



Food and Agriculture  
Organization of the  
United Nations



World Health  
Organization

FAO  
PLANT  
PRODUCTION  
AND PROTECTION  
PAPER

**192**

# **Pesticide residues in food 2007**

**Joint FAO/WHO Meeting  
on Pesticide Residues**

## **EVALUATIONS**

## **2007**

## **PART I - RESIDUES**



# Pesticide residues in food 2007

## Evaluations Part I – Residues

FAO  
PLANT  
PRODUCTION  
AND PROTECTION  
PAPER

192

### **Sponsored jointly by FAO and WHO**

Joint meeting of the  
FAO Panel of Experts on Pesticide Residues  
in Food and the Environment  
and the  
WHO Core Assessment Group  
Geneva, Switzerland, 18–27 September 2007

Monographs containing summaries or residue data and toxicological data considered at the 2007 JMPR, together with recommendations, are available upon request from FAO or WHO under the title:

Pesticide residues in food 2007  
Evaluations  
Part I: Residues  
FAO Plant Production and Protection Paper

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations or of the World Health Organization concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

This report contains the collective views of two international groups of experts and does not necessarily represent the decisions or the stated policy of the Food and Agriculture Organization of the United Nations or of the World Health Organization.

INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY

The preparatory work for the toxicological evaluation of pesticide residues carried out by the WHO Expert Group on Pesticide Residues for consideration by the FAO/WHO Joint meeting on Pesticide Residues in Food and the Environment is actively supported by the International Programme on Chemical Safety (IPCS).  
IPCS is a joint venture of the United Nations Environment Programme, the International Labour Organization and the World Health Organization. One of the main objectives of IPCS is to carry out and disseminate evaluations of the effects of chemicals on human health and the quality of the environment.

ISBN 978-92-5-105967-8

All rights reserved. Reproduction and dissemination of material in this information product for educational or other non-commercial purposes are authorized without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of material in this information product for resale or other commercial purposes is prohibited without written permission of the copyright holders. Applications for such permission should be addressed to the Chief, Electronic Publishing Policy and Support Branch, Communication Division, FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy or by e-mail to [copyright@fao.org](mailto:copyright@fao.org)

© FAO and WHO 2008

## CONTENTS

	pages
Participants.....	v
Abbreviations.....	ix
Use of JMPR reports and evaluations by registration authorities .....	xiii
Introduction.....	xv
<u>Monographs</u>	
Carbaryl (8).....	1
Dried chilli peppers.....	7
Clofentezine (156) .....	15
Cyfluthrin (157)/beta-Cyfluthrin (228).....	121
Cyromazine (169) .....	253
Difenoconazole (224).....	353
Dimethomorph (225) .....	467
Fenitrothion (037) .....	607
Flusilazole (165) .....	619
Phosmet (103) .....	773
Propiconazole (160) .....	787
Pyrimethanil (226) .....	919
Triadimefon (133) and Triadimenol (168).....	1027
Triazophos (143).....	1349
Zoxamide (227).....	1375
Annex 1: Previous FAO and WHO documents .....	1459

\* New compound.

\*\* Evaluated for the Periodic Review Programme of the Codex Committee on Pesticide Residues.



## LIST OF PARTICIPANTS

### *2007 JOINT FAO/WHO MEETING ON PESTICIDE RESIDUES*

*GENEVA, 18–27 SEPTEMBER 2007*

#### **FAO Members**

Dr Ursula Banasiak, Federal Institute for Risk Assessment, Thielallee 88-92, D-14195 Berlin, Germany

Professor Eloisa Dutra Caldas, University of Brasilia, College of Health Sciences, Pharmaceutical Sciences Department, Campus Universitário Darci Ribeiro, 70919-970 Brasília/DF, Brazil (*FAO Rapporteur*)

Mr Stephen Funk, Health Effects Division (7509P), United States Environmental Protection Agency, 1200 Pennsylvania Ave NW, Washington DC 20460, USA (*FAO Chairman*)

Mr Denis J. Hamilton, Principal Scientific Officer, Biosecurity, Department of Primary Industries and Fisheries, PO Box 46, Brisbane, QLD 4001, Australia

Mr David Lunn, Senior Programme Manager (Residues–Plants), Export Standards Group, New Zealand Food Safety Authority, PO Box 2835, Wellington, New Zealand

Dr Dugald MacLachlan, Australian Quarantine and Inspection Service, Australian Government Department of Agriculture, Fisheries and Forestry, GPO Box 858, Canberra, ACT 2601, Australia

Dr Bernadette C. Ossendorp, Centre for Substances and Integrated Risk Assessment, National Institute of Public Health and the Environment (RIVM), Antonie van Leeuwenhoeklaan 9, PO Box 1, 3720 BA Bilthoven, Netherlands

Dr Yukiko Yamada, Deputy Director-General, Food Safety and Consumer Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries, 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8950, Japan

#### **WHO Members**

Professor Alan R. Boobis, Experimental Medicine & Toxicology, Division of Investigative Science, Faculty of Medicine, Imperial College London, Hammersmith Campus, Duane Road, London W12 0NN, England (*WHO Chairman*)

Dr Les Davies, Chemical Review, Australian Pesticides & Veterinary Medicines Authority, PO Box E240, Kingston ACT 2604, Australia

Dr Vicki L. Dellarco, United States Environmental Protection Agency, Office of Pesticide Programs (7509P), Health Effects Division, 1200 Pennsylvania Avenue NW, Washington, DC 20460, USA (*WHO Rapporteur*)

Dr Helen Hakansson, Institute of Environmental Medicine, Karolinska Institute, Unit of Environmental Health Risk Assessment, Box 210, Nobels väg 13, S-171 77 Stockholm, Sweden

Professor Angelo Moretto, Department of Environmental and Occupational Health, University of Milan, International Centre for Pesticides and Health Risk Prevention (ICPS), Luigi Sacco Hospital via Grassi 74, 20157 Milan, Italy

Professor David Ray, Biomedical Sciences, University of Nottingham, Queens Medical Centre, Nottingham NG7 2UH, UK

Dr Roland Solecki, Safety of Substances and Preparations, Coordination and Overall Development, Federal Institute for Risk Assessment, Thielallee 88-92, D-14195 Berlin

Dr Maria Tasheva, National Center of Public Health Protection (NCPHP), 15, Iv. Ev. Geshov boul., 1431 Sofia, Bulgaria

### **Secretariat**

Dr habil. Árpád Ambrus, Hungarian Food Safety Office, Gyali ut 2-6, 1097 Budapest, Hungary (*FAO Temporary Adviser*)

Ms Catherine Adcock, Fungicide/Herbicide Toxicological Evaluation Section, Health Evaluation Directorate, Pest Management Regulatory Agency, 2720 Riverside Drive, AL 6605E Ottawa, Ontario K1A 0K9, Canada (*WHO Temporary Adviser*)

Mr Kevin Bodnaruk, 26/12 Phillip Mall, West Pymble, NSW 2073, Australia (*FAO Editor*)

Professor Zongmao Chen, Chairman of Codex Committee on Pesticide Residues, Academician, Chinese Academy of Engineering, Chinese Academy of Agricultural Sciences, No. 1, Yunqi Road, Hangzhou/Zhejiang 310008, China (*CCPR Chairman*)

Dr Myoengsin Choi, International Programme on Chemical Safety, World Health Organization, 1211 Geneva 27, Switzerland (*WHO Staff Member*)

Dr Ronald D. Eichner, 13 Cruikshank Street, Wanniasa ACT 2903, Australia (*FAO Temporary Adviser*)

Dr Ian C. Dewhurst, Pesticides Safety Directorate, Mallard House, King's Pool, 3 Peasholme Green, York YO1 7PX, England (*WHO Temporary Adviser*)

Dr Yibing He, Pesticide Residue Division, Institute for the Control of Agrochemicals, Ministry of Agriculture, Building 22, Maizidian Street, Chaoyang District, Beijing 100026, China (*FAO Temporary Adviser*)

Dr D. Kanungo, Additional DG, Directorate General of Health Services, Ministry of Health and Family Welfare, West, Block No. 1, RK Puram, New Delhi, India (*WHO Temporary Adviser*)

Dr Jeronimas Maskeliunas, Food Standards Officer, Joint FAO/WHO Food Standards Programme, Nutrition and Consumer Protection Division, FAO, Viale delle terme di Caracalla, 00153 Rome, Italy (*Codex Secretariat*)

Dr Heidi Mattock, 21 bis rue du Mont Ouest, 38230 Tignieu-Jameyzieu, France (*WHO Editor*)

Dr Douglas B. McGregor, Toxicity Evaluation Consultants, 38 Shore Road, Aberdour, KY3 0TU Scotland (*WHO Temporary Adviser*)



Dr Utz W. Mueller, Principal Toxicologist, Section Manager, Risk Assessment—Chemical Safety, Food Standards Australia New Zealand, PO Box 7186, Canberra BC ACT 2610, Australia (*WHO Temporary Adviser*)

Dr Rudolf Pfeil, Pesticides and Biocides Division, Federal Institute for Risk Assessment, Thielallee 88-92, D-14195 Berlin (*WHO Temporary Adviser*)

Dr Prakashchandra V. Shah, United States Environmental Protection Agency, Mail Stop: 7509P, 1200 Pennsylvania Avenue NW, Washington DC 20460, USA (*WHO Temporary Adviser*)

Mr Christian Sieke, Federal Institute for Risk Assessment, Thielallee 88-92, D-14195 Berlin, Germany (*FAO Temporary Adviser*)

Dr Atsuya Takagi, Division of Cellular and Molecular Toxicology, Biological Safety Research Center, National Institute of Health Sciences, 1-18-1 Kamiyoga, Setagaya-ku, Tokyo 158-8501, Japan (*WHO Temporary Adviser*)

Dr Angelika Tritscher, WHO Joint Secretary, International Programme on Chemical Safety, World Health Organization, 1211 Geneva 27, Switzerland (*WHO Joint Secretary*)

Dr Qiang Wang; Institute of Quality and Standard for Agricultural Products, Zhenjiang Academy of Agricultural Sciences, 198 Shiqiao Road, Hangzhou 310021, China (*FAO Temporary Adviser*)

Dr Gerrit Wolterink, Centre for Substances & Integrated Risk Assessment, National Institute of Public Health and the Environment (RIVM), Antonie van Leeuwenhoeklaan 9, PO Box 1, 3720 BA Bilthoven, Netherlands (*WHO Temporary Adviser*)

Ms Yong Zhen Yang, FAO Joint Secretary, FAO Plant Protection Service (AGPP), Viale delle Terme di Caracalla, 00153 Rome, Italy (*FAO Joint Secretary*)

Dr Jürg Zarn, Swiss Federal Office of Public Health, Food Toxicology Section, Stauffacherstrasse 101, CH-8004 Zurich, Switzerland (*WHO Temporary Adviser*)



## ABBREVIATIONS

(Well-known abbreviations in general use are not included. Specific abbreviations for pesticide degradation products, etc., may be used in the monographs and these are either identified where first used or in a table within the monograph. Two-letter codes for pesticide formulations are given in the Manual on development and use of FAO and WHO specifications for pesticides, 1<sup>st</sup> Ed., FAO Plant Production and Protection Paper 173, FAO, Rome, 2002.)

AChE	anti-acetylcholinesterase
ACN	acetonitrile
ADI	acceptable daily intake
AFID	alkali flame-ionization detection or detector (equivalent to TSD, forerunner of NPD)
ai	active ingredient
AR	Applied radioactivity
ARfD	acute reference dose
AUC	area under the curve for concentration–time
BBCH	Biologische Bundesanstalt, Bundessortenamt and Chemical industry.
bw	body weight
CA	Chemical Abstracts
CAC	Codex Alimentarius Commission
CAS	Chemical Abstracts Services
CCN	Codex classification number (for compounds or commodities)
CCPR	Codex Committee on Pesticide Residues
CCRVDf	Codex Committee on Residue of Veterinary Drugs in Food
CEC	cation exchange capacity
CI	chemical ionization
CV	coefficient of variation (RSD)
CXL	Codex Maximum Residue Limit (Codex MRL). See MRL
d	days
DAT	days after (last) treatment
DCM	dichloromethane
DFG	Deutsche Forschungsgemeinschaft
DT <sub>50</sub>	time for 50% decomposition (i.e., half-life)
DT <sub>90</sub>	time for 90% decomposition
2D-TLC	two dimensional thin layer chromatography
dw	dry weight
ECD	electron capture detection or detector
EI	electron-impact (ionization), now more usually electron ionization
EPA	Environmental Protection Agency (usually US EPA)
eq	residue expressed as ai equivalent
F <sub>1</sub>	first filial generation
F <sub>2</sub>	second filial generation
FAO	Food and Agriculture Organization of the United Nations
FID	flame-ionization detection or detector
FPD	flame-photometric detection or detector
GAP	good agricultural practice(s)
GC	gas chromatography; the detector system used is usually also abbreviated as a suffix
GC-ECD	gas chromatography with electron capture detection

GC-FID	gas chromatography with flame ionisation detection
GC-MS	gas chromatography with mass spectrometric detection
GC-NPD	gas chromatography with nitrogen phosphorus specific detection, also called alkali-metal doped flame ionisation detection (alkali FID) or thermionic ionisation detection (TID) or thermionic specific detector (TSD)
GEMS/Food	Global Environment Monitoring System–Food Contamination Monitoring and Assessment Programme
GLP	good laboratory practice (i.e. the defined system, not in the general sense)
GPC	gel-permeation chromatography
GSH	glutathione
HPLC	high-performance liquid chromatography
HPLC-MS	high-performance liquid chromatography – mass spectrometry
HPLC-UV	high-performance liquid chromatography with UV absorption detection
h	hour
HR	highest residue in the edible portion of a commodity found in trials used to estimate a maximum residue level in the commodity
HR-P	highest residue in a processed commodity calculated by multiplying the HR of the raw commodity by the corresponding processing factor
IARC	International Agency for Research on Cancer
IEDI	international estimated daily intake
IESTI	international estimate of short-term dietary intake
IPCS	International Programme on Chemical Safety
IR	infrared spectroscopy
ITD	ion-trap detector or detection
IUPAC	International Union of Pure and Applied Chemistry
JECFA	Joint Expert Committee on Food Additives
JMPR	Joint Meeting on Pesticide Residues
JMPS	Joint FAO/WHO Meeting on Pesticide Specifications
LC	liquid chromatography
LC-MS	liquid chromatography – mass spectrometry
LC <sub>50</sub>	median lethal concentration
LD <sub>50</sub>	median lethal dose
LOAEL	lowest-observed-adverse-effect level
LOAEC	lowest-observed-adverse-effect concentration
LOD	limit of detection
LOQ	limit of quantification
LSC	liquid scintillation counting or counter
M	molar = mole/L
MID	multiple ion detection (mass spectrometric)
MRL	Maximum Residue Limit. MRLs include <u>draft</u> MRLs and <u>Codex</u> MRLs (CXLs). The MRLs recommended by the JMPR on the basis of its estimates of maximum residue levels enter the Codex procedure as draft MRLs. They become Codex MRLs when they have passed through the procedure and have been adopted by the Codex Alimentarius Commission.
MS	mass spectrometry or mass spectrometric detector (suffix to GC- or LC-)
MSD	mass-selective detection or detector
MS/MS	tandem mass spectrometry
NOAEL	no-observed-adverse-effect level

NMR	nuclear magnetic resonance
NPD	nitrogen/phosphorus detector
OECD	Organization for Economic Co-operation and Development
om	amount of organic matter in soil
PES	post extracted solids
PF	processing factor
PHI	pre-harvest interval
ppm	parts per million (used only with reference to the concentration of a pesticide in a diet, in all other contexts the terms mg/kg or mg/l are used)
P <sub>ow</sub>	octanol–water partition coefficient
RAC	raw agricultural commodity
r.d.	relative density (formerly called specific gravity)
RfD	reference dose (usually in phrase “acute RfD”)
RSD	precision under repeatability conditions (measurements within one day or one run) expressed as relative standard deviation (= coefficient of variation)
SD	standard deviation
SPE	solid-phase extraction (may also describe a post-extraction clean-up process)
STMR	supervised trials median residue
STMR-P	supervised trials median residue in a processed commodity calculated by multiplying the STMR of the raw commodity by the corresponding processing factor
t	tonne (metric ton)
TAR	total applied (or administered) radioactivity
TLC	thin-layer chromatography
TRR	total radioactive residue
TMDI	theoretical maximum daily intake
TSD	thermionic specific detection or detector (equivalent to AFID, forerunners of NPD)
USDA	US Department of Agriculture
US FDA	US Food and Drug Administration
UV	ultraviolet (radiation)
UV-VIS	absorption spectrometry in ultraviolet and visible part of the spectrum
W	the previous recommendation is withdrawn, or withdrawal of the existing Codex or draft MRL is recommended
WHO	World Health Organization



## **USE OF JMPR REPORTS AND EVALUATIONS BY REGISTRATION AUTHORITIES**

Most of the summaries and evaluations contained in this report are based on unpublished proprietary data submitted for use by JMPR in making its assessments. A registration authority should not grant a registration on the basis of an evaluation unless it has first received authorization for such use from the owner of the data submitted for the JMPR review or has received the data on which the summaries are based, either from the owner of the data or from a second party that has obtained permission from the owner of the data for this purpose.





## INTRODUCTION

The Report of the Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Core Assessment Group (JMPR), held in Geneva, 18-27 September 2007, contains a summary of the evaluations of residues in foods of the various pesticides considered, as well as information on the general principles followed by the Meeting (JMPR, 2007). The present document contains summaries of the residues data considered, together with the recommendations made.

The Evaluations are issued in two parts:

Part I: Residues (by FAO);

Part II: Toxicology (by WHO).

For those interested in both aspects of pesticide evaluation, both parts and the Report containing summaries of residues and toxicological considerations are available.

Some of the compounds considered at the Meeting were previously evaluated and reported on in earlier publications. In general, only new information is summarized in the relevant monographs but reference is made to previously published evaluations, which should also be consulted. In the case of older compounds which are re-evaluated as part of the periodic review programme of the CCPR, a review of all available data, including data which may have previously been submitted, is carried out. Compounds evaluated for the first time are indicated by a single asterisk and those evaluated in the CCPR periodic review programme by double asterisks in the Table of Contents.

Summaries of recommended MRLs, STMR and HR levels and assessments of dietary intake, are published as Annexes 1, 3 and 4 in the Report, and reference is made to this report.

The name of the compound appearing as the title of each monograph is followed by its Codex Classification Number in parentheses.

References to previous Reports and Evaluations of Joint Meetings are listed in Annex I.

### Acknowledgements

The monographs in these Evaluations were prepared by the following participants in the 2007 JMPR, for the FAO Panel of Experts on Pesticide Residues in Food and the Environment:

Dr Á. Ambrus, Dr U. Banasiak, Dr E. Dutra Caldas, Dr R. Eichner, Mr S. Funk, Mr D. J. Hamilton, Dr Y. He, Mr D. Lunn, Dr D. MacLachlan, Dr K. Mastovska, Dr B. C. Ossendorp, Mr C. Sieke, Dr Q. Wang and Dr Y. Yamada.

**Note.** Any comment on residues in food and their evaluation should be addressed to the:

Plant Protection Service  
Plant Production and Protection Division  
Food and Agricultural Organization  
Viale delle Terme di Caracalla  
00100 Rome, Italy

### Reference

JMPR, 2007. Pesticide residues in Food – 2007. Report of the Joint Meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Core Assessment Group on Pesticide Residues, Geneva Switzerland, 18-27 September 2007. WHO and FAO, Rome, 2008.



## FAO TECHNICAL PAPERS

### FAO PLANT PRODUCTION AND PROTECTION PAPERS

- 1 Horticulture: a select bibliography, 1976 (E)
- 2 Cotton specialists and research institutions in selected countries, 1976 (E)
- 3 Food legumes: distribution, adaptability and biology of yield, 1977 (E F S)
- 4 Soybean production in the tropics, 1977 (C E F S)
- 4 Rev.1 Soybean production in the tropics (first revision), 1982 (E)
- 5 Les systèmes pastoraux sahéliens, 1977 (F)
- 6 Pest resistance to pesticides and crop loss assessment – Vol. 1, 1977 (E F S)
- 6/2 Pest resistance to pesticides and crop loss assessment – Vol. 2, 1979 (E F S)
- 6/3 Pest resistance to pesticides and crop loss assessment – Vol. 3, 1981 (E F S)
- 7 Rodent pest biology and control – Bibliography 1970-74, 1977 (E)
- 8 Tropical pasture seed production, 1979 (E F\*\* S\*\*)
- 9 Food legume crops: improvement and production, 1977 (E)
- 10 Pesticide residues in food, 1977 – Report, 1978 (E F S)
- 10 Rev. Pesticide residues in food 1977 – Report, 1978 (E)
- 10 Sup. Pesticide residues in food 1977 – Evaluations, 1978 (E)
- 11 Pesticide residues in food 1965-78 – Index and summary, 1978 (E F S)
- 12 Crop calendars, 1978 (E/F/S)
- 13 The use of FAO specifications for plant protection products, 1979 (E F S)
- 14 Guidelines for integrated control of rice insect pests, 1979 (Ar C E F S)
- 15 Pesticide residues in food 1978 – Report, 1979 (E F S)
- 15 Sup. Pesticide residues in food 1978 – Evaluations, 1979 (E)
- 16 Rodenticides: analyses, specifications, formulations, 1979 (E F S)
- 17 Agrometeorological crop monitoring and forecasting, 1979 (C E F S)
- 18 Guidelines for integrated control of maize pests, 1979 (C E)
- 19 Elements of integrated control of sorghum pests, 1979 (E F S)
- 20 Pesticide residues in food 1979 – Report, 1980 (E F S)
- 20 Sup. Pesticide residues in food 1979 – Evaluations, 1980 (E)
- 21 Recommended methods for measurement of pest resistance to pesticides, 1980 (E F)
- 22 China: multiple cropping and related crop production technology, 1980 (E)
- 23 China: development of olive production, 1980 (E)
- 24/1 Improvement and production of maize, sorghum and millet – Vol. 1. General principles, 1980 (E F)
- 24/2 Improvement and production of maize, sorghum and millet – Vol. 2. Breeding, agronomy and seed production, 1980 (E F)
- 25 *Prosopis tamarugo*: fodder tree for arid zones, 1981 (E F S)
- 26 Pesticide residues in food 1980 – Report, 1981 (E F S)
- 26 Sup. Pesticide residues in food 1980 – Evaluations, 1981 (E)
- 27 Small-scale cash crop farming in South Asia, 1981 (E)
- 28 Second expert consultation on environmental criteria for registration of pesticides, 1981 (E F S)
- 29 Sesame: status and improvement, 1981 (E)
- 30 Palm tissue culture, 1981 (C E)
- 31 An eco-climatic classification of intertropical Africa, 1981 (E)
- 32 Weeds in tropical crops: selected abstracts, 1981 (E)
- 32 Sup.1 Weeds in tropical crops: review of abstracts, 1982 (E)
- 33 Plant collecting and herbarium development, 1981 (E)
- 34 Improvement of nutritional quality of food crops, 1981 (C E)
- 35 Date production and protection, 1982 (Ar E)
- 36 El cultivo y la utilización del tarwi – *Lupinus mutabilis* Sweet, 1982 (S)
- 37 Pesticide residues in food 1981 – Report, 1982 (E F S)
- 38 Winged bean production in the tropics, 1982 (E)
- 39 Seeds, 1982 (E/F/S)
- 40 Rodent control in agriculture, 1982 (Ar C E F S)
- 41 Rice development and rainfed rice production, 1982 (E)
- 42 Pesticide residues in food 1981 – Evaluations, 1982 (E)
- 43 Manual on mushroom cultivation, 1983 (E F)
- 44 Improving weed management, 1984 (E F S)
- 45 Pocket computers in agrometeorology, 1983 (E)
- 46 Pesticide residues in food 1982 – Report, 1983 (E F S)
- 47 The sago palm, 1983 (E F)
- 48 Guidelines for integrated control of cotton pests, 1983 (Ar E F S)
- 49 Pesticide residues in food 1982 – Evaluations, 1983 (E)
- 50 International plant quarantine treatment manual, 1983 (C E)
- 51 Handbook on jute, 1983 (E)
- 52 The palmyrah palm: potential and perspectives, 1983 (E)
- 53/1 Selected medicinal plants, 1983 (E)
- 54 Manual of fumigation for insect control, 1984 (C E F S)
- 55 Breeding for durable disease and pest resistance, 1984 (C E)
- 56 Pesticide residues in food 1983 – Report, 1984 (E F S)
- 57 Coconut, tree of life, 1984 (E S)
- 58 Economic guidelines for crop pest control, 1984 (E F S)
- 59 Micropropagation of selected rootcrops, palms, citrus and ornamental species, 1984 (E)
- 60 Minimum requirements for receiving and maintaining tissue culture propagating material, 1985 (E F S)
- 61 Pesticide residues in food 1983 – Evaluations, 1985 (E)

62	Pesticide residues in food 1984 – Report, 1985 (E F S)	93/1	Pesticide residues in food 1988 – Evaluations – Part I: Residues, 1988 (E)
63	Manual of pest control for food security reserve grain stocks, 1985 (C E)	93/2	Pesticide residues in food 1988 – Evaluations – Part II: Toxicology, 1989 (E)
64	Contribution à l'écologie des aphides africains, 1985 (F)	94	Utilization of genetic resources: suitable approaches, agronomical evaluation and use, 1989 (E)
65	Amélioration de la culture irriguée du riz des petits fermiers, 1985 (F)	95	Rodent pests and their control in the Near East, 1989 (E)
66	Sesame and safflower: status and potentials, 1985 (E)	96	<i>Striga</i> – Improved management in Africa, 1989 (E)
67	Pesticide residues in food 1984 – Evaluations, 1985 (E)	97/1	Fodders for the Near East: alfalfa, 1989 (Ar E)
68	Pesticide residus in food 1985 – Report, 1986 (E F S)	97/2	Fodders for the Near East: annual medic pastures, 1989 (Ar E F)
69	Breeding for horizontal resistance to wheat diseases, 1986 (E)	98	An annotated bibliography on rodent research in Latin America 1960-1985, 1989 (E)
70	Breeding for durable resistance in perennial crops, 1986 (E)	99	Pesticide residues in food 1989 – Report, 1989 (E F S)
71	Technical guideline on seed potato micropropagation and multiplication, 1986 (E)	100	Pesticide residues in food 1989 – Evaluations – Part I: Residues, 1990 (E)
72/1	Pesticide residues in food 1985 – Evaluations – Part I: Residues, 1986 (E)	100/2	Pesticide residues in food 1989 – Evaluations – Part II: Toxicology, 1990 (E)
72/2	Pesticide residues in food 1985 – Evaluations – Part II: Toxicology, 1986 (E)	101	Soilless culture for horticultural crop production, 1990 (E)
73	Early agrometeorological crop yield assessment, 1986 (E F S)	102	Pesticide residues in food 1990 – Report, 1990 (E F S)
74	Ecology and control of perennial weeds in Latin America, 1986 (E S)	103/1	Pesticide residues in food 1990 – Evaluations – Part I: Residues, 1990 (E)
75	Technical guidelines for field variety trials, 1993 (E F S)	104	Major weeds of the Near East, 1991 (E)
76	Guidelines for seed exchange and plant introduction in tropical crops, 1986 (E)	105	Fundamentos teórico-prácticos del cultivo de tejidos vegetales, 1990 (S)
77	Pesticide residues in food 1986 – Report, 1986 (E F S)	106	Technical guidelines for mushroom growing in the tropics, 1990 (E)
78	Pesticide residues in food 1986 – Evaluations – Part I: Residues, 1986 (E)	107	<i>Gynandropsis gynandra</i> (L.) Briq. – a tropical leafy vegetable – its cultivation and utilization, 1991 (E)
78/2	Pesticide residues in food 1986 – Evaluations – Part II: Toxicology, 1987 (E)	108	Carambola cultivation, 1993 (E S)
79	Tissue culture of selected tropical fruit plants, 1987 (E)	109	Soil solarization, 1991 (E)
80	Improved weed management in the Near East, 1987 (E)	110	Potato production and consumption in developing countries, 1991 (E)
81	Weed science and weed control in Southeast Asia, 1987 (E)	111	Pesticide residues in food 1991 – Report, 1991 (E)
82	Hybrid seed production of selected cereal, oil and vegetable crops, 1987 (E)	112	Cocoa pest and disease management in Southeast Asia and Australasia, 1992 (E)
83	Litchi cultivation, 1989 (E S)	113/1	Pesticide residues in food 1991 – Evaluations – Part I: Residues, 1991 (E)
84	Pesticide residues in food 1987 – Report, 1987 (E F S)	114	Integrated pest management for protected vegetable cultivation in the Near East, 1992 (E)
85	Manual on the development and use of FAO specifications for plant protection products, 1987 (E** F S)	115	Olive pests and their control in the Near East, 1992 (E)
86/1	Pesticide residues in food 1987 – Evaluations – Part I: Residues, 1988 (E)	116	Pesticide residues in food 1992 – Report, 1993 (E F S)
86/2	Pesticide residues in food 1987 – Evaluations – Part II: Toxicology, 1988 (E)	117	Quality declared seed, 1993 (E F S)
87	Root and tuber crops, plantains and bananas in developing countries – challenges and opportunities, 1988 (E)	118	Pesticide residues in food 1992 – Evaluations – Part I: Residues, 1993 (E)
88	<i>Jessenia</i> and <i>Oenocarpus</i> : neotropical oil palms worthy of domestication, 1988 (E S)	119	Quarantine for seed, 1993 (E)
89	Vegetable production under arid and semi-arid conditions in tropical Africa, 1988 (E F)	120	Weed management for developing countries, 1993 (E S)
90	Protected cultivation in the Mediterranean climate, 1990 (E F S)	120/1	Weed management for developing countries, Addendum 1, 2004 (E F S)
91	Pastures and cattle under coconuts, 1988 (E S)	121	Rambutan cultivation, 1993 (E)
92	Pesticide residues in food 1988 – Report, 1988 (E F S)	122	Pesticide residues in food 1993 – Report, 1993 (E F S)
		123	Rodent pest management in eastern Africa, 1994 (E)
		124	Pesticide residues in food 1993 – Evaluations – Part I: Residues, 1994 (E)
		125	Plant quarantine: theory and practice, 1994 (Ar)
		126	Tropical root and tuber crops – Production, perspectives and future prospects, 1994 (E)
		127	Pesticide residues in food 1994 – Report, 1994 (E)

128	Manual on the development and use of FAO specifications for plant protection products – Fourth edition, 1995 (E F S)	162	Grassland resource assessment for pastoral systems, 2001, (E)
129	Mangosteen cultivation, 1995 (E)	163	Pesticide residues in food 2000 – Report, 2001 (E)
130	Post-harvest deterioration of cassava – A biotechnology perspective, 1995 (E)	164	Seed policy and programmes in Latin America and the Caribbean, 2001 (E S)
131/1	Pesticide residues in food 1994 – Evaluations – Part I: Residues, Volume 1, 1995 (E)	165	Pesticide residues in food 2000 – Evaluations – Part I, 2001 (E)
131/2	Pesticide residues in food 1994 – Evaluations – Part I: Residues, Volume 2, 1995 (E)	166	Global report on validated alternatives to the use of methyl bromide for soil fumigation, 2001 (E)
132	Agro-ecology, cultivation and uses of cactus pear, 1995 (E)	167	Pesticide residues in food 2001 – Report, 2001 (E)
133	Pesticide residues in food 1995 – Report, 1996 (E)	168	Seed policy and programmes for the Central and Eastern European countries, Commonwealth of Independent States and other countries in transition, 2001 (E)
134	(Number not assigned)	169	Cactus ( <i>Opuntia</i> spp.) as forage, 2003 (E S)
135	Citrus pest problems and their control in the Near East, 1996 (E)	170	Submission and evaluation of pesticide residues data for the estimation of maximum residue levels in food and feed, 2002 (E)
136	El pepino dulce y su cultivo, 1996 (S)	171	Pesticide residues in food 2001 – Evaluations – Part I, 2002 (E)
137	Pesticide residues in food 1995 – Evaluations – Part I: Residues, 1996 (E)	172	Pesticide residues in food, 2002 – Report, 2002 (E)
138	Sunn pests and their control in the Near East, 1996 (E)	173	Manual on development and use of FAO and WHO specifications for pesticides, 2002 (E S)
139	Weed management in rice, 1996 (E)	174	Genotype x environment interaction – Challenges and opportunities for plant breeding and cultivar recommendations, 2002 (E)
140	Pesticide residues in food 1996 – Report, 1997 (E)	175/1	Pesticide residues in food 2002 – Evaluations – Part 1: Residues – Volume 1 (E)
141	Cotton pests and their control in the Near East, 1997 (E)	175/2	Pesticide residues in food 2002 – Evaluations – Part 1: Residues – Volume 2 (E)
142	Pesticide residues in food 1996 – Evaluations – Part I Residues, 1997 (E)	176	Pesticide residues in food 2003 – Report, 2004 (E)
143	Management of the whitefly-virus complex, 1997 (E)	177	Pesticide residues in food 2003 – Evaluations – Part 1: Residues, 2004 (E)
144	Plant nematode problems and their control in the Near East region, 1997 (E)	178	Pesticide residues in food 2004 – Report, 2004 (E)
145	Pesticide residues in food 1997 – Report, 1998 (E)	179	Triticale improvement and production, 2004 (E)
146	Pesticide residues in food 1997 – Evaluations – Part I: Residues, 1998 (E)	180	Seed multiplication by resource-limited farmers - Proceedings of the Latin American workshop, 2004 (E)
147	Soil solarization and integrated management of soilborne pests, 1998 (E)	181	Towards effective and sustainable seed-relief activities, 2004 (E)
148	Pesticide residues in food 1998 – Report, 1999 (E)	182/1	Pesticide residues in food 2004 – Evaluations – Part 1: Residues, Volume 1 (E)
149	Manual on the development and use of FAO specifications for plant protection products – Fifth edition, including the new procedure, 1999 (E)	182/2	Pesticide residues in food 2004 – Evaluations – Part 1: Residues, Volume 2 (E)
150	Restoring farmers' seed systems in disaster situations, 1999 (E)	183	Pesticide residues in food 2005 – Report, 2005 (E)
151	Seed policy and programmes for sub-Saharan Africa, 1999 (E F)	184/1	Pesticide residues in food 2005 – Evaluations – Part 1: Residues, Volume 1 (E)
152/1	Pesticide residues in food 1998 – Evaluations – Part I: Residues, Volume 1, 1999 (E)	184/2	Pesticide residues in food 2005 – Evaluations – Part 1: Residues, Volume 2 (E)
152/2	Pesticide residues in food 1998 – Evaluations – Part I: Residues, Volume 2, 1999 (E)	185	Quality declared seed system, 2006 (E F S)
153	Pesticide residues in food 1999 – Report, 1999 (E)	186	Calendario de cultivos – América Latina y el Caribe, 2006 (S)
154	Greenhouses and shelter structures for tropical regions, 1999 (E)	187	Pesticide residues in food 2006 – Report, 2006 (E)
155	Vegetable seedling production manual, 1999 (E)	188	Weedy rices – origin, biology, ecology and control, 2006 (E S)\
156	Date palm cultivation, 1999 (E)	189/1	Pesticide residues in food 2006 – Evaluations – Part 1: Residues, Volume 1 (E)
156 Rev.1	Date palm cultivation, 2002 (E)	189/2	Pesticide residues in food 2006 – Evaluations – Part 1: Residues, Volume 2 (E)
157	Pesticide residues in food 1999 – Evaluations – Part I: Residues, 2000 (E)	190	Guidance for packing, shipping, holding and release of sterile flies in area-wide fruit fly control programmes, 2007 (E)
158	Ornamental plant propagation in the tropics, 2000 (E)		
159	Seed policy and programmes in the Near East and North Africa, 2000		
160	Seed policy and programmes for Asia and the Pacific, 2000 (E)		
161	Silage making in the tropics with particular emphasis on smallholders, 2000 (E S)		

- 191 Pesticide residues in food 2007 – Report, 2007 (E)  
192 Pesticide residues in food 2007 – Evaluations –  
Part 1: Residues, 2008 (E)

Availability: March 2008

Ar – Arabic	Multil – Multilingual
C – Chinese	* Out of print
E – English	** In preparation
F – French	
P – Portuguese	
S – Spanish	

*The FAO Technical Papers are available through the authorized FAO Sales Agents or directly from Sales and Marketing Group, FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy.*



