



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)



05091



Distr.  
LIMITED

ID/WG.154/18  
28 May 1973

ORIGINAL: ENGLISH

United Nations Industrial Development Organization

---

Workshop on Pesticides

Vienna, Austria, 28 May - 1 June 1973

**PESTICIDE PRODUCTION AND PROBLEMS IN BRAZIL<sup>1/</sup>**

by

Waldemar P. Almeida, Director,  
Division of Animal Biology, Biological Institute,

and

Oswaldo Giannotti, Director,  
Division of Agricultural Pesticides, Biological Institute  
São Paulo, Brazil

---

<sup>1/</sup> The views and opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

id.73-3957

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

CONTENTS

<u>Chapter</u>	<u>Pages</u>
1. Introduction	3
2. Trends in the use, application, and formulation of pesticides in Brazil	4
3. Expansion of the work on Pesticides in Brazil	6
4. Technical and economic factors determining the choice of pesticides for production in Brazil	7
5. Legislative factors determining the choice of pesticides for production in Brazil	8
6. Present status and contemplated development of pesticide production in Brazil	9
7. Potential need for small scale, multi-purpose demonstration pesticide plant in Brazil	10
8. Conclusions	12
9. Recommendations	13
10. References	14
Table I - Insecticides of major use in Brazil	15
Table II- Pesticide Importation, Brazil, 1962 to 1972	16
Table III-Production of some pesticides in Brazil (1970 to 1972)	17

## 1. INTRODUCTION

- 1.1 - The growth of the human population in Brazil is progressing at an annual rate of 3.2%. This development must go with a correspondent increase in the food production. However, if we consider the internal consumption and the possibilities for exportation, a 12% annual increase rate for the Brazilian agriculture must be achieved (Barragat, 1970).
- 1.2 - The mere expansion of the cultivated areas is not sufficient and a higher crop yield by area unit is the real aim to solve the problem of food supply. The correct usage of fertilizers and agricultural pesticides plays a very important role in this challenge.
- 1.3 - Only 28% of the cultivated areas in Brazil receive pesticide treatment (Barragat, 1970) and about 33% of the potential crop yield is lost annually by insect damage, plant diseases and weed competition (Cooperative Programme, 1972).
- 1.4 - On the other hand, the malaria eradication campaign, the Chagas' disease control, and the schistosomiasis control depend on the effective use of pesticides in public health programmes.
- 1.5 - A sharp expansion of the work on pesticides in Brazil took place in the last five years with the development of a UNDP Pesticide Project the FAO being the executing agency and the WHO the cooperating agency.

## 2. TRENDS IN THE USE, APPLICATION, AND FORMULATION OF PESTICIDES IN BRAZIL

2.1 - The general trend in the use of pesticides in Brazil is directed to the gradual decrease of agricultural application of the chlorinated hydrocarbon insecticides and their replacement by organophosphates, carbamates and other compounds which do not represent a hazard as environmental pollutants.

2.2 - The application of chlorinated hydrocarbon pesticides on pastures and directly on cattle is prohibited in Brazil. The agricultural use of these pesticides is permitted in cases where there are no substitutes as far as efficiency and low prices are concerned. DDT and BHC are still important in public health campaigns against malaria and Chagas' disease, respectively.

2.3 - The problems related to the application of the chlorinated hydrocarbon pesticides is weighed against the use of the highly toxic organophosphate compounds.

2.4 - Three fourth of the total agricultural insecticides in Brazil are used in the State of São Paulo and in the neighbour States. The cotton crop makes use of 70% of the pesticides in general and 92% of the DDT utilized for agricultural applications.

2.5 - Cotton, coffee, peanut, soybean, sugar cane and rice plantations are the main Brazilian crops where pesticides are utilized. Table I presents the insecticides of major use in Brazil.

2.6 - Copper salts and the dithiocarbamates may be intensively used in the fight against the coffee rust (Hemileia vastatrix) in the next future. The organic mercurial fungicides are still used as a seed dressing,

however other compounds are being tested in order to decrease or to abolish the use of the organic mercurial fungicides.

2.7 - The application of herbicides is gradually increasing, but the present consumption of these pesticides in Brazil is quite small in relation to the potential need for weed killers.

2.8 - The integrated control of plant pests is being studied in Brazil. This method combines the safe and effective use of pesticides, and the biological techniques of pest control.

2.9 - From 1962 to 1972, the annual importation of pesticides in Brazil varied from 11 807 to 50 400 tons/year (Table II). Pesticides of technical grade were the most common items in these importations.

2.10 - The Brazilian production of pesticides from 1970 to 1972 represented 34% to 26% of the total consumption in the country.

2.11 - As far as the formulations are concerned, parathions, DDT and BHC in dust formulations are rather intensively applied against cotton and coffee pests. Wettable powders and emulsion concentrates have a variety of uses in many cultures.

2.12 - The use of LVC formulations is rapidly increasing and there is a great interest in this type of formulation. The enforcement of the Brazilian legislation on LVC formulation is being put into effect and only the formulations which present low dermal toxicity and low speed of penetration through the skin are registered by the Ministry of Agriculture. These tests are carried out in the Biological Institute of São Paulo.

### 3. EXPANSION OF THE WORK ON PESTICIDES IN BRAZIL

3.1 - A sharp expansion of the work on pesticides in Brazil took place in the last five years as a result of the Project on the Expansion of the Work on pesticides at the Biological Institute of São Paulo, Brazil (UNDP/BRA/67/524). This project provided very good laboratory facilities for chemical and physical analyses of pesticides and their formulations, residue analyses, insect toxicology, mammalian toxicology and bio-statistics. International experts trained the local technical people and a fellowship programme completed the training of the key technical personnel. The development originating from this project became available to the whole country with the assistance and supervision of the Ministry of Agriculture; regular specialized courses and periodic seminars help the diffusion of the modern techniques.

3.2 - The Pesticide Project also includes the equipment for a pesticide formulation pilot plant. The installation of this pilot plant is planned for 1973.



#### 4. TECHNICAL AND ECONOMIC FACTORS DETERMINING THE CHOICE OF PESTICIDES FOR PRODUCTION IN BRAZIL

4.1 - The local availability of raw materials and the know-how for the synthesis are central problems pesticide industry to be developed in Brazil. Some raw materials already available from the petroleum and iron metallurgy industries facilitate the local production of DDT and BHC.

4.2 - The development of the basic chemical industry in Brazil would permit to have locally available by-products which are essential for pesticide production. Otherwise, the importation of raw materials is difficult and raise the price of the national production (Saabo, 1971).

4.3.- Integrated production of all important pesticides would be the solution for the problem in the Latin America. The integrated production would include the manufacture of the most important intermediates, technical active materials, and formulated end-products. But market demand, raw materials, and know-how are not usually favourable in most developing countries to this approach. One way to overcome this inherent difficulty is to pool markets and resources in regional cooperation between countries having common crop protection problems. Such cooperation is desirable in order to unify the fragmented markets and facilitate bulk and profitable production of the most widely used pesticides (Saabo, 1971).

**5. LEGISLATIVE FACTORS DETERMINING THE CHOICE OF PESTICIDES  
FOR PRODUCTION IN BRAZIL**

5.1 - The following characteristics are highly desirable when choosing pesticides for production in Brazil:

- 1) efficiency against the most important plant pests and diseases;
  - 2) acceptable prices;
  - 3) low mammalian toxicity;
  - 4) relatively low persistence in the environment.
- However, we realize how difficult it is to uncover pesticides which fulfil all these requirements.

5.2 - Among the regulatory aspects, the very strict pesticide residue tolerances in food, established by some importing countries, restrict the use of several pesticides in the countries which export food products. These pesticides are needed for the control of local pests which are serious problems for the agriculture mainly in the tropics. If these pests do not exist or do not present a serious problem in the importing countries no tolerances are established for the particular pesticides involved. This unilateral point of view is a handicap for the agricultural and industrial development of the countries which export food products. An international legislation related to pesticide residues in food is highly desirable to overcome these problems. The efforts developed by the FAO and WHO in order to establish international tolerances and acceptable daily intake for pesticide residues must be strongly supported.

6. PRESENT STATUS AND CONTEMPLATED DEVELOPMENT OF  
PESTICIDE PRODUCTION IN BRAZIL

6.1 - DDT, BHC, parathion, methyl parathion, dichlorvos, dodecachlor, maneb, and mancozeb are the pesticides presently produced in Brazil.

6.1.1 - DDT - The local production is 6 000 tons/year. This insecticide is used as an indoor spray in the malaria eradication campaign. The agricultural use of DDT is decreasing except in cotton plantation.

6.1.2 - BHC (=HCH)- The local production is 7 000 ton/year. The wettable powder with 30% of gamma isomer is imported. This insecticide is used as an indoor spray against the triatomid bug vector of the Chagas' disease. The main agricultural use of the BHC, in dust formulations with 1 to 1.5% of gamma isomer, has been in the control of the coffee berry borer (*Hypothenemus hampei*).

6.1.3 - Parathions - The local production of parathions is 2,200 tons/year and there are plans to increase the production. The sodium p-nitrophenate and the phosphorous sulfochloride are imported (Barragat, 1970). Methyl and ethyl alcohols are locally produced.

The parathions are used in the following plantations: 60% in cotton, 15% in peanut, 15% in soybean, 5% in wheat, 5% in vegetables.

6.1.4 - Dichlorvos - The local production is 10.5 tons/year and there is a project to increase the production to 96 tons/year (Barragat, 1970). This pesticide is widely used in household types of pesticide formulations, besides the agricultural application.

6.1.5 - Dodecachlor - The production of this insecticide is recent in Brazil. This chemical is used in baits against ants.

6.1.6 - Maneb and mancozeb - The production of these fungicides is recent in Brazil. The raw materials for their production (manganese sulfate, carbon disulfide, sodium hydroxide and ethylene diamine) are locally available except the ethylene diamine (Barragat, 1971). Fifty two per cent of the production in 1971 was exported.

These fungicides may have a wide use in the next years for the control of the coffee rust (Hemileia vastatrix).

6.2 - Pyrethrum, rotenone, and nicotine are extracted from plants in Brazil, however the production is small.

## 7. POTENTIAL NEED FOR SMALL SCALE, MULTI-PURPOSE DEMONSTRATION PESTICIDE PLANT IN BRAZIL

7.1 - A rather good centre for laboratory study of pesticides is in existence in Brazil, as a result of the UNDP/PAO/BRA/67/524 project. A pesticide formulation pilot plan complements the project and will facilitate the extension of the study to suitable formulations for the particular agriculture conditions of the country and the region.

7.2 - The next aim is the local synthesis of the main pesticides used in the country and in the region. This production must be big enough to fulfill the local requirements and be exported to the neighbouring countries South America.

7.3 - The installation of a small scale, multi-purpose pesticide plant in Brazil will: 1) permit to obtain and improve the know-how in the pesticide synthesis; 2) act as a centre for the practical teaching in this particular field of the applied chemistry; 3) help the utilization of by-products already available from other local chemical industries; 4) make better use of raw materials from the region.

7.4 - The pesticides which may be considered to be produced in Brazil are: 1) low toxic organophosphate compounds such as fenitrothion, malathion, and diazinon; 2) systemic organophosphate pesticides which allow to establish the integrated pest control because these compounds are absorbed by the plants and do not interfere in the development of the beneficial insects which are natural enemies of the plant pests; 3) Toxaphene, which is rather intensively used on cotton plantations and is not an environmental pollutant. In addition, the production of the pesticides which are already synthesized in Brazil must continue and be intensified, except BHC that will be gradually substituted by lindane.

## 8. CONCLUSIONS

8.1 - The development of the agriculture and food production in Brazil depends on the safe and effective use of pesticides, and the integrated control of plant pests.

8.2 - There is local production of DDT, BHC, parathions, dichlorvos, dodecachlor, maneb and mancozeb in Brazil. In some cases, imported raw materials are used and only the final synthesis is carried out in the country.

8.3 - Among the technical and economic factors determining the choice of pesticides for production in Brazil, the local availability of raw materials and the know-how for the synthesis are prominent items.

8.4 - The general trend in the use of pesticides in Brazil is directed to the gradual decrease of the chlorinated hydrocarbon pesticides and their substitution by less persistent pesticides as organophosphate and carbamate compounds. The integrated control, trying to combine chemical and biological methods of control, is being object of studies.

8.5 - As a result of the Project on Expansion of the Work on Pesticides (UNDP/FAO/BRA/67/524), high quality expertise and facilities have been established in Analytical Chemistry, Residue Chemistry, Formulation Chemistry, Insect Toxicology, Mammalian Toxicology, and Biostatistics at the Biological Institute of São Paulo.

8.6 - A pesticide formulation pilot plant will be installed and brought into operation in 1973 as a complement of the UNDP/FAO Pesticide Project. The practical work of this pilot plant may include preliminary formulation studies of the pesticides produced in the country.

8.7 - The development originating in the Pesticide Project is becoming available to the whole country with the participation and co-operation of the Ministry of Agriculture. Regular specialized courses and periodic seminars help the diffusion of the new techniques.

## 9. RECOMMENDATIONS

9.1 - The pesticides recommended to be produced in Brazil are: 1) low toxic organophosphoric compounds such as fenitrothion, malathion, and diazinon, 2) Systemic organophosphate pesticides, 3) toxaphene. In addition, the production of those pesticides which are already made in Brazil must continue and be intensified, except BHC that will be gradually substituted by lindane.

9.2 - The installation of a small scale, multi-purpose pesticide plant in Brazil will: 1) permit to obtain and improve the know-how on the pesticide synthesis; 2) act as a centre for practical teaching in this particular field of the applied chemistry, 3) help the utilization of by-products already available from other chemical industries, 4) make better use of raw materials from the region.

9.3 - The appreciable results of the UNDP/FAO Pesticide Project justify further studies for strengthening of the work on plant protection in Brazil.

9.4 - The cooperation of international agencies as FAO and UNIDO must be intensified envisaging the development of the agricultural technology and food production in the region.

9.5 - The establishment of bi-lateral agreements would also be valuable to initiate co-operative programmes in plant protection.

9.6 - An international legislation related to pesticide residues in food is required. The efforts developed by FAO, Codex Alimentarius, and WHO must be strongly supported.

## 10. REFERENCES

- Barragat, P. -1970- Mercado Brasileiro de Defensivos. Report presented at the Seminar on the Industry of Fertilizers and Pesticides in the Latin America, Rio de Janeiro, Nov.1970; (Sindicato da Industria de Formicidas e Inseticidas do Estado de São Paulo).
- Brazilian Society of Agricultural Pesticides -1973- (Sociedade Brasileira de Defensivos para a Lavoura e Pecuária), personal communication.
- Cooperative Programme -1972- Pesticides in the Modern World. A Symposium prepared by Members of the Cooperative Programme of Agro-Allied Industries with FAO and other United Nations Organizations, pg. 24
- SINFORMIN -1973- Sindicato da Indústria de Inseticidas e Formicidas do Estado de São Paulo, personal communication.
- Szabo, K. -1971- The National Pesticide Industry - Aims and Implications. Seminar on the Safe and Effective Use of Agricultural Pesticides in South America. Organized by FAO; São Paulo, Brazil, 2-5 May 1971.
- Química e Derivados, 45 (7): 89, 1969.



Table I

Insecticides of major use in Brazil\*

<u>Organo- phosphates</u>	<u>Chlorinated hydrocarbons</u>	<u>Carbamates</u>
Azinphos ethyl	Aldrin	Carbaryl
Carbophenothion	BHC	
Dimethoate	Chlorobenzilate	
Disulfoton	DDT	
Phosphamidon	Dieldrin	
Methyl - S - demeton	Endosulfan	
Monocrotophos	Endrin	
Parathion ethyl	Hepthachlor	
Parathion methyl	Lindane	
Trichlorfon	Toxaphene	

\* from the Brazilian Society of Agricultural Pesticides

Table II

Pesticide Importation<sup>a</sup>

-Brazil, 1963 to 1972-

<u>Year</u>	<u>Tons</u>
1963	11 807
1964	12 122
1965	16 248
1966	22 871
1967	18 248
1968	24 648
1969	27 038
1970	26 821
1971	30 992
1972	50 400

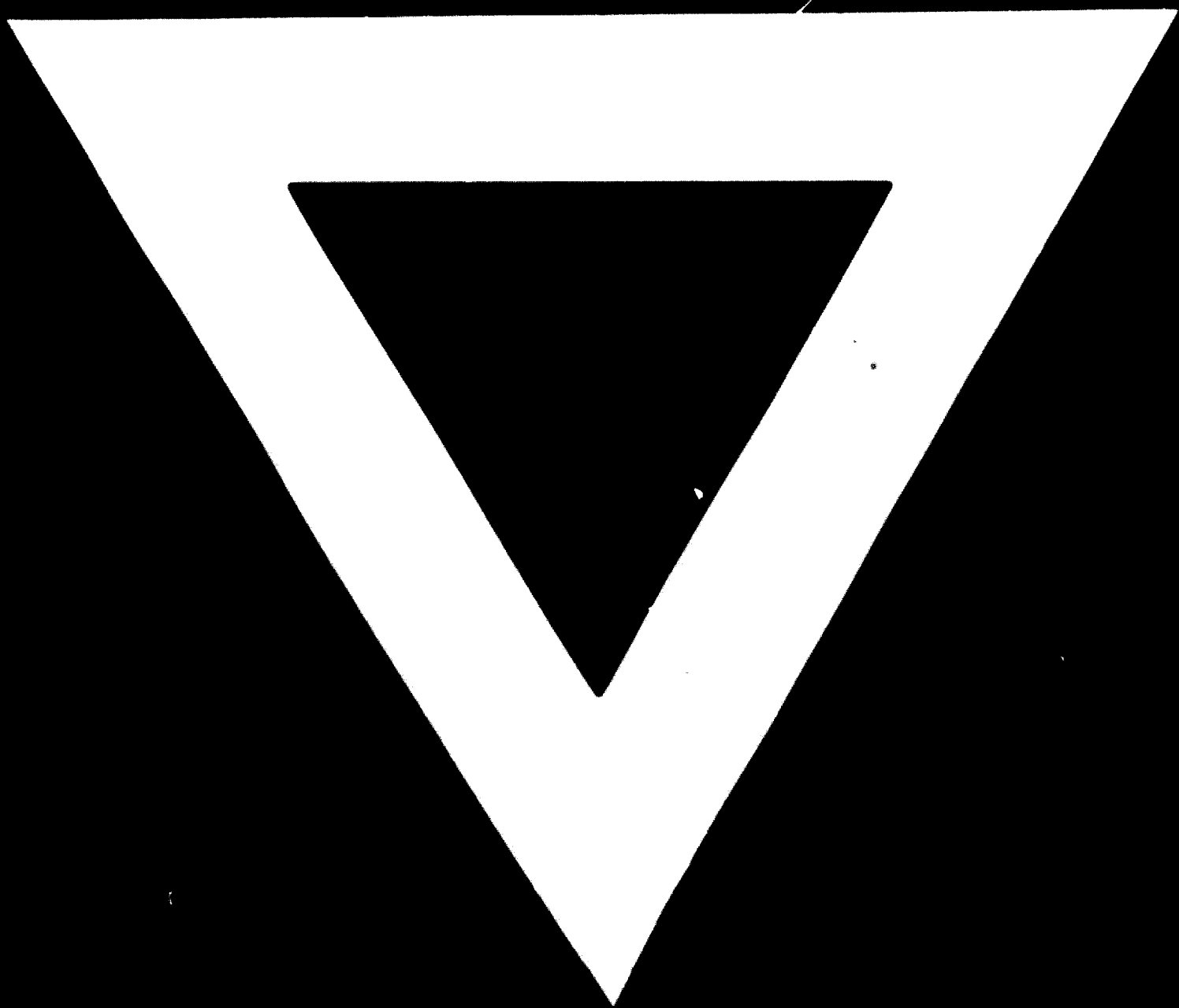
<sup>a</sup> data supplied by SINFONIN, 1973.

Table III

Production of some pesticides in Brazil\*

Pesticides	Tons of technical product		
	1970	1971	1972
DDT	4 200	4 800	6 000
BHC	6 472	6 735	5 825
Parathions	1 832	1 745	2 180
Linob and Mancosb	1 680	2 939	4 250

\*Data supplied by SIKFORMIN, São Paulo, Brazil



**2 . 9 . 74**