Cooperation Centre for Scientific Research Relative to Tobacco

Agro-Chemical Advisory Committee

CORESTA Guide N° 19

Responsible Use of Crop Protection Agents (CPAs) in Tobacco Leaf Production

April 2017

Author:
H.D. Papenfus, Alliance One International Services Ltd, U.K.

CORESTA TECHNICAL GUIDE N° 19

Title:

Responsible Use of Crop Protection Agents (CPAs) in Tobacco Leaf Production

Status: Valid

Note: This document will be periodically reviewed by CORESTA

Document history:

Date of review	Information
April 2017	Version 1

TABLE OF CONTENTS

1. Introduction

These guidelines are aimed at all stakeholders in the tobacco leaf production and supply sectors, including decision-makers, managers, agronomists, pest control, extension and training specialists, field supervisors and growers. They aim to provide a set of practical guidelines on how to manage and use crop protection agents effectively and safely, while simultaneously minimising their environmental footprint, the risks they pose to those associated with their use, and their residues. The guidelines are based on current international and national codes of practice, protocols and regulations, relevant CORESTA Guides and the tobacco industry's social responsibility and sustainability programmes.

Tobacco is grown in many different regions of the world under various agricultural systems at different levels of sophistication and so there is not one template to suit all situations. Therefore, although the main principles underlying responsible use should be followed, some judgement is necessary in how they are imposed in practice in each situation.

"*Tobacco production, like the production of nearly all other crops, is continually affected by harmful organisms. Therefore it is generally necessary to resort to appropriate measures to protect the growing plant to secure desired quality and yield levels and to preserve the crop after harvesting*" (Mueller and Ward, 1999 [1]). Effective crop protection is essential for sustainable crop production. Crop Protection Agents (CPAs), also referred to as Plant Protection Agents (PPAs) and Pesticides, have an important role in this respect in the context of Integrated Pest Management and for regulating plant growth.

There are clearly defined risks to handling, using, storing and disposing of CPAs and their containers, which must be taken seriously. CPAs may impact non-target organisms, such as beneficial insects, and could pollute land and water resources, which may alter ecosystems. Their residues may also affect an agricultural product's marketability. CPA use can lead to development of resistance in pests and pathogens exposed to them, which can compromise future management strategies. When managed responsibly, however, these risks can be mitigated and then the benefits of CPAs used judiciously and appropriately can far outweigh their cost and associated risks.

CPAs are substances, or mixture of substances of chemical or biological ingredients, intended for repelling, destroying or controlling any pest, or for regulating plant growth. They are classified as:

- Fungicides, bactericides, insecticides, miticides, nematicides and moluscisides.
- Fumigants to control soil borne pests and diseases and storage pests.
- Herbicides to control weeds that compete with the crop and may harbour pests.
- Growth regulators such as suckercides and ripening agents.
- Pheromones for attracting pests and repellents to repel them.

2. Complying with regulations

A key element in responsible use of CPAs is complying with regulations. CPAs must be approved for sale and use at government level in most countries. Regulations differ from country to country. To promote a harmonised setting of regulations at country level, international organizations, such as Food and Agricultural (FAO), World Health (WHO) and International Labour (ILO) Organisations, have developed and published Codes of Conduct on matters concerning CPAs. The codes are backed by a number of international instruments, some of which are legally binding.

2.1 The International Code of Conduct on CPA Management [2]

Because there are various degrees of risk associated with the use of CPAs to humans, animals, plants and environments, they are regulated in most countries. This often includes their registration, conditions of use and maximum residue limits. To this end, the Food and Agriculture Organisation of the United Nations (FAO) and the World Health Organisation (WHO) has issued the "International Code of Conduct on CPA Management". It is the principal FAO/WHO framework on CPA management for those associated with the production, regulation and management of CPAs and its objective is *"to establish voluntary standards of conduct for all public and private entities engaged in or associated with the management of CPAs, particularly where there is inadequate or no national legislation."* The Code covers legislation on CPA use in relation to crop protection, environmental protection, public health, occupational health, water, food safety, wildlife and marine protection, provides standards of conduct and serves as a point of reference for sound CPA management practices for governments, the CPA industry and agriculture.

Articles 3 and 5 of the Code are particularly relevant in the context of this Guide.

Article 3 deals with CPA management, i.e. the regulatory and technical control of all aspects of the CPA life cycle, including production (manufacture and formulation), authorization, import, distribution, sale, supply, transport, storage, handling, application and disposal of CPAs and their containers to ensure safety and efficacy and to minimize adverse health and environmental effects and human and animal exposure.

Governments have the overall responsibility for regulating the availability, distribution and use of CPAs in their countries. In those countries that have not yet established or are unable to effectively operate adequate regulatory schemes and advisory services, this responsibility falls upon the CPA industry comprised of CPA manufacturers, distributors, traders and those that market pest control products. In some countries even this second tier does not operate effectively. Therefore management falls on those involved in the commercial aspects of the crop. Their responsibilities include educating and training persons involved in the CPA chain, especially those that handle and use CPAs.

Article 5 deals with reduction of health and environmental risks. At a national level this involves ensuring that Health and Environmental Services are capable of handling accidents with CPAs and exposure to them. At the crop production level it promotes practices for the reduction of risks as follows:

- Using less toxic formulations;
- Using products in ready to use packages and with clear labelling;
- Using application methods and equipment that minimize exposure to CPAs;
- Using returnable and reliable containers which are not suitable for re-using, nor attractive to children or easy to open;
- Using personal protective equipment which is suitable for the tasks to be carried out and appropriate for the prevailing climate;
- Providing safe storage of CPAs;
- Establishing services to collect and safely dispose of used containers and small quantities of unused chemicals;
- Protecting biodiversity and minimizing adverse effects of CPAs on the environment water, soil and air and on non-target organisms;

- Raising awareness and understanding among CPA users about the importance and methods of protecting health and the environment from the possible adverse effects of CPAs;
- Taking necessary precautions to protect workers, bystanders, nearby communities and the environment;
- Preventing the accumulation of obsolete CPAs and used containers.

The Code is updated at the biennial FAO/WHO Joint Meeting on Pesticide Management (JMPM) and published as "Guidelines for the Implementation of the Code" [3]

Adoption of the FAO/WHO code and making it legally binding at national level is the responsibility of individual countries, each tailoring the code for their own purposes and conditions. Current legislation, regulations and guidelines by nationalities are published by FAOLEX, the FAO database of national legislation [4]. This is a relatively comprehensive and up-to-date legislative and policy database of national laws, regulations and policies on food, agriculture and renewable natural resources. Information on approaches towards the regulatory compliance and enforcement of CPAs in countries that are members of the Organisation for Economic Co-operation and Development (OECD) are published in "Pesticide Information and Enforcement" [5]

Some tobacco-growing countries, especially those in the developing world, may not have yet adopted the Code, often because their government infrastructure is inadequate to support the sector dealing with issues such as that of CPA use. They may be unable to carry out the procedures for testing CPAs locally that under-pin the legislation, neither to promulgate it nor to provide extension services to growers and the necessary training. They also may have little opportunity to connect with international developments in this field. In addition, in some cases where legislation exists, tobacco is not included in CPA legislation. To fulfil their commitment to product integrity, such as Good Agricultural Practice (GAP) and sustainability, stakeholders in the tobacco industry are stepping into the breach through their respective Social Responsibility Programmes and as far as practicable implementing the elements of the Code in leaf production operations in countries and regions where expected standards are not yet being achieved.

2.2 The *Codex Alimentarius* [6]

Codex Alimentarius develops and advocates health standards for consumable products. This includes setting Maximum Residue Limits (MRLs) for CPA residues. An MRL is the maximum concentration of a residue that is legally permitted or recognised as acceptable in or on a food or an agricultural commodity (including tobacco) or animal feedstuff. While being recommendations for voluntary adoption by members, Codex standards serve in many cases as a basis for national legislation. MRL for a specific CPA can vary from one country to another. Where MRLs are enshrined in legislation, movement of products, like tobacco, can be restricted by the limits imposed on CPA residues.

2.3 Montreal Protocol on Substances that Deplete the Ozone Layer [7]

This protocol deals with substances that deplete the ozone layer, such as methyl bromide the soil and storage fumigant. Its use is now banned, or being phased out, in most countries. The list of compounds is regularly reviewed and changes are published in the MP Handbook [8].

2.4 Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal [9]

The Basel Convention is the most comprehensive global environmental agreement on hazardous and other wastes. Among other matters, the convention calls for regulation of trans-boundary movement of CPAs. Movement of a CPA from one country to another where it is not registered is illegal. This practice is especially problematic where CPAs, typically generic formulations, are smuggled across borders and sold below market price. Small scale growers are most vulnerable in this respect. It is commonly illegal to purchase and use such CPAs. The marketability of agricultural products treated with such non-compliant CPAs, in raw and manufactured form, can be seriously damaging for the affected industry.

2.5 International Code of Conduct on Pesticide Management: Guidelines on Highly Hazardous Pesticides (HHPs), 2016 [10]

CPAs are considered highly hazardous if they present particularly high levels of acute or chronic hazards to human health or the environment. In the case of human toxicity they can cause immediate health effects to people who are preparing, mixing or using pesticides, but also to by-standers, people entering treated fields and from consuming treated produce too soon after application. They can also pose risk in storage, cleaning and storage of application equipment and disposal of empty containers and contaminated materials. Hazards to the environment include contamination of water resources and soils and acute or chronic toxicity to non-target organisms such as pollinators and predators of pests.

Countries are encouraged to identify the HHPs in use, to assess the risks involved and to decide upon appropriate measures to mitigate those risks. FAO and WHO recommend that HHPs should be defined as having one or more of the following characteristics:

- Criterion 1: CPA formulations that meet the criteria of classes 1A or 1B of the "WHO Recommended Classification of System Pesticides by Hazard" [11]
- Criterion 2: CPA active ingredients and their formulations that meet the criteria of carcinogenicity Categories 1A and 1B of the "Globally Harmonised System on Classification and Labelling of Chemicals (GHS)" [12]
- Criterion 3: CPA active ingredients and their formulations that meet the criteria of mutagenicity of Categories 1A and 1B of the "Globally Harmonised System on Classification and Labelling of Chemicals (GHS)" [12]
- Criterion 4: CPA active ingredients and their formulations that meet the criteria of reproductive toxicity Categories 1A and 1B of the "Globally Harmonised System on Classification and Labelling of Chemicals (GHS)" [12]
- Criterion 5: CPA active ingredients listed by the Stockholm Convention in its Annexes A and B and those meeting all criteria in paragraph 1 of annex D of the Convention [13]. Refer to Appendix 2.
- Criterion 6: CPA active ingredients and formulations listed by the Rotterdam Convention in its Annex III [14]. Refer to Appendix 1.
- Criterion 7: CPAs listed under the Montreal Protocol [7]
- Criterion 8: CPA active ingredients and formulations that have shown a high incidence of severe or irreversible adverse effects on human health or the environment.

2.6 Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade [14]

The objective of this Convention is to promote shared responsibility and cooperative efforts among countries in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm and to contribute to their environmentally sound use, by facilitating information exchange about their characteristics, by providing for a national decision-making process on their import and export and by disseminating these decisions. The decisions are reviewed regularly at meetings of participating countries and are published on the Convention's web-site.

PIC aims to ensure that hazardous chemicals exported from one country to another are packaged and labelled in a manner adequately protective of human health and the environment, including health of consumers and workers, against potentially harmful impacts from certain hazardous chemicals and CPAs in international trade.

With pressure on global agriculture to increase production, developing countries frequently provide a market for older, cheaper and more hazardous CPAs. They often include generic compounds from producers in expanding economies, which seek less regulated and monitored markets. Furthermore in some countries, locally-produced generic products are actively promoted in the interests of industrial development and low prices for farmers. PIC is a process which identifies and shares government decisions to ban or severely restrict CPAs. It includes dissemination of decisions to importing countries where information may be difficult to obtain. While promoting shared responsibility between importers and exporters, the exporting countries must ensure their industries comply with importing country regulations.

Responsible use of CPAs is compromised by ignoring the objectives of PIC. Monitoring compliance is obviously important. This involves keeping a close eye on the CPAs growers are being sold, obtaining reliable information on their provenance and registration credentials and, as far as possible, testing what they actually contain and its concentration. Also, making sure that label instructions comply with local or recognised regulations. However, it is not always easy to implement regulations (especially those that are technical in nature) in remote rural areas and where products may unofficially cross national borders. The grower therefore may be faced with a bewildering array of products.

Article 6 of the Rotterdam Convention provides a route through which information on incidents of CPA poisoning caused by Highly Hazardous Pesticides (HHPs) can be shared with other countries, including those likely to experience similar problems. The purpose is to alert countries to potential problems and to submit new proposals for candidate CPA formulations causing problems under national conditions of use for inclusion in the PIC list.

Hazardous CPAs are usually older generation, off-patent products that are relatively inexpensive to manufacture and are often found in the generic products market segment. This particularly affects countries that have poorly functioning registration and monitoring schemes. Such countries are often a target for these relatively cheap, and perhaps illegally imported, CPAs without reliable provenance. The problem can be exacerbated by the absence of adequate protection when handling and applying such CPAs because it is not available, too costly or uncomfortable to wear under the particular conditions, with unsophisticated application equipment, and by lack of knowledge and training.

CPAs classified as HHPs as of 2016 are listed in Appendix 1. For updates refer to Rotterdam Convention Annex III Chemicals [15].

2.7 Stockholm Convention on Persistent Organic Pollutants [13]

Persistent Organic Pollutants (POPs) are carbon-based chemical substances. They possess a particular combination of physical and chemical properties such that, once released into the environment, they:

- remain intact for exceptionally long periods of time (often many years),
- become widely distributed throughout the environment as a result of natural processes involving soil, water and, most notably, air,
- accumulate in the fatty tissue of living organisms including humans,
- are found at higher concentrations at higher trophic levels in the food chain and
- are toxic to humans and wildlife.

Banned CPAs and those under restriction or review are listed in Appendix 2. The lists are regularly reviewed.

2.8 International Labour Convention No.184 concerning safety and health in agriculture of 2001 [16]

This international convention, developed by the International Labour Organisation (ILO), is directed principally at those engaged in the handling and use of chemicals, including CPAs. It sets out standards on safety in their use in agriculture with the intention that they be brought into legislation locally. It is also directed at eliminating exposure of children to harmful chemicals, in effect limiting children's involvement in crop production.

To assist in implementation of the Convention, ILO has produced a guide "Safety and Health in the use of Agrochemicals", which includes practical measures to be taken to avoid undue consequences when handling CPAs. Emphasis has been laid extensively on safe handling and use, and on practical measures to be taken to avoid undue consequences. The guide is intended for use as a training aid [17].

3. Registration of CPAs

In most countries, it is illegal to use a CPA not registered locally for a given crop, including tobacco.

Registration for CPAs is mandatory under the FAO Code of Conduct. It is an essential component of most CPA laws. Registration means the process whereby the responsible national authority approves or does not approve the sale and use of a CPA. It typically follows the evaluation of comprehensive scientific data demonstrating that the product is effective for the intended purposes and does not pose an unacceptable risk to human or animal health or to the environment.

Countries design their registration schemes according to national needs, but the basic concept is that it is prohibited to manufacture for domestic use, import, pack, re-pack, store, sell, distribute, possess or use CPAs that are not registered as prescribed, unless otherwise provided under the law. Some developing countries design registration schemes suited to their own needs, rather than emulating in their entirety the detailed systems in place in countries with greater budgets and technical capacity for CPA registration. Pooling of resources through regional collaboration in CPA registration provides an alternative that enables a more rigorous process compared with that which each country would have been able to do on its own [18].

With the increasing concerns for the environment and the risk of adverse effects of some CPAs, re-registration in which existing CPAs are scrutinised against more stringent and new criteria is routinely carried out in many countries. In this way a number of CPAs have either lost their registration or had it temporarily removed for further evaluation, potentially making their possession and use illegal in most cases and restricted in others.

Governments are encouraged to establish their own legislation and testing facilities to support registrations. However, to promote a harmonized approach, FAO collaborates with most developed countries and an increasing number of less developed ones in this process through its "International Code of Conduct on CPA Management" [2].

Registration is an expensive, time-consuming process and manufacturers of CPAs are becoming increasingly prudent in their choice of candidates for registration. This particularly affects tobacco, which is regarded as a minor crop. Other minor crops, many in the horticultural sector, are also affected. In the European Union minor crops are now regarded as a single category which reduces the need for multiple testing.

The criteria for registration typically relate to efficacy and risk to health and the environment, and include:

- the intended use (crop/pest) and the efficacy of the product.
- occupational health hazards and risks to workers and users at different stages of the product cycle.
- where relevant, an acceptable daily intake (ADI).
- hazards and risks to public health with special attention to vulnerable groups, animal health, the environment (including contamination of surface water or ground water from leaching, run-off and spray) and non-target species (e.g. humans, wildlife, fish, pollinators).
- envisaged mode and conditions of use and associated risk factors.
- existence of alternatives that present lower risk.
- persistence, half-life and other factors contributing to the presence of residues on the crop concerned.
- pest resistance to CPAs.
- the proposed packaging and label.

Registered CPAs are typically listed in government gazettes or similar publications. In addition FAOLEX [4] and the Global Protection Database, Homologa™ [19], which is recognised as a world-wide source for CPA registration status.

In countries where there is no formal procedure for registration, stakeholders in the local tobacco industry are encouraged to set up a panel of experts that can prepare a list of "locally approved CPAs" for controlling local pests and plant growth based as far as possible on those registered for tobacco in other countries, preferably nearby and with comparable conditions for crop production. This is an informal procedure but demonstrates duty of care by the local tobacco industry.

4. Complying with Label Instructions

The CPA label is the "written, printed or graphic material" that is a mandatory part of the CPA product package. It is the principal contact between the manufacturer or supplier conveying the identity, formulation and strength of the CPA, the essential details of its use

and the risks that it may pose to health, safety and the environment. In most countries, CPA labels are legal documents in that they are required by law to be put on the package. The (minimum) content and format of the label is generally defined by local law and any modifications or variations need to be approved by the responsible authority. CPA labels are enforceable and using the CPA in a manner inconsistent with its labelling is a violation of the law in most countries. The label is an essential tool to provide judicious and effective use of CPAs and must be referred to before starting any pest control programme. Hence the opening statement on each label:

1. READ ALL SAFETY PRECAUTIONS AND DIRECTIONS FOR USE BEFORE USE

FAO has provided guidelines for good labelling practice [20]. A typical label displays the following information:

- Product content information, including target pests.
- Hazard and safety information, including precautions that must be taken to minimise or prevent adverse effects from exposure to the CPA and treatment if exposure occurs.
- Environmental hazards, for example to aquatic environments, ozone layer, wildlife, livestock, pollinators, natural enemies of pests, soil organisms and ground water.
- Dosage, rates, frequency of application, pre-harvest interval and re-entry time.
- Directions for use as required by Good Agricultural Practice – how, where and when the CPA can be legally used with maximal efficiency, safety and minimal risk to people, the broader environment and other crops.
- Secure storage and safe disposal.
- Supplier information.
- Registration number.

5. Health and Environmental Risks from CPAs

How chemicals are produced and used to minimise significant adverse impacts on the environment and human health are addressed by the Strategic Approach to International Chemicals Management (SAICM), adopted by the International Conference on Chemicals Management, 2006 [21]. A global programme for reducing risks associated with CPAs, targeted for adoption by 2020, is being developed by SAICM.

The core objective of the Strategic Approach is to minimise risks to human health, including that of workers and the environment throughout the life cycle of chemicals. Its aims are that chemicals which pose an unreasonable risk to health and the environment are no longer produced or used and are disposed of without negatively affecting the environment and are replaced by safer, alternative pest control practices or environmentally sound and safer alternatives. The groups of chemicals prioritised for assessment and related studies include:

- persistent, bio-accumulative and toxic substances;
- chemicals that are carcinogens or mutagens or that adversely affect, *inter alia*, the reproductive, endocrine, immune, or nervous systems;
- persistent organic pollutants (POPs); mercury and other chemicals of global concern;
- chemicals produced or used in high volumes and those subject to wide dispersive uses.

Local circumstances that may increase unintentional CPA exposure include:

- Non-availability of appropriate application equipment or limited access to it.
- Limited ability to safely store CPAs.
- Limited ability to maintain and safely clean and store application equipment.
- Improper advice and inadequate knowledge about CPA handling, use, storage and risks.
- Not respecting prescribed re-entry intervals and pre-harvest intervals.
- Risk of spray drift.
- Lack of disposal options/facilities for obsolete stocks, left-over product or empty containers.

Unintentional exposure of crops often results from drift or overflow. It may affect crop health and food safety. Drift of herbicides could damage crops in neighbouring fields and drift of insecticides and fungicides may affect food safety.

CPA use is therefore strictly regulated in many countries, for example by the Worker Protection Standard issued by Environmental Protection Agency in the United States [22] and the by EU Directive 2014.27EU [23] in the European Union. Refer also to the FAO database of national legislation [4] and the Organisation of Economic Co-operation and Development (OECD) publication "Pesticide Information and Enforcement" [5]. The OECD website is intended to provide a central point where anyone can quickly find information about approaches and practices towards the regulatory compliance and enforcement of pesticides in the 34 member countries as well as in a number of non-member ones.

5.1 Health

CPAs are the chemicals of greatest concern in terms of risks to health in agriculture, especially in labour intensive crops. Developing countries suffer disproportionately from the negative impact of CPAs. Protection from accidental exposure is paramount. The FAO/WHO International Code of Conduct [2] advocates that an important part of any legislative framework should be protecting those who come into contact with CPAs.

CPAs normally fall in the top three categories within the World Health Organization's classification (2009) [11] which defines the degree of risk to human health, i.e. the risk of single or multiple exposures orally, dermally or by inhalation over a relatively short period of time. It takes into consideration the toxicity of the active ingredients and of formulations. The categories are:

IA - extremely hazardous

IB - highly hazardous

II - moderately hazardous

III - slightly hazardous

IV - product unlikely to present acute hazards in normal use.

The European Union has adopted a similar system [23]. The United States Environmental Protection Agency also considers skin and eye effects.

The primary route of exposure for most widely used CPAs is absorption through the skin. At normal exposure levels, skin damage or other symptoms may not be noticed, so absorption occurs without the worker's knowledge. Exposure can occur to the whole body during spraying and to the hands in the majority of cases. Forearm, torso and facial exposure are common during mixing, loading and hand spraying. Exposure to the torso is likely when workers carry chemicals on their backs, as with backpack sprayers and also in fields of some mature row-crop plants when the leaves are nearly touching across rows. Inhalation is an important route of exposure when working with volatile compounds or in enclosed spaces such as greenhouses. Ingestion is another route of exposure for CPAs and can be a significant risk if food and smoking materials are handled after contact with CPAs prior to washing hands.

All those involved in handling and applying CPAs must be adequately protected. Personal protective equipment (PPE) to minimise exposure to CPAs can include gloves, safety glasses, respirators or masks and overalls. PPE should be appropriate for the CPA and application method, in good condition and must be properly used [24] [25].

Certain groups of people are particularly vulnerable and should be kept away from the work place where CPAs are being mixed, loaded and applied. These include pregnant women, young persons, children and those with more body fat. Children are considered to be at particularly high risk from CPAs. Their small size, rapid development, underdeveloped metabolism, diet and behaviour mean that smaller doses of toxins have a greater impact than in adults. Children are at risk of exposure in the agricultural workplace if their family members return home with CPAs on their clothing and skin, or if family vehicles, utensils or premises become contaminated.

As a health warning, CPA labels and chemical safety data sheets provide critical information on the proper mixing, loading and application procedures and their instructions should be followed at all times. They also typically carry specific information on potential health effects and mitigation measures.

5.2 Environment

The harmful impact of CPAs on the environment was brought into focus by the Rio Conference on environment and development. The Rio Declaration on Environment and Development set the stage for international co-operation for sustainable development, environmental protection and quality of life and for promoting them [26]. This was followed by Agenda 21, the "Global Programme of Action on Sustainable Development" [27] and **"**the Convention on Biological Diversity" [28].

Although many CPAs dissipate rapidly in soils, runoff can carry them to adjacent, susceptible crops or to surface and subterranean water resources, which can make the water unsafe to use. Biodiversity of beneficial organisms in the soil may also be affected. Similarly, wind-blown CPAs can affect other nearby crops, grazing animals, human settlements and biodiversity of non-target organisms, some of which are natural predators of the pests affecting the tobacco crop. There is also a risk from using legitimate CPAs for a particular crop that may contaminate the soil and could affect growth and productivity of subsequent crops and their CPA residues. Tobacco is a particularly susceptible crop in this respect. These effects are exacerbated by accidental spillage, inappropriate use of CPAs, over-application of CPAs, and improper disposal of unused CPAs and empty CPA containers.

5.3 Responsible practices to minimise health and environmental risks

International Instruments are:

- The Stockholm Convention on Persistent Organic Pollutants [13].
- International Code of Conduct on Pesticide Management: Guidelines on Highly Hazardous Pesticides (HHPs) [10].
- International Labour Convention No.184 concerning safety and health in agriculture of 2001 [16].

- From the outset, comply with label instructions and local regulations that protect the environment and the people who work with CPAs.
- Implement all locally feasible pest control practices offered by Good Agricultural Practice (GAP), including Integrated Pest Management (IPM) to minimise dependence on CPAs. (Refer to **6.** Good Agricultural Practice).
- As far as possible, use the least hazardous CPAs approved for tobacco and those with lowest risk to the environment. Apply them carefully to the tobacco, avoiding contamination or damage to adjoining areas and communities.
- Train all those concerned with storing, handling and applying CPAs on how to work safely with CPAs.
- Ensure that all those involved in handling CPAs are adequately protected. Ensure that personal protective equipment (PPE) is fit for the purpose and used properly [24] [25].
- Display warning signs where CPAs are being used.
- Ensure that all equipment, such as that used for applying CPAs, is fit for the purpose and serviced, with particular attention to avoiding leaks and spillage.
- Preferably select products in ready to use packages.
- Use returnable containers and container collection systems. Introduce this service wherever possible.
- Use containers that are not attractive for subsequent re-use.
- Follow local rules for disposing unused CPAs and empty containers. Refer also to: "FAO Guidelines for the Management of Small Quantities of Unwanted and Obsolete Pesticides" [29].
- Strictly control spillage and contamination during transport, storage, and mixing and, thereafter, when cleaning equipment.
- Take all necessary precautions to protect workers, bystanders and nearby communities.
- Take special care to keep children away from CPAs, whether in concentrated or dilute form, and their containers. Ensure that such chemicals are not brought into the home.
- Do not consume food when handling, mixing or applying CPAs.
- Do not use food utensils for mixing chemicals.
- Particularly avoid contaminating water resources, especially when cleaning spray equipment and clothing and disposing excess spray material, used containers and disposable gloves.
- Do not use CPAs that are highly toxic to fish anywhere near open water.

- Distribute and display leaflets and posters that carry specific information on potential health and environmental effects of CPAs being used and on mitigation measures for all those to see.
- Report all health and environmental incidents to authorities where this requirement exists.

5.4 CPA storage

CPAs must be stored safely and securely. Depending on the number and size of the containers, this can vary from lockable, strong metal or wooden boxes stored away from the reach of children, to more sophisticated store rooms with doors that can be locked. The USA-Environmental Protection Agency, for example, has the following guidelines [30].

- Follow all storage instructions on the pesticide label.
- Don't stockpile. Buy only the amount of pesticide needed soon.

Where to Store CPAs

- Store CPAs out of reach of children, livestock and pets.
- Never store CPAs in cabinets with or near food, animal feed, or medical supplies.
- Store flammable liquids outside your living area and far away from an ignition source such as a furnace, car, grill, or lawn mower.
- Do not store CPAs in places where flooding is possible or where they might spill or leak into wells, drains, ground water, or surface water.

How to Safely Store CPAs

- Always store CPAs in their original containers with the label, which lists directions for use, ingredients, and first aid steps in case of accidental poisoning.
- Never transfer CPAs to soft drink bottles or other containers. Children or others may mistake them for something to eat or drink.
- Use child-resistant packaging correctly. Child resistant does not mean child-proof, so close the container tightly and keep it out of children's reach.
- If you can't identify the contents of the container, or if you can't tell how old the contents are, follow the advice on safe disposal.

6. Good Agricultural Practice (GAP)

6.1 Introduction

The aim of Good Agricultural Practice (GAP) is to ensure sustainable, economically viable production of crops, in this case usable tobacco. CORESTA Guide No. 3 – "Good Agricultural Practices Guidelines" defines GAP as: "Agricultural Practices which produce a quality crop while protecting, sustaining or enhancing the environment with regard to soil, water, air, animal and plant life." [31] The GAP guidelines for crop protection spell out the practices necessary for the safe use of CPAs in relation to the people involved in their use and the surrounding communities, animals and environment. It also aims at decreasing the number of chemical CPAs used and the size of their residues by adopting the principles of Integrated Pest Management (IPM). IPM does not exclude the use of CPAs but takes account of all available plant protection measures to ensure that pests and diseases are kept at levels that are

economically sustainable and ecologically sound and that minimise safety and environmental risks. Refer to CORESTA publication "Integrated Pest Management" [32], and the OECD "IPM Hub" [33], which is a platform for information sharing and cooperation between all stakeholders on IPM matters.

Sound management of GAP can reduce the risk of pest infestation and damage. By so doing, dependence on CPAs and the risks associated with their use can be decreased.

6.2 Golden Rules

6.2.1 First Principles

- Implement IPM measures (such as traps) for detecting invasion of pests. Also, scout and monitor the crop routinely for pest/disease infestation to minimise damage and facilitate more effective control.
- Make optimal use of non-chemical systems (IPM).
- Correctly identify the pest/disease that needs to be controlled and then select an appropriate CPA, preferably a selective one, recommended and registered for its control in tobacco.
- Determine the economic threshold for CPA application and only apply CPAs when the threshold has been exceeded.

6.2.2 Purchasing CPAs

- Avoid illegal CPAs, such as those that are counterfeit.
- Purchase only from reliable sources, making sure that the label is in a familiar language, displays a valid registration number, complies with labelling regulations and guidelines and clearly identifies the active and any other ingredients.
- Select only CPAs that are registered for tobacco and, amongst these, the least hazardous ones and those that do least damage to the environment.

6.2.3 Using CPAs

- Make sure application equipment is in good condition (no leaks) and working order.
- Fit the correct nozzles and correctly calibrate application equipment.
- Carefully read label and then ensure selected CPA is used according to label instructions with regard to all aspects of its use, particularly dosage, rates and frequency of application, pre-harvest interval and re-entry time.
- Follow label instructions and local regulations regarding personal protection equipment and to avoiding risks to nearby people, animals and the environment. (Refer to 5. Health and Environmental Risks from CPAs).
- Determine to what extent current levels of CPA use are actually needed and eliminate unjustified CPA use.
- Implement the appropriate control measure, carefully study the label on the container and apply the CPA according to all its instructions and warnings. Read and act upon all safety precautions and directions before commencing treatment.
- Make sure all equipment for applying CPAs is fully serviceable, fitted with the right nozzles, properly calibrated and leak-proof.

- Use bio-CPAs (also known as bio-pesticides) where these have been successfully tested, registered and locally recommended for tobacco in preference to synthetic CPAs.
- Obtain all CPAs from reputable sources and preferably as branded products from the original manufacturers.

6.3 Seed

- Always use locally recommended, tested and registered disease-free seed of varieties with reliable provenance. Avoid farmer retained seed or that from the leaf crop.
- Select varieties resistant to one or more local diseases if available.

6.4 Seedling Production

Seedlings are the foundation of a successful crop. They need to be of the right size, healthy, undamaged and in adequate numbers for the planned crop. They are particularly susceptible to pest and disease damage. Therefore, it is important to carry out control procedures meticulously from the outset. In the case of seedling production, the cost of recommended pest and disease control measures is small compared with their benefits.

- For traditional, open beds, select a weed-free site that has not been cropped to tobacco for at least two years, more if the previous crop was infected by nematodes, black shank or fusarium wilt. Intervening crops should not be susceptible to the same diseases as tobacco. Therefore avoid solanaceous plants, such as potatoes, tomatoes and peppers in rotation with tobacco, as well as these crops in adjacent beds or fields. Grasses and cereals are preferable as rotation crops.
- Entry to seedbeds should be restricted by gated fencing or walls.
- For float system production, ensure trays are clean and sanitised and that the growing medium is disease and weed free. Obtain growth medium from a reliable source.
- In all cases, use only water that is not at risk of carrying nematodes or other pathogens and chemicals toxic to plants, such as herbicides.
- Sanitise equipment to be used in production sites and wash hands and gloves with soap and running water before entering plant bed areas and handling transplants. This is especially important for avoiding transmission of tobacco mosaic virus (TMV), which weakens plants of varieties not resistant to TMV and can greatly reduce their yield potential, especially when they are infected from a young stage.
- Clean footwear in foot baths containing disinfectant at the entrance to the site before entering to avoid bringing in contaminated soil and plant material.
- Identify disease infested areas. Remove and destroy affected seedlings promptly.
- Wear clean protective clothing and strictly prohibit use of any tobacco products when working in plant beds and during transplanting.
- Select uniform, healthy, undamaged seedlings for transplanting.
- Promptly destroy remaining seedlings after the crop is established.

6.5 Field Crop

- Ensure that cultural practices, such as preparation of soil and its condition, transplanting and weed control are optimal for unrestricted, healthy growth. It is generally accepted that the susceptibility to disease and extent of damage is larger in

plants that are weak or injured than their stronger counterparts. Plants already affected by one or more pests or diseases are also more susceptible to infection and damage by others than healthy ones.

- Rotate tobacco with crops/pastures that are not hosts to tobacco pathogens, such as black shank, bacterial wilt and fusarium wilt, or to tobacco nematodes and cutworms.
- Determine from soil samples the potential pressure from soil borne pathogens (such as nematodes) ahead of planting to assess the type and intensity of control measure.
- Avoid disease transfer from residues of previous tobacco crops, discarded waste product, soil from previously infected areas and contaminated equipment.
- Regularly clean and sanitise equipment to be used in the field, especially when plants are young and actively growing.
- If possible, schedule planting when climate is least conducive to pest and disease pressure.
- Scout routinely for pest and disease infestation. Use traps to help identify insect infestation and commence disease and pest control as soon as threshold levels are reached, not before.
- Plan to have a tobacco-free period of sufficient length to restrict pest and disease carry-over from one crop to the next on the same soil.
- Where feasible, use trap and catch crops and predators, such as the wasp, *Aphidius colemani*, to assist in control.
- Destroy alternate host plants in and around the crop when they first appear.
- Destroy crop residues immediately after harvesting is completed.

7. Maximum Residue Limits (MRLs) and Guidance Residue Levels (GRLs)

Residues of the original active ingredient(s) or their products of degradation may be detected on crops. The amount of residue is critical in determining the acceptability of the product. The maximum residue limit (MRL) is the highest level of a CPA residue that is legally tolerated on the product.

Recommended MRLs for products that are consumed are set by the Joint FAO/WHO Meeting of Pesticide Residues (JMPR) on the strength of residue data from field trials in different environmental and climatic conditions and the results of toxicological studies with animals and epidemiological ones with humans. Conclusions and recommendations which result from the meetings of JMPR are then submitted to another United Nations body, the Codex Committee on Pesticide Residues (CCPR) which is one of the subsidiary bodies of the *Codex Alimentarius* Commissions (CAC), as part of their programme to promote safety and quality standards internationally. As a final step, CAC establishes Codex MRL (CXL) as an international standard which is the maximum concentration of a pesticide residue recommended by the CAC to be legally permitted in or on food commodities and animal feeds. Governments then follow the international standard as their standard under Sanitary and Phytosanitary measures/SPS measures unless there is a scientific justification. In some cases, they can retain their existing standards or set new ones. This sometimes results in MRLs that can vary widely from those recommended by CAC. Furthermore, according to the Codex definition, tobacco is out of its scope. It also accounts for the fact that not all countries

have set MRLs for some commodities such as tobacco. Greater global harmonisation, however, is inevitable as a result of treaties under the World Trade Organization (WTO).

Some countries have regulations on MRLs for CPAs that apply specifically to tobacco and its products, which are imbedded in their legally binding ordinances or decrees. This gives them a right to prohibit importation of product with residues larger than the MRL they have imposed.

Although international and national authorities regulate the residues of CPAs in food and feed crops, there is no universal consensus with regards to tobacco. MRLs for tobacco are absent from regulations in some countries and among others they vary over a broad range of values. Accordingly, Guidance Residues Levels (GRLs) have been developed by the CORESTA Agro-chemical Advisory Committee to provide guidance to tobacco growers, research, extension, and training personnel involved in the application of CPAs and the implementation of GAP with regard to CPA use. The GRLs are published in CORESTA Guide No. 1 "Agrochemical Guidance Residue Levels (GRLs)" [34] and are intended to assist with the interpretation and evaluation of the results of CPA testing as an indicator that GAP is being implemented. They are based on the best available technical and scientific knowledge, historical residue data, existing MRLs and the results of field trials. These GRLs apply to predominantly traditional cigarette tobaccos.

Although GRLs offer a globally harmonised approach to CPA residues by the tobacco industry, they do not replace the requirement to comply with regulations such as those for MRLs set by authorities. They are designed to emphasise the importance of GAP for growing quality tobacco and have been widely adopted by the industry, not only to promote implementation of GAP but also as one of the measures of raw material integrity.

8. CPA Application Equipment

When using an approved CPA the objective is to distribute the correct dose to a defined target with the minimum of wastage due to drift using the most appropriate spraying equipment. CPAs only give acceptable field results if they are delivered safely and precisely. For this, efficient, well designed and constructed, durable spray equipment is essential for obtaining a satisfactory level of pest control, to minimise waste of CPAs and possible harm to operators, adjacent crops and the wider environment. Price will always play an important part in purchase decisions on equipment but even the cheapest sprayer models should meet minimum standards of safety and durability.

Safety and quality standards for these sprayers do not exist in all countries and existing international standards for this type of equipment are often not universally appropriate. Accordingly, FAO has produced guidelines based on national standards, published information and the expertise of specialists in this field:

- for portable sprayers which are very widely used in crop production, especially by small scale growers refer to "Guidelines on minimum requirements for agricultural pesticide application equipment", vol. 1 Portable (operator carried) sprayers [35].
- for vehicle mounted and trailed sprayers refer to "Guidelines on minimum requirements for agricultural pesticide application equipment", vol. 2 Vehicle mounted and trailed sprayers [36].
- for portable operator carried foggers "Guidelines on minimum requirements for agricultural pesticide application equipment", vol. 3 Portable (operator carried) foggers [37].

In common with other FAO guidelines, these guidelines are voluntary. In some countries legislation is in place to control safe and efficient CPA use and application and this must be the first point of reference. The FAO guidelines offer additional information for up-dating or improving local legislation, which may be important for legal reasons. For other countries, the guidelines serve as a guide until appropriate legislation is in place.

Even the most well designed and maintained sprayer can do immeasurable damage in the hands of an unskilled operator and, unlike other field operations, the results from poor spraying may not become apparent for some time. It is therefore essential that those involved in CPA selection and use are fully aware of their responsibilities and obligations, and are trained in CPA use and application. Refer to: "FAO Guidelines on Good Practice for Ground Application of Pesticides" [38].

9. Stakeholder Involvement

Most major global manufacturers of tobacco products, their suppliers and growers are committed to programmes that implement production practices aimed at sustainability and integrity of their respective tobacco products. The Sustainable Tobacco Production (STP) Programme is an example of key tobacco product manufacturers and leaf suppliers working together on important non-competitive sustainability aspects in a unified approach. The programme is a merger and refinement of various individual company's social responsibility, GAP, and sustainability programs into a common industry approach. These programmes have a common strategy for dealing with the risks associated with the use of CPAs in crop protection, for reducing dependence on CPAs and their residues and for monitoring compliance. Best practices are promoted through an extensive network of extension services, agronomists and field technicians, largely sponsored by the industry, which covers practically every corner of the leaf-growing sector. Participation is largely obligatory for contracted growers and for trading leaf. This has formed the framework for continual crop improvement, including crop protection practices and the use of CPAs. Information on these programmes and on sustainable tobacco production practices can be found on the web-sites of grower organisations, suppliers and manufacturers and in CORESTA Guide No. 17 "Sustainability in Leaf Tobacco Production [39].

10. References

1. Müller, L and M.R. Ward (1999): "Pesticide Regulations and their Impact on Crop Protection Strategies (Minimising of Pesticide Residues) in Tobacco *Production, Chemistry and Technology*, ed. D. Layten Davis and Mark Nielsen, Blackwell Science Ltd., Oxford, pp.250-264.
2. The International Code of Conduct on CPA Management - http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/CODE_2014Sep_ENG.pdf
3. The International Code of Conduct on CPA Management Guidelines for the Implementation of the Code" - http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/Annotated_Guidelines2014.pdf
4. FAOLEX database of national legislation - http://faolex.fao.org/
5. OECD Pesticide Information and Enforcement" - http://www.oecd.org/chemicalsafety/pesticide-compliance
6. The *Codex Alimentarius* - http://www.codexalimentarius.net
7. Montreal Protocol on Substances that Deplete the Ozone Layer - http://ozone.unep.org/
8. Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer - http://ozone.unep.org/en/handbook-montreal-protocol-substances-deplete-ozone-layer/6
9. Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal - http://www.basel.int/
10. International Code of Conduct on Pesticide Management: Guidelines on Highly Hazardous Pesticides, 2016 - http://www.fao.org/3/a-i5566e.pdf
11. World Health Organization's classification (2009) - http://www.who.int/ipcs/publications/pesticides_hazard_2009.pdf
12. Globally Harmonized System of Classification and Labelling of Chemicals (GHS)(2015) - https://www.unece.org/fileadmin/DAM/trans/danger/publi/ghs/ghs_rev06/English/ST-SG-AC10-30-Rev6e.pdf
13. Stockholm Convention on Persistent Organic Pollutants - http://chm.pops.int
14. Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade - http://www.pic.int
15. International Code of Conduct on Pesticide Guidelines – Updates - http://www.pic.int/theconvention/chemicals/annexiiichemicals/tabid/1132/language/en-us/default.aspx
16. International Labour Convention No.184 concerning safety and health in agriculture of 2001 - www.ilo.org/public/english/standards/relm/ilc/ilc89/pdf/c184.pdf
17. Safety and Health in the use of Agrochemicals (ILO guide) - http://www.ilo.org/safework/info/instr/WCMS_110196/lang--en/index.htm
18. FAO/WHO Guidelines for the Registration of Pesticides - http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/Registration_2010.pdf

19. Homologa™ - The Global Crop Protection Database of MRLs and current product registrations - http:/www.homologa.com

20. International Code of Conduct on Pesticide Management Guidelines on Good Labelling Practice for Pesticides (revised), 2015 - http://www.fao.org/3/a-i4854e.pdf

21. Strategic Approach to International Chemicals Management (SAICM) (I*nternational Conference on Chemicals Management, 2006*) - www.saicm.org

22. USA Environmental Protection Agency - Worker Protection Standard - https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps

23. European Union Directive 2014.27EU– "Exposure to chemical agents" - http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=cellar:292b8ec3-9290-4f8f-afd9-64dacfd6ca2e

24. Personal Protective Equipment - http://www.osha.gov/SLTC/personalprotectiveequipment/

25. FAO guidelines for PPE when working with CPAs in tropical climates - http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/Old_guidelines/PROTECT.pdf

26. Rio Declaration on Environment and Development 1992 - http://www.unesco.org/education/pdf/RIO_E.PDF

27. Global Programme of Action on Sustainable Development - http://www.un.org/esa/dsd/agenda21/

28. Convention on Biological Diversity - http://www.cbd.int/

29. FAO Guidelines for the Management of Small Quantities of Unwanted and Obsolete Pesticides - www.fao.org/fileadmin/user_upload/obsolete_pesticides/docs/small_qties.pdf

30. USA Environmental Protection Agency – "Guidelines on Storage of Pesticides" - http://extension.psu.edu/pests/pesticide-education/applicators/fact-sheets/consumer/what-you-need-to-know-about...storing-a-pesticide

31. CORESTA Guide No.3 "Good Agricultural Practices Guidelines - https://www.coresta.org/good-agricultural-practices-gap-guidelines-29207.html

32. CORESTA "Integrated Pest Management" - http://www.uky.edu/Ag/Agronomy/IPM_Taskforce/assets/oct2015_update/FinalReport_Oct-21-2015.pdf

33. OECD Hub - "Integrated Pest Management (IPM)" - https://www.oecd.org/chemicalsafety/integrated-pest-management/

34. CORESTA Guide No. 1 "Agrochemical Guidance Residue Levels (GRLs)" - https://www.coresta.org/agrochemical-guidance-residue-levels-grls-29205.html

35. FAO Guidelines on Minimum Requirements for Agricultural Pesticide Application Equipment Volume 1 - Portable (Operator-carried) Sprayers - http://www.fao.org/docrep/006/y2765e/y2765e00.HTM

36. FAO Guidelines on Minimum Requirements for Agricultural Pesticide Application Equipment Volume 2 - Vehicle mounted and trailed sprayers - http://www.fao.org/docrep/006/Y2753E/Y2753E00.htm

37. FAO Guidelines on Minimum Requirements for Agricultural Pesticide Application Equipment Volume One Volume 3 -Portable (operator carried) foggers - http://www.fao.org/docrep/006/y2757e/y2757e00.htm

38. FAO Guidelines on Good Practice for Ground Application of Pesticides - www.fao.org/docrep/006/y2767e/y2767e00.htm

39. CORESTA Guide No. 17 “Sustainability in Leaf Tobacco Production [39] - https://www.coresta.org/sustainability-leaf-tobacco-production-29948.html

11. References for Further Information

The following is by no means an exhaustive list. Most countries that grow commercial tobacco as well as organisations in those countries associated with it publish and make available similar information, normally in their respective vernaculars.

1. Crop Management GAP CONNECTIONS: Connecting farmers through environmentally and socially sustainable good agricultural practices - http://www.gapconnections.com/GAPC%20Book/2016/2016%20Guidelines%20Final.pdf

2. NC Good Agricultural Practices (GAP) for Tobacco, November 4, 2010 - http://ncagr.gov/markets/commodit/horticul/tobacco/NC%20Tobacco%20Good%20Agricultural%20Practices.pdf

3. Hannah J. Burrack, Aurora Toennisson and Catherine LePrevost. “Protecting People and the Environment when using Pesticides” in 2016 FLUE-CURED TOBACCO INFORMATION, North Carolina State University, pp.190-202 - https://tobacco.ces.ncsu.edu/

4. Tobacco Research Board (Zimbabwe): “Flue-cured Tobacco Recommendations” - http://www.kutsaga.co.zw/Publications.html

5. SindiTabaco: “Integrated Production of Tobacco” - http://sinditabaco.com.br/en/

6. OECD Pesticide Compliance and Enforcement - https://www.oecd.org/chemicalsafety/pesticide-compliance/laws-policies-guidance.htm

7. Di@gnoplant Tobacco App: Available for smartphones and tablets
> know pests and diseases of tobacco
> identify diseases with help of image identification module
> access information on disease symptoms and protection methods
Free download for iOS / Android

12. Appendices

Appendix 1: Rotterdam Convention Annex III – Banned or severely restricted chemicals (2016) [14]

Crop Protection Agents
2,4,5 T and its salts and esters
alachlor
aldicarb
aldrin
azinphos-methyl
binapacryl
captafol
chlordane
chlordimeform
chlorobenzilate
DDT
dieldrin
dinitro-ortho-cresol (DNOC) and its salts
Dinoseb and its salts and esters
EDB (1,2 dibromethane)
endosulfan
ethylene dichloride
ethylene oxide
fluoracetamide
HCH (mixed isomers)
heptachlor
hexachlorobenzene
Lindane (gamma HCH)
mercury compounds
methamidophos
monocrotophos
parathion
Pentachlorophenol and its salts and esters
toxaphene (camphechlor)
tributyl tin compounds
dustable powder formulations containing a combination of benomyl (=/<7%), carbofuran (=/>10%) and thiram (=/>10%) – severely hazardous chemicals.

Crop Protection Agents
methyl parathion (ec =/>19.5% a.i. and dusts =/>15%) – severely hazardous chemical.
phosphamidon (formulation >1000g a.i.) – severely hazardous chemical.
Chemicals recommended for listing
fenthion (u/v =/>640 a.i./L)
Paraquat dichloride (=/>276g/)
Trichlorfon
Chemicals scheduled for review
atrazine
carbofuran (severely hazardous formulation)

Appendix 2: Stockholm Convention on Persistent Organic Pollutants [13]

Chemical substances recognised as causing adverse effect on humans and eco-systems

Crop Protection Agents
Annex A (Elimination)
aldrin
chlordane
chlordecone
dieldrin
endrin
endosulfan (with exceptions listed in the register part VI of Annex A)
heptachlor
Hexachlorobenzene (HCB)
mirex
Lindane (gamma HCH)
toxaphene
Industrial chemicals which may contaminate tobacco through contact with materials, such as those used in packing or through other uses
PCB
Pentachlorophenol (PCP)
polychlorinated naphthalene
Annex B (Restriction)
DDT
CPAs under review
Dicofol

13. Acknowledgements

For help and advice from:

R.E. Baren (Altria Client Services)
N. Bennett (Universal Leaf Tobacco Co.)
C. Berardi and M. Di Giacomo (Philip Morris Int'l Management S.A.)
I. Berger (Souza Cruz S.A.)
L. Caruso (JT International S.A.)
R.G. Collins III (Altria Client Services Inc.)
C. Garner (R J Reynolds Tobacco Company)
P. Harp (Reynolds American Inc. Services)
A. Jackson (Premier Tobacco International DMOC)
C. Insaurralde (Alliance One International Ltd.)
K. Nakayama (Japan Tobacco Inc.)
J-M. Piquemal (Reemtsma Cigarettenfabriken GMBH)
M. Prat (JT International GmbH)
L. Ruffieux (Philip Morris Int'l Management S.A.)
L. Scott (Universal Leaf Tobacco Co.)
N. Watanabe (Japan Tobacco Inc.)

Picture on the cover page: "Controlling pests in a young tobacco crop In Brazil"
- Reprinted with kind permission from Alliance One Brasil Exportadora de Tabacos Ltda