpose of education or research.

(3) Regulations made under this section shall be subject to negative resolution of Parliament.

(4) Except as provided in section 13, a person who contravenes the provisions of the regulations is guilty of an offence and is liable on summary conviction to a fine of two hundred and fifty dollars and, if the offence in respect of which he was convicted is continued after the conviction, he is guilty of a further offence and liable in respect thereof to a fine of twenty-five dollars for each day on which the offence is so continued.

Offences and penalties

13. (1) A person is guilty of an offence who—

(*a*) manufactures, imports or sells or uses a controlled product in contravention of the regulations, or in breach of any condition subject to which a controlled product was registered, or a licence was granted to him under the regulations;

(*b*) operates as a pest control operator in contravention of the regulations, or in breach of any condition subject to which a licence was granted to him under the regulations;

(*c*) assaults, resists, intimidates or obstructs an inspector in the execution of his duties under this Act or the regulations;

(*d*) by any gratuity, bribe, promise or other inducement prevents or attempts to prevent an inspector from carrying out his duties under this Act or the regulations;

(*e*) fails to comply with any requirement imposed by an inspector under section 8;

(*f*) conceals or prevents any person from appearing before or being examined by an inspector under section 8;

(*g*) knowingly or recklessly makes any false or misleading statement either orally or in writing to any inspector engaged in exercising his powers under this Act or the regulations;

(*h*) fails to keep any record which he is required to keep by the regulations;

(*i*) wilfully makes a false entry in a register, record, return, or other document kept or furnished in pursuance of the regulations, or wilfully makes use of such false entry; or

(*j*) removes, alters or interferes in any way with any article seized under this Act without the authority of the inspector.

(2) In subsection (1), a reference to an inspector shall be construed so as to include a reference to a member of the Board referred to in section 4(2) and to a medical examiner.

(3) A person guilty of an offence under this section is liable—

(*a*) on summary conviction for a first offence to a fine of five hundred dollars, or to imprisonment for six months or to both such fine and imprisonment, and for a subsequent offence to a fine of one thousand dollars or to imprisonment for twelve months or to both such fine and imprisonment;

(*b*) on conviction upon indictment to a fine of five thousand dollars or to imprisonment for three years, or to both such fine and imprisonment.

(4) A person convicted of an offence under this section may, in addition to any other penalty imposed, be disqualified for such period as the court or magistrate thinks fit, from obtaining a licence in respect of any activity relating to controlled products.

(5) No proceedings by way of indictment for an offence against this Act shall be commenced without the written consent of the Director of Public Prosecutions.

Offence by corporation

14. Where an offence against this Act is committed by a body corporate, any person who at the time of the commission of the offence was a director, manager, secretary or other officer thereof, or was purporting to act in any such capacity, shall be deemed to be guilty of that offence, unless he proves that the contravention took place without his consent or connivance and that he exercised all such diligence to prevent the commission of the offence as he ought to have exercised having regard to the nature of his functions in that capacity and to all the circumstances.

Jurisdiction

15. (1) A prosecution under this Act may be instituted, heard, tried, or determined in the court in the district in which the offence was committed or the subject matter of the prosecution arose or in any place where the accused was apprehended or happens to be.

(2) Where a person is found guilty of an offence against this Act the court or magistrate may, before proceeding to conviction, adjourn the proceedings to afford that person an opportunity to modify any article by means of or in relation to which the offence was committed, within such time as the court or magistrate may specify, to bring it into conformity with this Act and the regulations.

(3) Where a person is convicted of an offence against this Act the court or magistrate may order that any article by means of or in relation to which the offence was committed or any article of a similar nature belonging to or in the possession of the defendant or

found with such article, which the court or magistrate reasonably believes to be in contravention of this Act or the regulations, be forfeited and upon such order being made, such article shall be forfeited to the State and may be destroyed or otherwise disposed of as the Minister may direct on the advice of the Board or as prescribed by regulations.

Inspector may prosecute

16. An inspector may prosecute and conduct before a court of summary jurisdiction any information, complaint or other proceeding for an offence against this Act.

Time limit on prosecution

17. A prosecution for a contravention of this Act or the regulations may be instituted at any time within twelve months from the time when the subject-matter of the prosecution arose.

Evidence and sufficiency of proof

18. (1) Subject to this section—

(*a*) a certificate of an analyst stating that he has analysed or examined an article or a sample submitted to him by an inspector and stating the results thereof; and/or

(*b*) a certificate or report of a medical examiner

shall be admissible evidence in a prosecution for a contravention of this Act or the regulations and shall be *prima facie* of the statements contained in the certificate.

(2) No certificate shall be received in evidence under subsection (1) unless the party intending to produce it has, before the trial, given to the party against whom it is intended to be produced fourteen days' notice of such intention and a copy of the certificate.

(3) The party against whom a certificate of an analyst is produced under subsection (1), may, with leave of the court or magistrate, require the attendance of the analyst for the purpose of cross-examination.

(4) The court or magistrate may, where a request is made by a party to the proceedings, cause the part of any sample retained as prescribed by the regulations for future comparison to be analysed or examined by an analyst, other than the analyst whose certificate is then before the court or magistrate.

Financial provisions

19. (1) The expenses incurred in carrying this Act into operation shall be paid out of funds provided by Parliament for the purpose.

(2) Any sums received under or by virtue of this Act by the Comptroller of Accounts shall be paid into the general revenue and shall form part of the Consolidated Fund.

Application to the State

20. This Act binds the State.

Commencement

21. This Act shall come into operation on a date appointed by the President by Proclamation published in the *Gazette*.

Passed in the House of Representatives this 19th day of November, 1979.

R. L. GRIFFITH
Acting Clerk of the House

Passed in the Senate this 27th day of November, 1979.

E. WILLIAMS
Acting Clerk of the Senate

GOVERNMENT PRINTERY, TRINIDAD, TRINIDAD AND TOBAGO—1979

[Price 10 cents]

JAMAICA

No. —1975

I assent,

[L.S.]

Governor-General

AN ACT to Make provision for regulating the importation, manufacture, sale and use of pesticides, for the licensing of pest control operators and for matters connected therewith or incidental thereto.

[ ]

BE IT ENACTED by The Queen's Most Excellent Majesty, by and with the advice and consent of the Senate and House of Representatives of Jamaica, and by the authority of the same, as follows:—

Short title and commencement.

1—This Act may be cited as the Pesticides Act, 1975, and shall come into operation on a day to be appointed by the Minister by notice published in the *Gazette*.

Interpretation.

2—In this Act unless the context otherwise requires—

"active ingredient" means any substance in a pesticide which acts on a pest so as to exterminate it;

"advertise" includes any representation by any means whatever for the purpose of promoting directly or indirectly, the sale or other disposition of a pesticide;

"analyst" means a person so designated pursuant to section 17;

"the Authority" means the Pesticides Control Authority established by section 3;

"chairman" means the chairman of the Authority or any person for the time being performing the functions of the chairman;

"extermination" means the destruction or control of pests by means of the use of a pesticide;

"functions" includes duties and powers;

"inspector" means a person so designated pursuant to section 17;

"label" includes any legend, word, mark, symbol or design applied or attached to, included in, belonging to or accompanying any pesticide;

"manufacturer" means a person engaged in the business of formulating, producing, preparing, mixing or processing any pesticide;

"package" means any container, wrapping, covering or holder in which any pesticide is wholly or partly contained, placed or packed;

"pest" means any insect, fungus, bacterium, nematode, weed, rodent, predatory animal or any other form of plant or animal life, including a virus, which may infest or be detrimental to vegetation, man, animals, or households, present in any environment where not desired, or which may be declared by the Minister, by order, to be a pest;

"pest control operator" means any person who, by himself or his employees, assistants or agents, carries out an extermination by way of trade or for purposes of gain;

"pesticide" means any product, organism, substance or thing that is manufactured, represented, sold or used as a means of directly or indirectly controlling, preventing, destroying, mitigating, attracting or repelling any pest, and includes—

(a) any compound or substance that enhances or modifies or is intended to enhance or modify the physical or chemical characteristics of a pesticide to which it is added; and

(b) any active ingredient used for the manufacture of a pesticide;

"prohibited pesticide" means any pesticide of which the possible effects on the environment, plants, animals or human beings are considered by the Minister to be too dangerous to justify its use, and which is specified in the Second Schedule; Second Schedule.

"Registrar" means the Registrar appointed pursuant to section 6;

"registered premises" means any premises registered pursuant to section 9;

"restricted pesticide" means any pesticide specified in the Third Schedule, and any preparation or mixture containing such pesticide, other than— Third Schedule.

(a) a preparation or mixture in which the quantity of any such pesticide identified by an asterisk is not more than 2% by weight; or

(b) an impregnated resin strip in which the quantity of a restricted pesticide is not more than 20% by weight of dichlorvos;

"sell" includes offer for sale or expose for sale, display or advertise for sale, have in possession for sale and distribute;

"vehicle" includes any vessel or aircraft.

Establishment of Authority.

3—(1) There shall be established for the purposes of this Act a body to be called the Pesticides Control Authority which shall be a body corporate to which the provisions of section 28 of the Interpretation Act, shall apply.

First Schedule.

(2) The provisions of the First Schedule shall have effect with respect to the constitution and procedure of the Authority and otherwise in relation thereto.

Functions of the Authority.

4—The functions of the Authority shall be—

(a) to register pesticides;

(b) to licence persons to import or manufacture registered pesticides;

(c) to authorize persons to sell restricted pesticides;

(d) to register premises in which a restricted pesticide may be sold;

(e) to license pest control operators;

(f) to consider and determine applications made pursuant to this Act and to deal with all aspects of the importation, manufacture, packaging, preparation for sale, sale, disposal and use of pesticides and to advise the Minister on all matters in relation thereto; and

(g) to do such other things as may be expedient or necessary for the proper performance of its functions under this Act.

Policy directions.

5—The Minister may, after consultation with the chairman, give to the Authority directions of a general character as to the policy to be followed in the performance of any of its functions, and the Authority shall give effect to such directions.

Appointment of Registrar and other officers and servants.

6—The Authority shall appoint a Registrar and may engage such other employees as it thinks necessary for the proper carrying out of the provisions of this Act at such remuneration and on such terms and conditions as it thinks fit:

Provided that no salary in excess of five thousand dollars per annum shall be assigned to any post without the prior approval of the Minister.

Registration of pesticides.

7—No person shall manufacture, import, advertise or sell any pesticide unless such pesticide is registered in the prescribed manner.

No person shall manufacture, or import any pesticide unless he first obtains in the prescribed manner a licence to manufacture or import, as the case may require, that pesticide.

Authorization to sell restricted pesticides and registration of premises.

9—(1) No person shall sell a restricted pesticide unless—

(a) he is authorized in the prescribed manner so to do;

(b) the premises in which the sale is carried out has been registered in the prescribed manner for the purpose; and

(c) the sale is carried out in accordance with such other requirements as may be prescribed.

(2) The Minister may from time to time, after consultation with the Authority, by order, amend the list of restricted pesticides specified in the Third Schedule.

Third Schedule.

Prohibition on extermination for reward without licence.

10—(1) No person shall engage in or perform or offer to perform an extermination for reward unless he is licensed as a pest control operator by the Authority in the prescribed manner or, subject to subsection (2), is an employee of such operator.

(2) No person shall serve as an employee of a pest control operator for the purpose of carrying out an extermination unless he complies with the regulations for the time being in force relating to employees of pest control operators.

Registers which shall be kept.

11—(1) The Authority shall cause the Registrar to keep in such form as it may from time to time determine—

(a) a register to be known as the Register of Pesticides

in which shall be entered the name and prescribed particulars of any pesticide registered under this Act;

(b) a register to be known as the Register of Licensees in which shall be entered the name and prescribed particulars of every person licensed under this Act to manufacture or import a registered pesticide:

(c) a register to be known as the Register of Authorized Persons and Registered Premises in which shall be entered the name and prescribed particulars of any person authorized under this Act to sell a restricted pesticide and the prescribed particulars of the premises registered by that person for the purpose of such sale;

(d) a register to be known as the Register of Pest Control Operators in which shall be entered the name and prescribed particulars of any person licensed under this Act as a pest control operator.

(2) The registers kept pursuant to subsection (1) shall be open to inspection by any member of the public at all reasonable times and a copy of each register shall be published in the *Gazette* at such times as may be prescribed.

(3) Every application for the registration of a pesticide, for a licence to manufacture or import a registered pesticide, for authorization to sell a restricted pesticide, for registration of the premises in which such restricted pesticide may be sold, or for registration as a pest control operator, shall be made in the prescribed form and be accompanied by the relevant prescribed fee; and, subject to the provisions of this Act, the Authority may grant any such application on such terms and conditions as it thinks fit, may refuse any such application, and may at any time after an application has been granted, revoke any licence, certificate or authorization issued pursuant to that application.

(4) The Registrar shall issue to every person whose application made pursuant to this section is granted, the appropriate licence or certificate of registration or authorization, as the case may require, in the prescribed form.

Corrections of registers.

12—It shall be the duty of the Registrar—

(a) to remove from any of the registers mentioned in subsection (1) of section 11 any entry which the Authority directs him in writing to remove;

(b) to correct in accordance with the Authority's directions any entry in any such register which the Authority directs him in writing to correct as being in the opinion of the Authority an entry which was incorrectly made; and

(c) to make from time to time any necessary alterations in any prescribed particulars contained in any of such registers.

Suspension and deletion of entry from register.

13—(1) If any person who has obtained any registration, licence or authorization pursuant to this Act, is found upon enquiry by the Authority to have procured such registration, licence or authorization, as the case may be, as a result of any misleading, false or fraudulent representation, the Authority may if it thinks fit, either suspend that registration, licence or authorization, as the case may be, for a period not exceeding one year or direct the Registrar to delete the relevant entry from the appropriate register.

(2) The Authority may at any time if it thinks just, direct any entry which has been deleted from a register pursuant to subsection (1) to be reinstated.

(3) The Authority may, as soon as practicable after—

(a) any registration, licence or authorization has been suspended or deleted from a register; or

(b) the reinstatement of any registration, licence or authorization which was deleted from a register,

cause notice of the appropriate fact to be published in the *Gazette*.

(4) Whenever any registration, licence or authorization is deleted from a register, the Authority may in writing require the person to whom such registration, licence or authorization had been granted to return to the Registrar the relevant certificate or licence, as the case may be, and such person shall comply with that requirement.

Prohibited pesticides. Second Schedule.

14.-(1) The pesticides specified in the Second Schedule shall be prohibited pesticides for the purposes of this Act, and accordingly shall not be brought into or used in the Island.

(2) The Minister may from time to time, after consultation with the Authority, by order amend the list of prohibited pesticides specified in the Second Schedule.

(3) An order made pursuant to subsection (2), may provide for the withdrawal from sale or use, and for the disposal of, any pesticide added to the list of prohibited pesticides.

Prohibition on deceptive advertising.

15—No person shall package, label or advertise any pesticide in a manner that is false, misleading or deceptive, is likely to create an erroneous impression regarding its character, value, quantity, composition, merit or safety, or is inconsistent with the information supplied to the Authority at the time of the application for registration.

Regulations.

16—(1) The Authority may, with the approval of the Minister, make regulations—

(a) for the registration of pesticides;

(b) respecting experimental samples of pesticides and matters related thereto;

(c) for the licensing of persons to import or manufacture registered pesticides;

(d) relating to restricted pesticides, the authorization and the eligibility therefor of persons to sell

restricted pesticides and the premises in which such pesticides may be sold;

(e) relating to pest control operators, their employees and any medical or other examination which they may be required to undergo, and fixing the amount and type of insurance or bond to be carried or furnished by registered pest control operators;

(f) as respects the labelling, packaging, storage, transportation and use of pesticides;

(g) specifying the pesticides which may only be used by or under the direct supervision of a registered pest control operator or other specified person;

(h) governing the aerial application of pesticides;

(i) providing for the keeping of books and records by authorized persons, by persons licensed under this Act to manufacture or import registered pesticides and by pest control operators;

(j) relating to the designation of inspectors and official analysts, and the taking and analysing of samples;

(k) for matters relating to examinations by registered medical practitioners of various persons having contact with pesticides;

(l) prescribing the protective clothing to be worn and other precautions to be taken by persons handling or having contact with particular pesticides or classes thereof and imposing obligations on employers of such persons with respect thereto;

(m) prescribing the permissible level of any pesticide or breakdown product thereof, at any specified time, in any kind of plant or animal product intended for consumption by human beings or domestic animals;

(n) regulating the periods during which particular pesticides may or may not be used on certain agricultural crops;

(o) respecting the disposal of pesticides and packages;

(p) for the protection of persons who may suffer damage as a result of the use, storage, manufacture or packaging of pesticides by others;

(q) exempting certain substances which may be used as pesticides from the provisions of this Act when being used otherwise than as pesticides;

(r) prescribing fees and forms in respect of any registration, licence or authorization under this Act; and

(s) for giving further and better effect to the provisions of this Act and prescribing any other matter or thing, whether similar to the foregoing or not, which may be or is required by this Act to be prescribed.

(2) Notwithstanding anything contained in section 29 of the Interpretation Act, regulations under this section may provide in respect of a breach of any of the provisions thereof that the offender shall be liable on summary conviction in a Resident Magistrate's Court to such fine not exceeding five hundred dollars or to such term of imprisonment with hard labour not exceeding six months or to both such fine and imprisonment as may be specified therein.

Designation of officers.

17—The Minister may from time to time designate any person whether by name or by the title of his office to be an inspector or an analyst for the purposes of this Act.

Powers and duties of inspector.

18—(1) An inspector may at any reasonable time—

(a) enter—

(i) any premises or vehicle in which an extermination is being carried out;

(ii) any premises where pesticides are manufactured, stored, kept for sale or disposed of;

(iii) any vehicle in which pesticides are transported, and

(iv) any other premises or vehicle in which he has reasonable cause to believe any breach of this Act has been or is being committed,

and may make such examinations and enquiries and take such samples free of charge as he may deem necessary;

(b) open and examine any receptacle or package found in any premises or vehicle mentioned in paragraph (a) that he reasonably believes contains any pesticide;

(c) examine any books, documents or other records found in any premises or vehicle mentioned in paragraph (a) which he reasonably believes contain any information which may assist in the enforcement of this Act, and make copies thereof or extracts therefrom;

(d) seize and detain any article by or in relation to which he reasonably believes any provision of this Act has been contravened, so, however, that any article so seized may, at the option of an inspector, be stored or kept in the premises where it was seized, or may on his direction be removed to any other place which he considers satisfactory for the purpose.

(2) An inspector shall be furnished with a certificate of designation and on entering any premises or vehicle pursuant to subsection (1) he shall, if required so to do, produce the certificate to the person in charge of the premises or vehicle.

(3) The owner or person in charge of any premises or vehicle entered by an inspector pursuant to subsection (1), and every person found therein, shall give the inspector all reasonable assistance in their power and shall furnish him with such information in their possession as he may reasonably require.

(4) An inspector may examine or analyse any article seized by him or any sample therefrom, or any sample taken

by him, or submit such article or sample to an analyst for examination or analysis.

Certificate of examination or analysis.

19—(1) Where an inspector or analyst has made an examination or analysis pursuant to section 18, he may issue a certificate setting out the result of his examination or analysis, as the case may be.

(2) The certificate of an inspector or analyst stating that he has examined or analysed an article or sample for the purposes of this Act and stating the result of his examination or analysis, as the case may be, shall be admissible in evidence in a prosecution for contravention of this Act and shall be *prima facie* proof of the statements contained in the certificate, but the party against whom it is produced may require the attendance of the inspector or analyst issuing the certificate for the purpose of cross-examining him.

Offences.

20—(1) Every person who—

(a) contravenes any of the provisions of this Act;

(b) with intent to deceive—

(i) forges or uses or lends to or allows to be used by another person any licence or certificate issued pursuant to this Act; or

(ii) makes or has in his possession any document so closely resembling such licence or certificate as to be calculated to deceive; or

(c) assaults or obstructs any inspector or other officer designated or appointed as the case may be under this Act, acting in the performance of his functions pursuant to this Act; or

(d) without proper authority interferes with, or disposes of, any article seized or detained pursuant to paragraph (d) of subsection (1) of section 18; or

(e) bribes or attempts to bribe any inspector or other officer designated or appointed as the case may be under this Act, in connection with any matter

arising in the performance of any of his functions pursuant to this Act; or

(f) knowingly gives false or misleading information to any inspector or other officer designated or appointed as the case may be under this Act; or

(g) being an inspector or other officer designated or appointed under this Act as the case may be, accepts or solicits any bribe in connection with any matter arising in the performance of any of his functions pursuant to this Act,

shall be guilty of an offence and shall be liable on summary conviction before a Resident Magistrate to a fine not exceeding five hundred dollars or to imprisonment for a term not exceeding six months.

(2) A prosecution for an offence under paragraph (d) or (f) of subsection (1) shall not be instituted without the sanction of the Director of Public Prosecutions.

Appeals to Minister.

21—Any person aggrieved by any decision of the Authority may appeal to the Minister against such decision within such time and in such manner as may be prescribed.

FIRST SCHEDULE (Section 3)

Constitution of Authority.

1. The Authority shall consist of not more than fourteen members being persons appearing to the Minister to have ability and experience in the fields of plant protection, food storage, pesticide chemistry, public health, food chemistry, the pest control industry, and matters related thereto.

Tenure of office.

2. The appointment of a member shall, subject to the provisions of this Schedule, be for a period not exceeding three years and such member shall be eligible for re-appointment.

Chairman.

3. The Minister shall appoint one of the members to be chairman thereof.

Acting appointments.

4. If the chairman or any other member is absent or unable to act, the Minister may appoint any person to act in the place of the chairman or such member.

Resignations.

5. (1) Any member other than the chairman may at any time resign his office by instrument in writing addressed to the Minister and transmitted through the chairman and from the date of receipt by the

Minister of such instrument that member shall cease to be a member of the Authority.

(2) The chairman may at any time resign his office by instrument in writing addressed to the Minister and such resignation shall take effect as from the date of receipt by the Minister of that instrument.

Revocation of appointments.

6. The Minister may at any time revoke the appointment of any member if he thinks it expedient so to do.

Filling of vacancies.

7. If any vacancy occurs in the membership such vacancy shall be filled by the appointment of another member by the Minister, and in making such appointment, the Minister shall have regard to the provisions of paragraph 1.

Gazetting of membership.

8. The names of all members as first constituted and every change in the membership shall be published in the *Gazette*.

Co-option of members.

9. The Authority may co-opt such persons, whether Government officers or otherwise, to attend particular meetings or parts thereof, as it thinks fit.

Funds of the Authority.

10. The funds of the Authority shall consist of such moneys as may from time to time be placed at its disposition for the purposes of this Act by Parliament, and such other moneys as may be lawfully paid to the Authority.

Accounts and audit.

11. The Authority shall keep proper accounts of its receipts, payments, assets and liabilities, and such accounts shall be audited annually by an auditor appointed in each year by the Authority with the approval of the Minister.

Annual report and estimates.

12. (1) The Authority shall not later than three months after the end of each financial year, cause to be made and transmitted to the Minister, a report of its activities during the preceding financial year, including a statement of its accounts, audited in accordance with paragraph 11, and the Minister shall cause copies of such report, together with the auditor's report, to be laid on the Table of the House of Representatives and of the Senate.

(2) The Authority shall, before a date specified by the Minister, submit to the Minister for his approval estimates of revenue and expenditure for the ensuing financial year.

Seal and execution of documents.

13. (1) The seal of the Authority shall be kept in the custody of the chairman or the Registrar and shall be affixed to instruments pursuant to a resolution of the Authority in the presence of the chairman or any other member of the Authority, and the Registrar.

(2) The seal of the Authority shall be authenticated by the signatures of the chairman or any other member authorized to act in that behalf, and the Registrar.

(3) All documents other than those required by law to be under seal made by and all decisions of the Authority may be signified

under the hand of the chairman, or any other member authorized in that behalf, or the Registrar.

Procedure and meetings.

14. (1) The Authority shall meet at such times as may be expedient for the transaction of its business and such meetings shall be held at such places and times and on such days as the Authority may determine.

(2) The chairman shall preside at all meetings of the Authority at which he is present, and in the case of the chairman's absence from any meeting, the members present and forming a quorum shall elect one of their number to preside at that meeting.

(3) The chairman may at any time call a special meeting of the Authority and shall call a special meeting within seven days of the receipt of a written requisition for that purpose addressed to him by any three members of the Authority.

(4) A quorum of the Authority shall be four.

(5) The decisions of the Authority shall be by a majority of votes and, in addition to an original vote, the chairman or other person presiding at a meeting shall have a casting vote in any case in which the voting is equal.

(6) Minutes in proper form of each meeting of the Authority shall be kept.

(7) The validity of the proceedings of the Authority shall not be affected by any vacancy amongst the members thereof or by any defect in the appointment of any member thereof.

Committees.

15. (1) The Authority may appoint such committees as it thinks fit, and may delegate to any committee so appointed the power and authority to carry out on its behalf such functions as the Authority may determine, so, however, that no committee so appointed shall have the power to make regulations.

(2) The constitution of any committee appointed pursuant to sub-paragraph (1) shall be determined by the Authority.

(3) The validity of the proceedings of a committee appointed pursuant to this paragraph shall not be affected by any vacancy amongst the members thereof or by any defect in the appointment of a member thereof.

(4) The provisions of paragraph 16 shall apply to a member of a committee in like manner as they apply to a member of the Authority.

Protection of members.

16. (1) No member of the Authority shall be personally liable for any act or default of the Authority done or omitted to be done in good faith in the course of the operations of the Authority.

(2) Where any member of the Authority is exempt from liability by reason only of the provisions of this paragraph, the Authority shall be liable to the extent that it would be if the member was a servant or agent of the Authority.

Remuneration of members.

17. There shall be paid from the funds of the Authority to the chairman and other members of the Authority such remuneration whether by way of honorarium, salary or fees, and such allowances as the Minister may determine.

Office of chairman or member of Authority not public office.

18. The office of chairman or member of the Authority shall not be a public office for the purposes of Chapter V of the Constitution of Jamaica.

SECOND SCHEDULE (Sections 2 and 14)

Prohibited Pesticides

aldicarb (Temik)
azinphos-ethyl (Gusathion A)
azinphos-methyl (Gusathion M. Guthion)
demeton (Systox)
dicrotophos (Bidrin)
dimefox (Pestox XIV)
DNOC
EPN
fensulfothion (Dasanit, Terracur P)
fluenetil (Lambrol)
fonofos (Dyfonate)
Gophacide
parathion
parathion-methyl
phorate (Thimet)
schradan
sulfotep
TEPP
thionazin (Nemofos, Zinophos)
Zectran

THIRD SCHEDULE (Sections 2 and 9)

Restricted Pesticides

Abate
acrylonitrile
aldrin
alpha naphthyl thiourea (Antu)
aluminium phosphide
arsenates, lead, copper and calcium
arsenites, sodium and potassium

THIRD SCHEDULE (Sections 2 and 9)

Restricted Pesticides, *contd.*

Nemacur
nicotine sulphate
oxydemeton-methyl (Metasystox—R)
oxydisulfoton (Disyston—S)
paraquat (Gramoxone)
Paris Green
Pentachlorophenol
phosphamidon (Dimecron)
propoxur (Baygon, Unden)
prothoate (Fac)
red squill
sodium fluoride
sodium fluoro
acetate ("1080")
strychnine
TDE (DDD)
thallium sulphate
toxaphene
Vorlex, Trapex, Di-Trapex
White arsenic
White phosphorus
zinc phosphide

Passed in the House of Representatives with (4) amendments this 26th day of February, 1975.

R. S. MACPHERSON,
Speaker.

Passed in the Senate this 7th day of March, 1975.

RICHARD BYFIELD,
President.

This printed impression has been carefully compared by me with the authenticated impression of the foregoing Act, and has been found by me to be a true and correct printed copy of the said Act.

Clerk to Houses of Parliament

COMPULSORY

TRINIDAD AND TOBAGO STANDARD

Guide on

THE CLASSIFICATION OF PESTICIDES AND CERTAIN TOXIC CHEMICALS

TTS 6 20 401 : 1980

Trinidad and Tobago Bureau of Standards

TRINIDAD AND TOBAGO STANDARD
Guide on
THE CLASSIFICATION OF PESTICIDES AND CERTAIN TOXIC CHEMICALS

The Committees responsible for the formulation of this Trinidad and Tobago Standard are as follows:

SECTIONAL COMMITTEE ON GOODS FOR USE IN AGRICULTURE

Professor Nazeer Ahmad – Chairman

Dr Earl Chandool – Consultant, personal capacity

Dr Laurence Iton – Consultant, personal capacity

and representatives of

Agricultural Society of Trinidad and Tobago

Chemistry, Food and Drugs Division, Ministry of Health

Trinidad and Tobago Chamber of Industry and Commerce

Trinidad Manufacturer's Association

Ministry of Agriculture

Trinidad and Tobago Bureau of Standards

SPECIFICATIONS COMMITTEE ON PESTICIDES

Mr Walter Celestain – Chairman, Chemistry, Food and Drugs Division, Ministry of Health

and representatives of

Factory Inspectorate, Division of the Ministry of Labour

Ministry of Health

Caribbean Agricultural Research and Development Institute

Ministry of Agriculture

Trinidad and Tobago Bureau of Standards

CONTENTS

0 FOREWORD

0.1 These requirements were declared a Trinidad and Tobago Standard with effect from August 29, 1980 when the draft finalized by the Sectional Committee on Good For Use in Agriculture was approved by the Standards Council.

0.2 This standard is intended to provide guidance on the classification of pesticides and certain toxic chemicals sometimes used in agriculture; they are classified according to the degree of hazard that they present during manufacture, storage, handling, applicaiton or use.

0.3 Such a classification is needed in order to formulate appropriate procedures for handling these substances and to determine the kind of labelling and information which should be provided for users.

0.4 The following are some of the more important factors which are to be considered in devising such a classification:

(a) the different effects of different formulations containing the same active substance or substances;
(b) the different degrees of hazard resulting from absorption through the mouth, through the skin and by the inhalation;
(c) the lack of correlation between LD_{50} values obtained by experiments with animals and with values likely to apply to man;
(d) the differences of climate and crops which may affect conditions of use in the Caribbean area as compared with other countries where classifications have already been set up; and
(e) the level of training and the practices common among farmers in Trinidad and Tobago.

0.5 In preparing this guide the following points were given the most weightage:

(a) the latest available LD_{50} values (oral and dermal toxicity) for pure active substances and some of their more common commercial formulations;
(b) the amount of any commercial formulation which would have to be absorbed and which would contain amounts of their pure active substances proportionate to the LD_{50} values thus representing the most hazardous situation likely to be encountered in the house, in the garden or in the field;

NOTE – It is regognised that LD_{50} values for different test animals are not necessarily related to LD_{50} values that would apply to humans.

(c) the irreversibility, or difficulty of treating cases of poisoning due to a particular active substance in the circumstances of the Caribbean area; and
(d) the deterioration of packages of certain pesticides over long storage periods.

0.5.1 Consideration has been given to the relationship between toxicity and hazard. Whereas the toxicity of a pesticide or chemical is its ability to produce a harmful effect on live animals and humans, its hazard is the probability that it will do so. To what extent such a material is hazardous is dependent upon its toxicity principally, and, to a lesser extent, other factors including those outlined in 0.4 above.

0.6 In preparing this guide, assistance has been derived from the following publications:

(a) COMMONWEALTH CARIBBEAN PESTICIDES CONTROL UNIT: Suggestions for list of Restricted Pesticides. Trinidad, 1973;
(b) WORLD HEALTH ORGANIZATION: Tentative Classification of Pesticides by Hazard. Geneva, 1974 (Ref VBC/74.3);
(c) COMMONWEALTH DEPARTMENT OF HEALTH: Australian National Poison Manual. Canberra, 1969;
(d) KANSAS STATE UNIVERSITY: Insecticides Handbook. Kansas, 1972;
(e) CENTRE FOR OVERSEAS PEST RESEARCH: PANS Pesticides Index. London, 1976;
(f) WORLD HEALTH ORGANIZAITON (WHO): Chronicle, Volume 29:397-401 (1975): Recommended Classification of Pesticides by Hazard;
(g) UNITED NATIONS NEW YORK: Transport of Dangerous Goods – Recommendations prepared by the Committee of Experts on the Transport of Dangerous Goods (1977); and
(h) THE CHEMICAL INDUSTRIES ASSOCIATION, Alembri House, 93 Albert Embankment, London SE1 7TU: A Guide to the Regulations for the Labelling and Marking of Containers and Vehicles, First Edition 1977.

0.6.1 Appendices A and B of this standard are reproduced from pages 399, 400 and 401 of 0.6 (f) above. The assistance obtained in this regard is specially acknowledged.

0.7 The guide covers pesticides in trade and in use in Trinidad and Tobago in 1979, together with some which are obsolete, or which are likely to be introduced. Also included are some defoliants and plant desiccants which are toxic, and which are not strictly defined as pesticides in draft legislation now under consideration

in Trinidad and Tobago. It is expected that this classification would be used when legislation is implemented, and amendments, additions and deletions would be made as new substances come into use, or as more information on hazards is received.

0.3 This standard is to be used in conjunction with TTS 21 10 500 Part 8 – Labelling of Retail Packages of Pesticides.

1.0 SCOPE

1.1 This standard provides guidelines for classifying pesticides, defoliants and plant desiccants according to the degree of hazard which they present to human life.

1.2 Four hazard classes are identified and some of the more commonly used pesticides have been placed into one or more of these classes.

NOTE – In Appendices A and B are the names of some commonly used pesticides, defoliants and plant desiccants listed according to their hazard classes. Amendments to the list will be made periodically as required.

2.0 DEFINITIONS

2.1 For the purpose of this standard the following definitions shall apply:

2.1.1 Common Name means the name of the active substance of a pesticide, defoliant or desiccant as given in:

AS 1719:1975	Recommended Common Names for Pesticides, or
BS 1831:1967	Recommended Common Names for Pesticides, or
ISO R/1750 – 1970	Recommended Names for Pesticides, or
TTS	Recommended Names for Pesticides*,

or, if no such name is given in these publications, the name under which it is known in the trade in Trinidad and Tobago.

2.1.2 Defoliant means any active substance which, by itself or in combination with other substances, when applied to plants by spraying, dusting or otherwise, causes them to shed their leaves.

2.1.3 Hazard includes any harm or risk to the health or safety of humans or animals which may arise during handling and use of a pesticide or agricultural chemical.

2.1.4 Hazard Class means the class in which a pesticide, defoliant or plant desiccant is placed after consideration of all foreseeable hazards which might occur whenever man is exposed to it.

2.1.5 LD_{50} for acute oral toxicity means that dose of the substance administered by feeding which is most likely to cause death within 14 days in one-half of both male and female young adult white rats weighing about 200-300 grams. The number of animals tested shall be sufficient to give a statistically significant result and be in conformity with good toxicological practices. The result is expressed in milligrams per kg body weight.

2.1.5.1 LD_{50} for acute dermal toxicity means that dose of the substance which, administered by continuous contact for 24 hours with the bare skin of the rat is most likely to cause death within 14 days in one-half of the animals tested. The number of animals tested shall be sufficient to give a stastically significant result and be in conformity with good toxicological practices. The result is expressed in milligrams per kg body weight.

2.1.6 Pesticide means any active substance (including toxic agricultural chemicals) which, by itself or in combination with other substances, is proposed, represented, or used for destroying or controlling pests, but does not include any antiseptic, disinfectant, drug or preservative used in food.

NOTE – In the retail trade a pesticide generally consists of one or more active substances mixed into a solvent or diluent.

2.1.7 Plant Desiccant means any active substance which, by itself or in combination with other substances, when applied to plants by spraying, dusting or otherwise, causes them to lose moisture resulting in their 'drying up'

2.1.8 Toxic, as applied to pesticides and agricultural chemicals, means capable of producing serious acute and/or chronic health risks and even death to humans and animals through ingestion, dermal contact or inhalation.

2.1.9 Toxicity, as applied to pesticides and agricultural chemicals, is the ability of any of these materials to produce a harmful effect on humans and animals through ingestion, dermal contact or inhalation. See also Toxic, above 2.1.8.

**In preparation*

3.0 GUIDELINES FOR CLASSIFICATION

3.1 A pesticide or other toxic agricultural chemical may be placed in one or more of the following hazard classes as indicated in rows (1) to (4) inclusive, of Table 1.

(a) Hazard Class Ia – Extremely hazardous
(b) Hazard Class Ib – Highly hazardous
(c) Hazard Class II – Moderately hazardous
(d) Hazard Class III – Slightly hazardous

3.1.1 The principal criterion for classifying pesticides and agricultural chemicals into hazard classes shall be their latest available LD_{50} values and are as indicated in Table 1. This criterion shall take precedence over all other criteria.

TABLE 1
CLASSIFICATION OF PESTICIDES AND AGRICULTURAL CHEMICALS INTO HAZARD CLASSES ACCORDING TO LD_{50} VALUES
(Sub-Clause 3.1.1)

	CLASS (1)	LD_{50} for the rat (mg/kg body-weight)			
		Oral		Dermal	
		Solids (2)	Liquids (3)	Solids (4)	Liquids (5)
(1)	Ia – Extremely hazardous	5 or less	20 or less	10 or less	40 or less
(2)	Ib – Highly hazardous	5 – 50	20 – 200	10 – 100	40 – 400
(3)	II – Moderately hazardous	50 - 500	200 - 2000	100 - 1000	400 -4000
(4)	III – Slightly hazardous	Over 500	Over 2000	Over 1000	Over 4000

NOTE – The LD_{50} values in this table are applicable to the commercially available material whether it be the pure active substance or a preparation or a formulation containing the pure active substance.

3.1.2 Secondary criteria for classifying pesticides and other agricultural chemicals into hazard classes shall be the availability of antidotes (row 1 of Table 2) and type of toxicity (row 2 of Table 2).

TABLE 2
SECONDARY CRITERIA FOR CLASSIFICATION OF PESTICIDES AND AGRICULTURAL CHEMICALS ACCORDING TO AVAILABILITY OF ANTIDOTES AND TYPES OF TOXICITY
(Sub-Clause 3.1.2)

	(1) CRITERIA FOR HAZARD	(2) HAZARD CLASS Ia	(3) HAZARD CLASS Ib	(4) HAZARD CLASS II	(5) HAZARD CLASS III
(1)	Antidotes for pesticides or other toxic agricultural chemicals	not normally readily available	normally readily available	commonly available	commonly available
(2)	Toxic action due to intake of pesticides or other agricultural chemicals	rapid, naturally irreversible, but may be reversible by very scarce antidotes	takes effect over several hours or longer and may be reversible by antidotes	takes effect over one or more days and is reversible by antidotes	takes effect over two or more days and is reversible by antidotes

NOTE – Other criteria for the development of a classification of this type are degree of flammability, degree of explosiveness, corrosiveness and suffocation effects. However, these are more important for the labelling of pesti-

3.2 In cases where, for a particular pesticide or agricultural chemical, the criteria in Table I appear to be inadequate or in cases of doubt about the most appropriate classification for such material, the ruling of the Toxic Chemicals Control Board* or the Bureau of Standards shall be final.

* *Until the Toxic Chemicals Control Board is set up, the ruling of the Bureau of Standards shall be final.*

APPENDIX A

A-1 The following list of pesticides according to hazard classes refer to the technical product (active ingredient) wherever a specific formulation for a preparation is not indicated.

A-2 For new technical products LD_{50} values should be obtained from the manufacturers or latest research literature in order to classify them. For their preparations or formulations the LD_{50} values for these may be computed according to the formula:

$$LD_{50} \text{ of formulation} = \frac{LD_{50} \text{ of active ingredient} \times 100}{\% \text{ of active ingredient in formulation}}$$

The LD_{50} values of solvents, wetting agents, etc should be considered as well and an overall value for the mixed ingredients be obtained for classification of the preparation.

A-3 Class Ia (Extremely Hazardous) Pesticides

A-3.1 acrylonitrile
aldicarb
aluminium phosphide

carbophenothion (80% emulsifiable concentrate)
chlorfenvinphos
chloropicrin
coumachlor
coumarin
crimidine

demephion-O + demephion-S ('demephion')
demeton-O + demeton-S ('demeton') (50% emulsifiable concentrate)
dichlorvos
dicrotophos
difenacoum
dimefox
disulfoton

endrin (24% emulsifiable concentrate)
EPN*
ethion

fensulfothion
fonofos

isodrin
isobenzan

mecarbam
mercuric chloride
methyl bromide (bromemethane)
mevinphos (20%,emulsifiable concentrate)

oxamyl

paraquat
parathion
parathion-methly (80% emulsifiable concentrate)
phorate
phosphamidon

red squill

schradan (60% emulsifiable concentrate, 30% emulsifiable concentrate)
sodium fluoroacetate

"EPN" — O-ethyl O-(4-nitrophenyl) phenylphosphonothioate

TEPP (20% emulsifiable concentrate)
terbufos (15% granules)
thionazin (48% emulsifiable concentrate)

A-4 Class Ib (Highly Hazardous) Pesticides

A-4.1 acrolein
aldrin (30% emulsifiable concentrate)
aldicarb (10% granules)
aminocarb (75% wettable powder)
azinphos-methyl (25% wettable powder, 20% emulsifiable concentrate)
azinphos-ethyl
bendiocarb
binapacryl (40% emulsifiable concentrate)

calcium arsenate
carbofuran
carbophenothion (40% emulsifiable concentrate, 25% wettable powder)
carbophenothion methyl analogue
chlorfenvinphos (32% seed dressing, 24% emulsifiable concentrate)
chlorpyriphos (35% emulsifiable concentrate)
coumatetralyl
crotoxyphos

demephion-O + demephion-S ('demephion') (30% emulsifiable concentrate)
demeton-O + demeton-S-methyl ('demeton') (50% wettable powder)
demeton-S-methyl (50% emulsifiable concentrate)
dialifor
dieldrin (20% emulsifiable concentrate)
DNOC
dinoseb acetate (50% emulsifiable concentrate)
dinobuton (50% wettable powder)
dioxathion (40% emulsifiable concentrate)
diphacinone
disulfoton (10% granules)
endosulfan (35% emulsifiable concentrate)
endothal-sodium (20% aqueous solution)
endothion (50% emulsifiable concentrate)
endrin (50% wettable powder)
EPN* (25% emulsifiable concentrate, 25% wettable powder)
ethion (80% emulsifiable concentrate, 40% emulsifiable concentrate)
ethoprophos

fenamiphos (30%, 40% spray concentrates, 15% and 40% granules)
fensulfothion (25% wettable powder, 10% dust, 5% granules)
fonofos (10% granules)

isodrin (50% wettable powder, 25% emulsifiable concentrate)
isofenphos (emulsifiable concentrate, granules)

lead arsenate
leptophos (emulsifiable concentrate, wettable powder, granules, and dust)

mecarbam (40% emulsifiable concentrate, 68% wettable powder)
medinoterb acetate
methidathion (40% emulsifiable concentrate, 20% emulsifiable concentrate)
monocrotophos
methomyl

*EPN — O-ethyl O-(4-nitrophenyl) phenylphosphonothioate

mevinphos (5% emulsifiable concentrate)
mexacarbate (22% emulsifiable concentrate)
morphothion

nicotine (90% emulsifiable concentrate)
norbromide

oxydemeton-methyl (50% emulsifiable concentrate)
omethoate (dimethoate-met)(80%,50% emulsifiable concentrate)
paraquat compounds (20% to 26% solutions)
parathion (20% emulsifiable concentrate)
parathion-methyl (40% emulsifiable concentrate)
phenkapton
phenylmercury acetate
phorate (5% granules)
phosalone
phosphamidon (50% wettable powder, 20% emulsifiable concentrate)
phosfolan (25% emulsifiable concentrate)
protothoate (20%, 40% emulsifiable concentrate, 40% wettable powder)

thiometon (25% emulsifiable concentrate)
thionazin (10% granules, 5% granules)
triamiphos (25% wettable powder)
trichloronat (20% emulsifiable concentrate)

zinc phosphide

A-5 Class II (Moderately Hazardous) Pesticides

A-5.1 aldrin (50% wettable powder)
allidochlor (40% emulsifiable concentrate)
aminocarb (50% wettable powder)
amidithion (30% emulsifiable concentrate)
azinphos-methyl (5% dust)

bensulide (40% emulsifiable concentrate)
benquinox
binapacryl (25% wettable powder)
bromophos-ethyl (80% emulsifiable concentrate)
bromoxynil (20% emulsifiable concentrate)
BPMC (50% emulsifiable concentrate)
bufencarb (10% granules)

carbaryl
carbophenothion (2% dust)
carbophenothion dimethyl analogue (40% emulsifiable concentrate)
cartap
chlordane (50% emulsifiable concentrate)
chlordecone (50% wettable powder)
chlordimeform
chlorfenvinphos (5% dust)
chlormequat chloride (40% aqueous solution)
chlorobenzilate (50% emulsifiable concentrate)
chlorpyriphos (50% wettable powder)
$C_8H_9O_3PS^*$ (10% granules, 25% emulsifiable concentrate, 25% wettable powder)
crufomate (25% emulsifiable concentrate)

$C_8H_9O_3PS^*$ – 2-methoxy-4H-1,3,2-benzodioxaphosphorin-2-sulphide

2,4-D
dazomet (85% dust)
2,4-DB (40% emulsifiable concentrate)
DDT
di-allate (40% emulsifiable concentrate)
demeton-S-methyl (25% emulsifiable concentrate)
diazinon (60% emulsifiable concentrate)
dibromochloropropane
dichloropropane -dichloropropene mixture
dichloropropene
dichlofluanid
dieldrin (50% wettable powder)
dimethoate
dimexano
dinoseb acetate (40% wettable powder)
dinoterb acetate (25% wettable powder)
dioxacarb (5% powder, 50% wettable powder, 40% liquid concentrate)
diquat compounds (20% solution)
disulfoton (5% granules)
drazoxolon (40% aqueous suspension)

edifenphos (30%, 40% and 50% emulsifiable concentrate 1.5% 2% and 2.5.% dust)
EDB (ethylene dibromide)
endrin (5% granules, 2% dust)
ethion (25% wettable powder)
ethoatemethyl (40% emulsifiable concentrate, 25% wettable powder)

fenitrothion (50% emulsifiable concentrate)
fentin compounds (60% wettable powder)
fenthion (50% emulsifiable concentrate, 40% wettable powder)
formothion (25% emulsifiable concentrate)
fonofos (5% granules)

HCH (BHC) (dusts, wettable powders, oil solutions)
heptachlor

ioxynil octanoate
isaphos (20% and 50% emulsifiable concentrate, 3%, 5%, 10% and 20% granules)
isodrin (5% granules, 2% dust)

Lindane (≥99% gamma-HCH) (50% wettable powder, 20% emulsifiable concentrate)

malathion (50% emulsifiable concentrate)
MCPA (50% emulsifiable concentrate)
mecarbam (25% dust)
mecoprop (50% solution)
medinoterb acetate (25% wettable powder)
methidathion (40% wettable powder)
methiocarb (75% wettable powder)
methomyl (10% granules)
mexacarbate (25% wettable powder)
morfamquat dichloride (20% solution)

naled

parathion (5% dust)
PCP
pentachlorophenol (10% emulsifiable concentrate)

phenkapton (20% emulsifiable concentrate)
phenthoate
phosalone (35% emulsifiable concentrate, 30% wettable powder)
phosmet (50% wettable powder, 30%, 20% emulsifiable concentrate)
pirimicarb (50% wettable powder)
pirimphos – ethyl (25%, 50% emulsifiable concentrate, 10% granules)
profenfos (50%, 40% emulsifiable concentrate)
propoxur (50% wettable powder, 20% emulsifiable concentrate)

quinalphos (20%, 25% emulsifiable concentrate)

rotenone

sodium fluoride
sulfallate (40% emulsifiable concentrate)
2,4,5-T (80%, 50%, 40% emulsifiable concentrate),

terbumeton
thiazafluron (50%, 80% wettable powder)
thiometon
thiram (80% wettable powder)
tri-allate (40% emulsifiable concentrate)
toxaphene (60% emulsifiable concentrate, 40% wettable powder, 20% granules)
triazophos (40% emulsifiable concentrate, 30% wettable powder)
tricamba
trichlorfon (50% emulsifiable concentrate)
tridemorph (75% emulsifiable concentrate)

vamidothion (40% emulsifiable concentrate)

A-6 Class III (Slightly Hazardous) Pesticides

A-6.1 acephate (75% soluble powder)
alachlor (40% emulsifiable concentrate, 15% granules)
aldrin (5% dust)
allethrin
ametryn
amitraz (20% emulsifiable concentrate, 50% wettable powder)
aminotriazole (amitrole)

barban (50% wettable powder)
binapacryl (4% dust)
bioallethrin (d-trans allethrin)
bromofenoxin (50% wettable powder)
bromophosethyl (25% wettable powder)

$C_5H_{12}NS_3$ (Evisect)
chlordecone (10% dust)
cyanofenphos
cyanophos

DDT (50% wettable powder, 50% emulsifiable concentrate)
desmetryne
diazinon (40% wettable powder)
dichlofluanid (50% wettable powder)
dicofol
dimethoate (20% wettable powder)
diphenamid
dithianon (75% wettable powder)
dodine (80% wettable powder)
DSMA

endosulfan (5% dust)
ethion (4% dust)

fenithrothion (40% wettable powder)

isoprocarb

malathion (50% wettable powder)
metaldehyde
metham-sodium
mirex
MSMA

nicotine (11% smokes)

paraquat compounds (5% granules)
parathion (1% dust)
propachlor (65% wettable powder)

ryania

tebuthiuron (80% wettable powder)
trichlorfon (50% wettable powder)
trichloronat (5% granules)

APPENDIX B

B-1 The following is a list of pesticide active ingredients with acute oral LD_{50} for the rat greater than 2000 mg/kg. These have not been classified by the WHO Recommended Scheme.

B-2 Unclassified Pesticides

B-2.1 aluminium ammonium sulphate
aluminium sulphate
ammonium suplhamate
anilazine
anthraquinone
asulam
atrazine
aziprotryne
azobenzene

benazolin
benfluralin
benodanil
benomyl
benzoprop
benzoximate
bifenox
bioresmethrin
biphenyl
bromacil
bromophos
bromopropylate
buturon
butylate

camphor
captafol
captan
carbetamide
carboxin
chloramben
chloranil
chlorbenside
chlorbromuron
chlorbufam
chlorfenson
chloroneb
chlorpropham
chlorthalmethyl
chlorthaldimethyl
chlorothalonil
chlorotoluron
cloropropylate
chloroxuron
cufraneb

dalapon
daminozide
dicamba
dichlobenil
1,4-dichlorbenzene dichlorophen
didoran (ditranil)
diflubenzuron
dimethirimol

dimethrin
dinitroamine
diuron
dodemorph
dodicin

ethephon
ethirimol

fenuron
ferbam
fluometuron
flurodifen
fluorenol
folpet

gibberellic acid
griseofulvin
glyphosate

hexachlorobenzene

iodofenphos
iron (2 +) sulphate
isonoruron

jodfenphos

lenacil
linuron

maleic hydrazide
mancozeb
maneb
mebenil
methabenzthiazuron
metiram
methiuron
methoprotryne
methoxychlor
metobuomuron
metolachlor
metribuzin
monalide

naphthalene
2-naphthoxyacetic acid
1-naphthylacetic acid
neburon
nitrofen

oxine-copper
oxycarboxin
oxytetracycline

pentanochlor
phenmedipham
phenothrin
picloram

profluralin
prometon
prometryn
propazine
propham
propineb
pyrazon
pyridinitril

quinazamid
quassia
quintozene

resmethrin

salicylanilide
secbumeton
siduron
simazine
streptomycin salts
sulphur

tecnazene
terbacil
terbuthylazine
terbutryn
tetrachlorvinphos
tetradifon
tetramethrin
tetrasul
thiabendazole
thiophanate
tiophanate-methyl
trifluralin

zineb

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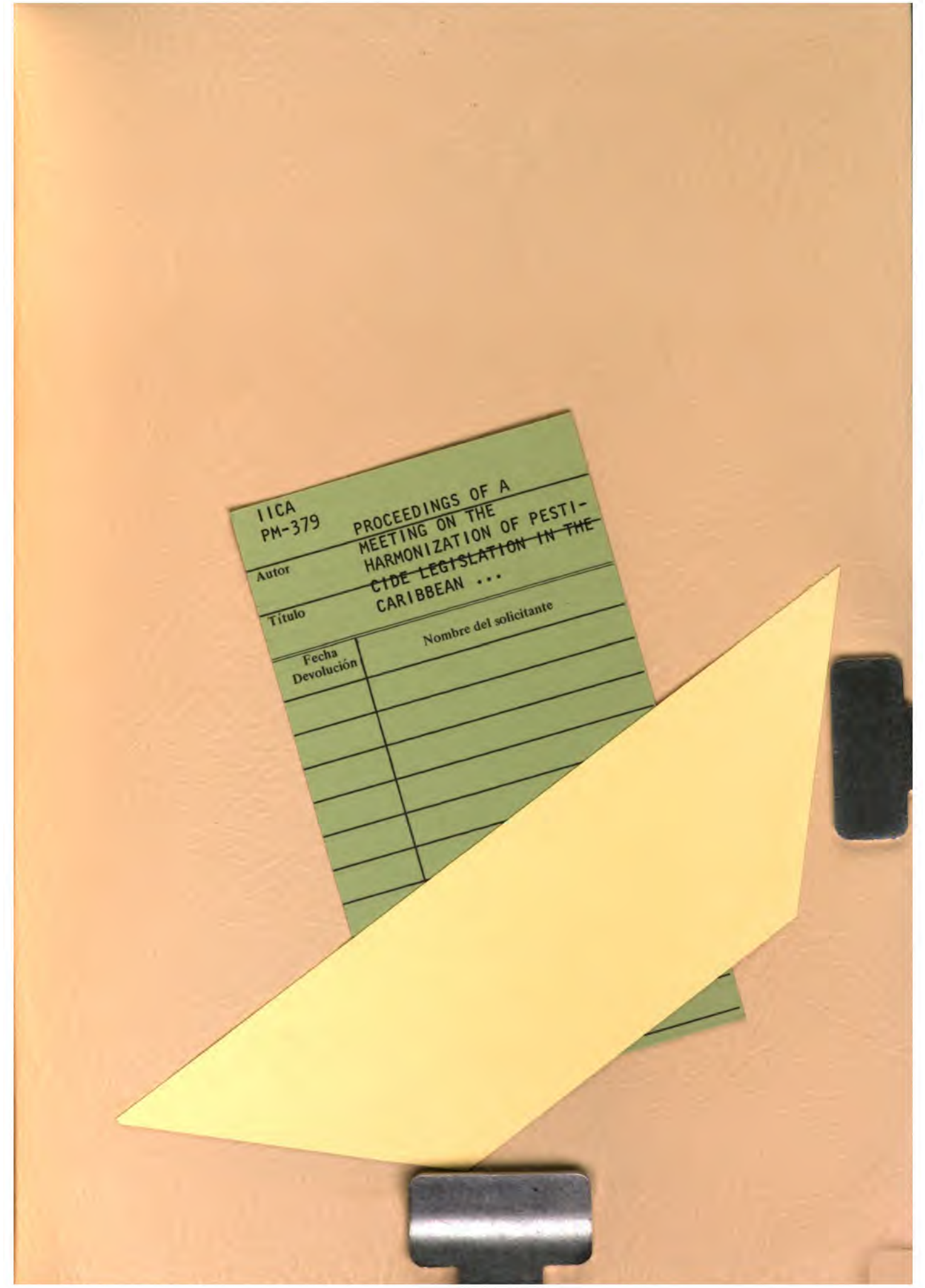
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