FAO Pesticide Disposal Series

14

edition 1.1

The Preparation of Inventories of Pesticides and Contaminated Materials

Volume 1

Planning

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ROME, 2010

ISBN 978-92-5-106637-9

Foreword

Obsolete pesticide stocks and contaminated materials continue to accumulate in developing countries and countries with economies in transition. They represent a threat to human health, the environment and the sustainable development of the regions in which they are found. The reasons for the accumulation of obsolete pesticide stocks are well documented. They include poor storage and management of pesticide stocks, international bans on the use of harmful pesticides, untimely donations of pesticides, over-ordering and supply and procurement of strategic stocks of pesticides for migratory pest control, which are then not used completely or not needed. Pesticide stocks are often stored under very poor conditions, resulting in container deterioration and leakage into the surrounding environment and ultimately affecting soil and ground water quality.

FAO has been working actively to identify and help resolve the problems associated with obsolete pesticides stocks and contaminated materials since the early 1990s. As part of this assistance, FAO publishes a range of guidance documents, training modules and toolkits that give countries practical advice on the management of pesticides and obsolete pesticides, including guidance on issues related to preventing future accumulation. This guidance document adds to this range, and can be used as a key resource for countries wishing to scope the scale of the problem posed by obsolete pesticides and associated wastes through the design and implementation of a comprehensive national inventory.

The preparation of an inventory of stocks can be considered the first practical step in addressing the problem of obsolete pesticides and associated contaminated materials. The successful planning and implementation of disposal projects can only be achieved once the types, quantities, distribution and environmental risks of the pesticides have been assessed. An accurate inventory therefore provides a firm foundation for all subsequent environmental risk assessments (ERAs), and the planning and implementing of safeguarding, disposal and remediation projects.

The inventory can also help countries to identify the manufacturers, suppliers and donors of the obsolete pesticides. These organizations are of particular importance as they are often willing to provide resources for subsequent safeguarding and disposal activities. The inventory process can also identify reasons for the accumulation of the obsolete pesticides and can assist in the development of a baseline for the planning of measures to prevent their accumulation in the future. An inventory has, however, a finite validity, and any subsequent clean-up or disposal project should be planned to take place as soon as possible after the collection and interpretation of the inventory data.

This guidance document provides countries faced with obsolete pesticide stockpiles with all the information necessary to plan and prepare an inventory of its pesticides and contaminated materials. Focused at a strategic level, it will assist countries in developing a policy for inventory preparation. It does not provide detailed information of all the practical steps needed to conduct an inventory project, so it is supported by a range of FAO training modules that develop the practical skill base within the project teams to allow them to undertake an inventory project effectively and safely.

The guidance document therefore focuses on a number of key aspects of inventory taking and offers practical advice based on recent experience in a range of developing countries. The main areas covered in this document include:

- defining the scope of the inventory;
- stakeholder analysis;
- methodology development;
- development of an effective implementation strategy.

The document also touches upon the need to manage and interpret the inventory data adequately, and directs the reader towards other guidelines in the FAO series related to the use of database systems currently operational within the Pesticide Management Programme within FAO. For instance, FAO has developed the Pesticide Stock Management System (PSMS) to assist countries in data management. The system includes inventory forms and a database utility that is designed specifically for inputting inventory data and producing reports that can be used for a variety of purposes related to data evaluation. The PSMS uses other FAO Technical Guidelines such as the *Environmental Management Toolkit* (EMTK), Volumes 1, 2 and 3 to manipulate the basic inventory data and to assist countries in the development of effective safeguarding and disposal strategies. Separate guidance on the use of PSMS and the application of the EMTK is available from FAO at www.fao.org/ag/obstocks.htm[1]

Finally, these guidelines look at providing a framework for countries to apply based on their specific needs. In Africa, where FAO has completed a large number of projects, the problems include large stocks of obsolete stocks, contaminated soils and other contaminated materials. In other regions the issues, scale and emphasis may differ. In Asia it is currently believed that the major problem from obsolete pesticides is not large stocks of chemicals but potentially contaminated soils and containers. Similarly, it is understood that pesticide burial sites with very large volumes of unidentified wastes and contaminated soils predominate in Central and Eastern Europe. In some countries, old pesticide production sites with large quantities of production wastes are a significant problem. In all cases, the inventory preparation principles are the same, and this document aims to provide guidance that is relevant to as wide a range of country situations as possible.

1 For information on the guidelines included within the FAO Disposal Series, please contact the FAO Pesticide Programme at opgroup@fao.org

Contents

Acronyms

BAT	best available technology
BEP	best environmental practice
EA	environmental assessment
EMP	environmental management plan
EMTK	Environmental Management Toolkit
ERA	environmental risk assessment
ESM	Environmentally Sound Management (a principle of the Basel Convention)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
ICC	interim collection centre
ILO	International Labour Organization
IMDG Code	International Maritime Dangerous Goods Code
M&E	monitoring and evaluation
MCC	major collection centre
NIP	National Implementation Plan of the Stockholm Convention
NPC	national project coordinator
SC	national steering committee
SF	national stakeholder forum
PMU	project management unit
POP	persistent organic pollutant (Stockholm Convention)
PPE	personal protective equipment
WHO	World Health Organization

Glossary

Environmental management plan (EMP)	The output from the Environmental Management Tool Kit, Volume 3. The EMP is a document that describes the actions to be taken within a country relating to the safeguarding and repackaging of obsolete pesticides, their transportation to collection centres, transportation to local disposal facilities or to a port for export. All stakeholders, including the general public, should be able to consult the EMP in order to understand the rationale that has motivated the implementation (or not) of the measures that are taken to protect the environment.
Environmental Management Tool Kit (EMTK)	Found in four volumes, the EMTK assesses and prioritizes the risks to the environment posed by obsolete pesticide stores. It can be used to help develop an EMP for a country. The principles of the EMTK are also used in the FAO PSMS database for inventory evaluation.
Environmental risk assessment (ERA)	A procedure for assessing the risks to the environment of any activity or installation. FAO has developed the EMTK, Volume 1 for assessing and prioritizing the risks to the environment posed by obsolete pesticide stores.
Holder	Any individual, group or organization that has pesticide stocks. A holder may own the pesticides, have responsibility for them, or possess them involuntarily.
Pesticide Stock Management System (PSMS)	A system designed by FAO for management of inventory data on pesticides and pesticide-contaminated materials. It comprises a set of paper forms for compiling inventories of pesticide stores and sites, together with a Web-based application for recording inventory and environmental data. The PSMS includes tools based on the EMTK for evaluating and prioritizing the stores based on environmental risk. It is used for both inventories of usable and obsolete stocks. It also includes components for managing and tracking usable pesticides through their life cycle.
Persistent organic pollutants (POPs)	The global treaty, the Stockholm Convention, is designed to protect human health and the environment from persistent organic pollutants (POPs). POPs are chemicals that include the following characteristics: they remain intact in the environment for long periods; become widely distributed geographically; accumulate in the fatty tissue of living organisms and are toxic to humans and wildlife. POPs circulate globally and can cause damage wherever they travel. In implementing the convention, governments will take measures to eliminate or reduce the release of POPs into the environment. In 2004 the convention designated 12 organochlorine chemicals as POPs, 9 of which are pesticides. The introduction of 5 new pesticides to the POPs list in 2009 will add to the amounts of obsolete stocks requiring treatment.
Scope	The scope of the inventory will have a critical influence on the complexity, time and budget needed to collect and collate the inventory data. The scope is typically set following consultation with stakeholders and may include all pesticides (usable and obsolete), government and farmer-held stocks, production and formulation facilities and so on.
Sector	Holders of pesticide stocks can be divided into sectors to allow the undertaking of an inventory. A sector is a grouping of holders that shares common characteristics and needs.
Stakeholder	A stakeholder is any interested or affected party, and can include local civil society groups, organizations within the country, organizations and groups from neighbouring countries and international organizations. Some stakeholders may hold pesticide stocks, may be involved in their manufacture and distribution, and may represent groups affected by them.

1 Introduction

1.1 Background to obsolete pesticides

The problems associated with obsolete pesticide stocks and contaminated materials are well documented and feature in a series of existing FAO technical guidelines, which can be found at www.fao.org/ag/obstocks.htm

Obsolete pesticides and contaminated materials can pose a direct threat to public health and the environment. The reasons include:

- a lack of information on or understanding of the hazard posed by the pesticide by the various stakeholders from original supplier to end user;
- inadequate training of farmers, government inspectors and store managers on risk data and stock control;
- poor storage conditions of pesticide containers, resulting in their corrosion or rupture, with associated leakage of their contents;
- unwanted pesticides, which have been disposed of by inappropriate disposal options such as burial and have subsequently contaminated the surrounding soil and/or ground water;
- spillage and leaks during the manufacturing, formulation, packaging processes;
- containers that have been emptied deliberately to be used for other storage purposes, including for drinking water and food;
- storage sites and containers that have been damaged during conflicts, or because of environmental disasters such as flooding.

The Stockholm Convention, which entered into force in May 2004, originally identified 12 persistent organic pollutants (POPs), 9 of which are pesticides.[2] The introduction of new chemicals in 2009, including Lindane or gamma HCH and other pesticides, will add to the accumulation of banned stocks that will need to be identified and treated. The convention requires that these chemicals are no longer used and are disposed of in an environmentally sound manner as set out in the joint Basel/Stockholm Convention BAT/BEP (Best Available Technology/ Best Environmental Practice) guidelines which can be found at www.basel.int (Basel Convention) and www.pops.int (Stockholm Convention). With respect to POPs pesticides, their persistence has also resulted in the widespread dispersion of the chemicals into the environment, affecting all areas of the globe and not just the storage locations themselves. The conventions are not described in any more detail in this document, and the reader is directed to the respective Web pages referenced above.

1.2 FAO activities

1.2.1 Publications

FAO has been helping countries identify and resolve the problems associated with obsolete pesticides stocks and contaminated materials since the early 1990s. This work has been aimed at establishing systems and methodologies that countries can use when they set out to improve pesticide management (including managing obsolete pesticides). FAO has published guidance that gives countries practical advice on:

2 The current list of 14 POPs pesticides is under continuous review and expansion and may include additional chemicals to those at the time of print. The reader is directed to the Stockholm Convention Web page for the most recent list of POPs chemicals, www.pops.int

- how countries should approach obsolete pesticide problems;
- improved pesticide management, resulting in the prevention of the accumulation of obsolete pesticides;
- pesticide storage and stock control;
- environmental assessment (EA);
- safeguarding of obsolete pesticides;
- disposal of obsolete pesticides;
- assessment of soil contamination.

1.2.2 Consultations

FAO also holds consultation meetings that provide a forum for information exchange, discussion, cooperation and collaboration on obsolete pesticide issues. These meetings focus on:

- experience and lessons learned from completed pesticide projects;
- future prevention and disposal activities;
- demonstrations and explanations of new project toolkits;
- developments in legal, policy and technical arenas for pesticide remediation.

Participants typically include country representatives, donor organizations, United Nations (UN) agencies, obsolete pesticide experts, the agrochemical industry and non-governmental organizations (NGOs).

1.2.3 Training modules

FAO has also developed a comprehensive set of training modules that link to key aspects of the management of pesticides. The modules cover a wide range of subject areas – the inventory of stocks, conducting an EA, how to safeguard and dispose of pesticides, monitoring and evaluation, project management, stakeholder involvement, awareness and communications and the prevention of accumulation. These modules can be found in the resources section at the FAO Obsolete Pesticide Programme Web site (www.fao.org/ag/obstocks). The modules have been used to complete bespoke training programmes at both country and regional level to assist in project implementation and to build national and regional capacity for managing obsolete pesticides.

1.2.4 Coordinating projects

FAO has also assisted in the coordination of pesticide management projects. The countries involved in these activities have included Bolivia, Eritrea, Ethiopia, Gambia, Lebanon, Madagascar, Morocco, Mozambique, Nicaragua, Pakistan, Paraguay, Somalia, South Africa, the Syrian Arab Republic, the United Republic of Tanzania, Uganda, Yemen and Zambia – underlining that expired agricultural chemicals are a global problem.

FAO will continue to refine existing systems and guidelines, and develop additional training materials and guidelines and offer technical advice and assistance wherever possible. However, it falls to a country's decision-makers to prioritize this subject in their development strategies, both with donors and internally. Where countries do not have sufficient or appropriate resources to prepare inventories of their pesticides and contaminated materials, FAO will assist by working with the country to solicit funding from local and international donors.

1.3 Why is an inventory needed?

Completing an accurate inventory of obsolete pesticides and associated contaminated materials takes both time and significant amounts of external resources. However, this should be considered an investment in the final elimination of the risks from obsolete pesticide and associated contaminated materials and an investment in the development of sustainable mechanisms, improved pesticide management and for the prevention of accumulation in the future.

Completing an inventory is the first practical step in understanding the extent and nature of pesticides impacts within a country and the risks that they pose to its environment and public health. A reliable inventory provides a firm basis for:

- prioritizing pesticides sites according to the level of risk that they pose to public health and the environment;
- planning safeguarding activities;
- identifying the manufacturers, suppliers and donors of obsolete pesticides who may be willing to provide resources for their disposal and remediation;
- planning campaigns for the private sector to surrender obsolete stocks;
- planning the subsequent disposal of obsolete stocks;
- planning the remediation of contaminated sites;
- developing a programme to avoid the reoccurrence of obsolete pesticides.

The inventory is therefore an essential first step in the disposal phase of any project and the quality of the data collected at this initial stage will have a significant impact on the implementation of all subsequent phases in the disposal programme.

1.4 Setting the scope

At the onset of the inventory and before collecting any data, it is important that a scope is defined for the inventory based on local needs. It is therefore necessary to set a number of clear definitions from the start of the process. Of particular importance are definitions for:

- pesticides;
- obsolete pesticides;
- associated wastes;
- publicly owned;
- scope of inventory (in terms of all pesticides).

Section 3 below provides the definitions that will be used throughout the remainder of this document and in other guidelines in the *Pesticide Management* series.

1.5 Review of existing data

In general terms most countries have a large body of information related to the amounts, kinds, distribution profile and usage patterns for pesticides. Typically, this information is segregated into a number of different departments and ministries that may not have the necessary linkages to allow consolidation and use of the data. It is therefore important to consolidate this information as far as possible at the start of any project on the management of pesticides. Every country is likely to face a different situation depending upon a number of key factors, including the:

- legislative framework for pesticide licensing, manufacture, formulation, importation, use and disposal;
- supply chain for pesticides;
- maturity, scale and development of agricultural production;
- relative scale of government and private sector involvement in agriculture;
- numbers and size of organizations and individuals that use or hold pesticide stocks;
- pattern of pesticide usage, for example, large-scale coordinated campaigns to address migratory pests to the routine usage of pesticides on farms; and
- history of pesticide procurement, supply, manufacturing and formulating in the country.

The review of the above plus the consolidation of the available data is a significant first step in improved pesticide management and can usually be done with a minimum of cost and effort. The process for completing this review will be discussed further in Section 2 below.

1.6 Information to be collected

Historically, an inventory has been considered a simple list detailing the type, quantity and location of pesticides. This view is, however, overly simplistic and does not make the maximum use of the inventory process as an information and decision-making tool. FAO has therefore developed a set of data-collection formats to allow countries to not only collect information on the pesticides themselves, but also on associated wastes such as contaminated containers. The inventory also includes the collection of data on the general storage conditions for each location.

The formats have been designed based on the concept of using the information gathered during an inventory to allow priorities to be set for the follow-up activities – including an EA, site prioritization based on the risk to public health and the environment, the safeguarding of stocks (planning of packaging requirements, etc.) and the development of safeguarding and disposal strategies which may involve international tendering for disposal services. Ultimately, the inventory data is used to develop a risk-based assessment of the threat from obsolete pesticides in any country and to identify usable pesticide stocks that may become obsolete in the near future.

The inventory therefore provides an opportunity to not only collect information on the pesticides in a country but also on the relationship between the pesticides and the environment in which they are currently stored. This is used to provide a picture of the potential impact on public health and environment through a general review of the conditions of the store (the structure), the conditions in the store (the extent of leakage and contamination) and the conditions around the store (the proximity to sensitive areas). More details of the forms and information are presented in Section 2 below. A full explanation of the use of the inventory data to define the risk posed by the pesticides in a country is presented in the Tools A–C of EMTK, Volume 1 (available at www.fao.org/ag/obstocks.htm).

1.7 Validity of inventories

An inventory has only a short period of validity. It is inevitable that, following the inventory, the circumstances of the pesticides will change for any one of a number of reasons, including:

- Some pesticides will be used.
- Some pesticide stocks will be moved to other locations.
- The condition of the packaging will deteriorate resulting in additional leakage.
- The contamination from leaks will spread further.
- Additional pesticides may become obsolete.

It is therefore recommended that in cases where stocks are managed predominately through the government sector that the inventory includes *all* pesticides in the country – not just those that are believed to be obsolete at the time of the exercise. While this adds to the complexity of the inventory, this approach has several advantages:

- It prevents inventory teams having to decide what pesticides are obsolete and what are usable, thus saving time and avoiding errors.
- It captures information about pesticides that are usable but should be declared obsolete because they are not needed.
- It allows experts to review the country's pesticide stocks centrally to determine what is unusable or unwanted.
- It allows pesticides that date expire after the inventory to be included in a subsequent list of obsolete stocks.

In countries where pesticides are predominately stored at the farm level and not in centralized store, the process of collecting data on all pesticides in the market at any one time may not be feasible.

Where pesticide stocks are managed well in centralized locations (such as pesticides used for migratory pest control), it is possible to use stock-management systems to keep the inventory up to date and to reflect pesticide usage, consolidation into new packaging and movements to collection centres. Even with a good stock-management system, however, the accuracy of the inventory data will decrease with time.

Given that the principal long-term aim of the inventory exercise is to provide a complete picture of the amounts of pesticides in a country and their locations, the inventory will also provide a firm basis for planning the repackaging and disposal of the pesticides. It is recommended that the follow-on activities of safeguarding and final disposal are implemented as soon as possible following the completion of the inventory, ideally within six months of the end of the inventory exercise.

1.8 Institutional arrangements

If any pesticides management project is to be a success, it generally needs a high level of support from decision-makers within government. FAO can indeed assist in the design and implementation of the project by providing technical support, but the main driving force must be the country itself. Projects require extensive commitment from their initial conception through to their design and ultimate implementation. It is the role of government institutions within the country to ensure that each step is coordinated and implemented effectively. Other stakeholders can assist (sometimes in partnership) but the lead must come from the government. Generally, this requires a strong political will on the part of a lead ministry and its minister or senior official to champion the project. Where senior government officials have had personal experience of the risks of obsolete pesticides, there is often a strong drive to address the problems they pose.

Past experience suggests that it is best that a single government agency take the lead in dealing with the inventory of obsolete pesticides. The lead agency should have strong links with the farming sector and a good understanding of the issues related to pesticide management. The agency should coordinate with the other agencies and departments that may also have pesticide stocks, such as the Ministry of Health and government agencies appointed as custodians of the national environment. The Ministries of Agriculture, Health and Environment are all key stakeholders to the project and the roles and responsibilities of each partner needs careful consideration.

Only with the commitment of the government, and at their request, will the international agencies and donors be able to lend their support to the project. A project will commence when the government recognizes the pesticide problem and requests formal assistance from, among others, FAO.

FAO's guidance document, No. 11, *Country Guidelines*, in the Obsolete Pesticide Series,[3] explains in detail the actions that a country should take to develop a pesticides management project.

1.9 Stakeholder involvement

As with all projects, it is important to identify and involve all key stakeholder groups at the outset. It is also necessary to recognize from an early stage in project design the relative skills and experience that each stakeholder brings to the project. Based on an analysis of comparative advantage, the project needs to develop roles and responsibilities for all partners. The benefit of involving a range of stakeholders includes:

- the identification of the full extent of issue of pesticides, including the likely locations, quantities, and their condition;
- the identification of potential issues early on in the process before they become a threat to implementation;

3 This can be found at: www.fao.org/fileadmin/templates/obsolete_pesticides/Guidelines/Y2566E.pdf

- the breaking-down of barriers between stakeholders that could prevent effective implementation;
- improved communication on the purpose and benefits of the project; and
- the monitoring and evaluation of the project.

Section 4 below gives some examples of typical stakeholder groups and provides some information regarding potential roles and responsibilities of stakeholders based on comparative advantage. The stakeholder analysis should be completed as soon as possible in the project design phase, but should also be flexible enough to allow participation of new stakeholders as and when required throughout the implementation phase. FAO's No. 11, *Country Guidelines* provides detailed guidance on identifying and liaising with stakeholder groups.

1.10 International setting

These guidelines have been prepared with reference to a number of international conventions and codes of conduct, in particular:

- International Code of Conduct for the Distribution and Use of Pesticides (2002).
- International Labour Organization's Convention concerning Safety and Health in Agriculture.
- Stockholm Convention on Persistent Organic Pollutants.
- Rotterdam Convention on the Prior Informed Consent.
- Basel Convention relating to Sound Environmental Management and Trans-boundary Movement of Waste.
- The Inter-Organization Programme for the Sound Management of Chemicals (IOMC).
- The Strategic Approach to International Chemicals Management (SAICAM).

FAO continues to work in close collaboration with other UN agencies and development partners to provide a coordinated approach to chemicals management.

2 Overview of the inventory process

2.1 Types of inventory

This guideline discusses three principal types of inventory that can be used to quantify the scale of pesticide distribution in a country: (i) indicative, (ii) rapid and (iii) detailed. The relative usefulness in terms of allowing the design of a comprehensive EA and subsequent safeguarding and disposal activities are summarized below.

2.1.1 Indicative inventory

An indicative inventory can be prepared comparatively quickly and with relatively low cost. Typically, the inventory is limited to a desktop review of data available in a country related to pesticide imports, government purchases, pesticide-management practices (needs assessment, distribution, storage locations, etc.), private sector sales data, historical reports and limited numbers of site surveys at known, high-profile affected sites and so on. Unfortunately, the data is usually incomplete and its value in terms of providing a basis for EA and associated strategies for safeguarding and disposal is limited. The indicative inventory can, however, be useful as a preliminary step in the scoping of the scale of the problem in a country. It can also highlight areas where further study is needed and where there are currently gaps in the understanding of the extent to which pesticides pose a significant risk to public health and the environment.

As a general rule, if the indicative inventory shows a significant problem in terms of quantity of obsolete stocks, contamination and/or lack of pesticide management in a country, then it can be assumed that the real situation is far more serious and that a comprehensive inventory and subsequent disposal and prevention programme are needed. Unfortunately, the weakness of this approach is that the indicative inventory could indicate that there is no problem but the reality may be the opposite. A key disadvantage of an indicative inventory is that it relies on access to available data which is often incomplete or lacking altogether.

BOX 2.1
Ethiopia

An indicative inventory completed in 1996 identified 1100 tonnes of stocks scattered across the country. This figure was revised upwards to 1500 tonnes in 1998 following an FAO task force mission that highlighted significantly larger stocks. Based on the revised data, a disposal operation was designed, and donor support secured with project implementation starting in 2000. A detailed inventory of stocks was completed as a preliminary step of the project and identified over 2700 of obsolete pesticides scattered in over 940 storage locations, thousands of tonnes of contaminated soils and many thousands of pieces of contaminated pesticide-application equipment. The disposal of the large amount of additional stocks could not be funded through the existing donor contributions and so the inventory data was used to prioritize every location based on risk. This analysis formed the basis as to which stocks would be included in the initial disposal project and has since been developed into the FAO EMTK, Volume1. Additional donor support was secured to allow safeguarding and disposal of remaining stocks. The indicative inventory was therefore of use in highlighting the scale of the problem but did not give an accurate picture of the true scale of the problem in the country or allow the development of a complete safeguarding and disposal strategy. To do this, a detailed inventory is required.

2.1.2 Rapid assessment

An emergency situation can result in the need to take immediate action to safeguard a particular location where there is a well-documented risk to public health and/or the environment. An emergency intervention provides an opportunity to complete a rapid assessment of the situation and identify high-risk sites that may need to be addressed as a priority. The rapid assessment methodology uses the data from the indicative inventory as a starting point. From an analysis of this data it may be possible to focus on a number of key areas that are believed to pose a significant, immediate risk. The identification of these locations will rely on data collected by national teams and also through consultation with a wide group of stakeholders who may know of stores that have not been identified as part of the indicative inventory.

The process for both rapid assessment and an inventory will include site visits to the locations which have been identified as being potentially high risk. It is recommended that the assessment of the sites be completed by personnel who have been trained in the FAO inventory and environmental risk assessment (ERA) methodology and that the data collected is recorded on the standard inventory and EA formats presented in the EMTK, Volume 1 and PSMS.

A rapid assessment does provide more substantial data than the indicative inventory, and also provides standardized information on sites previously identified as posing a high risk. The methodology does not, however, allow for the complete comparative prioritization of all affected storage locations, and does not provide an opportunity for site visits to every location to allow a detailed assessment and inventory of all stocks. However, it does offer a relatively low-cost assessment of the impact of pesticides on public health and the environment, and the information collected will show if a country suffers from poor pesticide management. As a result, it can allow for the development of a more detailed project that can be subsequently submitted to government and donors for financial support. However, the methodology does not allow for the development of a nationwide safeguarding and disposal strategy based on a risk-based assessment of all stocks in a country.

2.1.3 Detailed inventory

Following the completion of an indicative inventory and/or a rapid assessment, it may be necessary to compile a comprehensive national inventory of pesticides in a country wishing to complete a national disposal and prevention project. As mentioned in Section 1.6 above, a detailed inventory has historically resulted in the development of a comprehensive list of all obsolete pesticides in a country, catalogued by the store location. Since 2000, FAO has been developing an inventory methodology that not only produces a list of chemicals but also enables the assessment of the environmental impact of the chemicals on public health and environment. The data collected from these inventory formats as part of a detailed inventory can be used to:

- formulate a list of all pesticides, contaminated soils, contaminated equipment and other materials;
- based on the World Health Organization (WHO) classification of the pesticide, the quantity and an on-site assessment of the amount of leakage, calculate a risk factor related to the pesticides in a store (Tool A of the EMTK, Volume 1);
- based on an inspection of the conditions in the store, an assessment of the store structure and of the relationship of the store with the surrounding environment, determine a risk factor associated with the storage location (EMTK, Volume 1);
- by using the formats provided, identify the original manufacturer of the stocks which provides an opportunity to link with product stewardship initiatives that support safeguarding and disposal of obsolete stocks;
- collect data on the supplier of the stocks, which may allow an approach to a donor or other agency responsible for original delivery of the stocks.

Developing the correct scope, stakeholder roles and the overall inventory design will have a large impact on the completeness and usefulness of the final detailed inventory data. A poorly designed detailed inventory will be of no value. In practical terms, a detailed inventory of obsolete pesticides can have two phases: (i) the design process, which deals with issues such as setting the scope, identifying the stakeholders, developing the methodology and obtaining institutional support to move forward. This is followed by (ii) the implementation phase.

The implementation phase entails the collection of the inventory data; management and manipulation of the data and data interpretation. These guidelines focus on the completion of a detailed inventory. They also discuss the design phase of the detailed inventory and offer support for the scoping of the inventory, the stakeholder analysis, the development of methodologies and the preliminary implementation/work plan. As noted above, a set of training modules related to each of these topics has also been developed. It is recommended that the design phase be completed as an interactive training workshop with facilitation based on these modules and the content of these guidelines.

The complete set of supplementary training modules covers aspects such as Health and Environmental Hazards of Pesticides, Use of Personal Protective Equipment, Completion of Inventory Documents and Detailed Inventory Planning. These modules are typically presented as part of a seven–ten day training workshop with the national inventory team. The principles presented in the lecture theatre are usually applied through a number of field visits to stores with obsolete pesticides. During the visit, the inventory team is expected to complete an accurate inventory using the formats provided and under the supervision of experienced FAO personnel or supervising consultants. The trainees are then asked to complete an examination and, based on performance during the practical sessions of the training workshop, the site visit and in the written exam, are certified as competent to complete the inventory to FAO standards.

FAO's review of the inventory process since 2000 has also allowed a re-evaluation of what type of data needs to be collected by inventory teams in the store. For example, the WHO classification of pesticide information is often missing from the product labels. By developing a system of recording the active ingredient, trade name and formulation percentage, it is possible, through the FAO EMTK, Volume 1 and the PSMS, to calculate the WHO classification of every item in a store. Similarly, PSMS can use data related to the package type, size, leakage and so on to calculate the exact amount of stocks in a store rather than making an estimation. The inventory system therefore focuses on collecting the minimum amount of *objective* data on each type of pesticide in a store along with an assessment of the storage conditions, and at the same time aims to minimize the amount of *subjective assessment* by the person taking the inventory. In this way, the detailed inventory data should provide a sound basis for making far-reaching decisions related to the safeguarding and disposal strategies to be developed.

The completed inventory forms are only the first stage in management of the inventory data. All forms then need to be consolidated and the information entered into the FAO PSMS. This Web-based system is a database that allows data to be tabulated and reported in various formats and also, through linkages with reference data such as the *Pesticide Manual*,[4] WHO toxicity reference tables, the International Maritime Dangerous Goods Code (IMDG)[5] and other reference texts, allows an ERA of all pesticide-storage locations based on the methodology presented in the FAO EMTK, Volume 1. Using the methodology presented in the EMTK (Volumes 1 and 2), PSMS interprets the inventory data and allows countries to prioritize affected stores based on risk to public health and the environment; to prioritize geopolitical regions based on the cumulative risk;

4 The *Pesticide Manual* is a comprehensive reference document published by the British Crop Protection Federation. It provides essential data related to manufacturer trade names, WHO classification and other valuable data.

5 The IMDG code is published by the International Maritime Organization and provides information on the UN classification and assigned UN number for pesticides and other hazardous materials.

provide a monitoring and evaluation tool through the calculation of a national risk index; identify potential collection points where stocks can be centralized during the safeguarding phase and to provide suggested transport routes from outlying stores to the collection points selected.

A detailed inventory therefore requires a substantial investment in terms of time, personnel and external resources. Personnel must be trained in the inventory process, and resources such as vehicles and protective equipment need to be procured to allow inventory teams to complete their activities. This is a significant undertaking and should be considered only if a country is committed to completing the process and acting on the findings of the inventory.

2.2 Institutional and implementation arrangements for an inventory

Coordination between partners is vital for pesticide-management projects involving many government and non-governmental stakeholders. Where possible, countries should use existing structures and committees to assist in the completion of the project-design phase. It is common, however, to find that these structures are absent or are taken up with other activities.

Setting up an effective management structure for project implementation is vital for delivering a project successfully. Ideally, the committees and implementation units established for an inventory will grow and evolve as project implementation progresses to the safeguarding and disposal stages. This will allow for development of a detailed understanding of the systems and processes used to manage pesticides. This capacity will be of value to neighbouring countries as they embark on similar projects. The needs of the project and hence the roles of the different stakeholders may change with time, and as the emphasis of project implementation changes, so a flexible approach that allows for the inclusion of additional stakeholders as project implementation progresses is necessary. The structures typically developed during an inventory project include the:

- national project steering committee;
- national stakeholder forum;
- project management unit.

2.2.1 National project steering committee

As mentioned in Section 1.8 above, to be a success, it is vital that projects have the necessary level of institutional support from key decision-makers. The principal responsibility rests with government but other stakeholders have an important role to play. The following description of the inventory process therefore assumes that the country has established a national project steering committee (SC) for improved management of pesticides. The SC will include representatives from the key stakeholders in a country, including government departments (agriculture, environment, health and others), farmers groups, civil society and pesticide-industry representatives.

2.2.2 National stakeholder forum

Countries are encouraged to include representatives of non-governmental partners in the SC. In some instances this is not possible and the SC takes on a role related to budget review and work-plan approval. However, it is still important to provide a forum for communications and information exchange with the non-government partners. In such cases, the establishment of a national stakeholder forum (SF) will ensure that all stakeholders are kept up to date on the status of project implementation. The SF also provides an opportunity for issues and problems to be highlighted in an open and transparent manner before they have an impact on project implementation. The different perspective on the project aims and objectives brought by partners such as farmers groups, civil society and the pesticide industry are a valuable input to project design, and the SF provides a mechanism for these stakeholders to influence project implementation.

2.2.3 Project management unit

It is also assumed that the country has appointed a national project management unit (PMU) hosted by the government agencies assigned by the SC. The PMU will take responsibility for managing the planning and implementation of the project on a day-to-day basis. Membership of the PMU is a country-specific issue, but usually includes a full-time national project coordinator supported by a disposal component coordinator and a pesticide management component coordinator. These national staff can be supported by a full-time technical advisor to the project who in turn is supported by specific specialist thematic consultants who can assist in areas of training of national staff and the completion of specialist surveys and studies. The allocation of responsibility for management of the inventory is a national issue and will depend on an assessment of capacity within the team and the scope of the work to be completed.

2.2.4 Project implementation teams (field teams)

Once the management structure of the inventory is established, it is necessary to develop capacity to complete the physical inventory of the pesticides. This is typically completed by the development of a number of inventory field teams. The number and composition of the teams in a country will be influenced by the apparent scale of the stockpile (from indicative data), the geographical distribution, the logistics in terms of geopolitical regions and the availability – or not – of government staff or other personnel who can be trained to complete the tasks.

Under normal circumstances, it is beneficial in terms of effective and efficient implementation if members of national and regional/provincial government departments within the country are trained to complete the inventory of stocks. They can be supported by representatives from civil society groups, farmers groups and the pesticide industry depending on the scope of the inventory exercise (see Section 3) and the main sectors believed to hold obsolete stocks (see Section 4). In limited instances and subject to funding or capacity limitations, the government may wish to invite the pesticide industry to take a lead in completing the inventory or place a contract with a private enterprise to complete this exercise. In such cases the role of government is more "hands-off" and focus on monitoring the implementation by a third party based on a Terms of Reference. This approach will affect the level of government ownership and the type and level of capacity developed within government institutions. In all cases, the teams will need to be trained in the inventory process based on the FAO modules available on the FAO Web site. FAO can provide the training subject to a formal request from Government and the availability of funds.

2.3 Step-by step guide to inventory

There are five key steps in the inventory process. The overview of the whole process that follows aims to put the guidance into context with the surrounding activities and to demonstrate the need for taking a systematic approach. Figure 2.1 below shows the main steps in the overall process. As mentioned in Section 2.1, these guidelines focus on the inventory design phase (Steps 1–5 below).

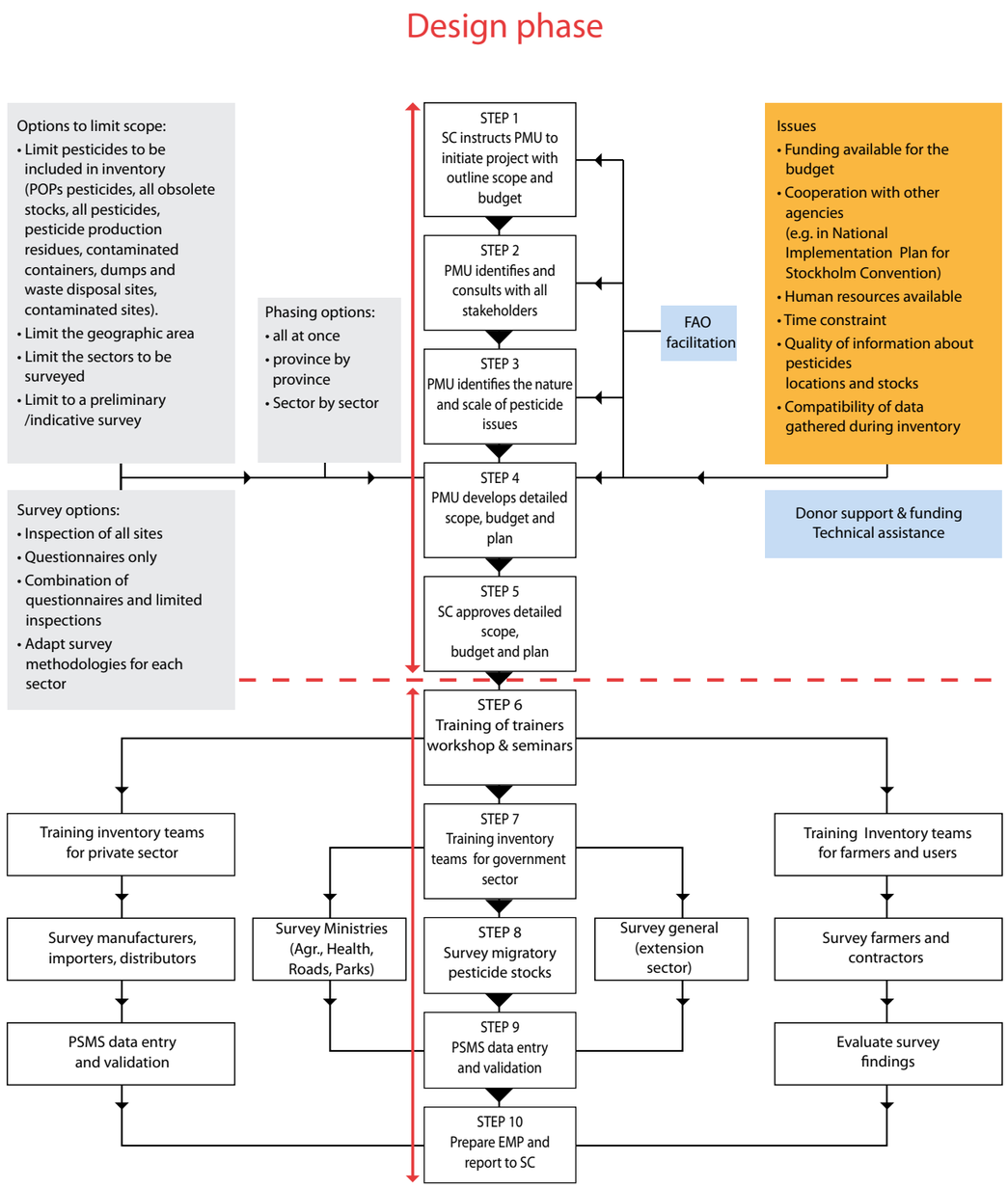
STEP 1

SC instructs PMU to initiate planning for inventory

It is assumed that the lead national body assigned responsibility for the management of pesticides is the SC. The SC or an alternate lead agency will have a view of the nature and scale of the pesticides issues that the country faces and their importance relative to other development issues. The SC will also have an understanding of the scale of resources and funds that are likely to be needed to undertake an inventory, any follow-on safeguarding and disposal/remediation activities and the potential sources of funding including allocation of national budget.

The SC should provide guidance regarding the scope for the project. The SC should then empower the PMU and other stakeholders to develop a detailed project design for later review and approval (see Step 5).

FIGURE 2.1
Steps in the inventory process



STEP 2

PMU identifies and consults with all stakeholders

It is recommended that the PMU consult with a wide variety of principal stakeholders as early as possible during the project design. The stakeholders should be actively involved in the identification of the key pesticide-related issues that impact upon them. The PMU should explain the nature of the project that the SC has laid out in their scope, in order to encourage the stakeholders to cooperate. Positive engagement with stakeholders at this stage in the project will help to ensure their cooperation and commitment. FAO's No. 11, *Country Guidelines*, gives advice on the methods for engaging with stakeholders.

Stakeholders should be encouraged to give the PMU detailed information about the scale and nature of pesticide stocks that they hold or of which they are aware (the indicative inventory process outlined above). It is desirable that they provide information on the types, quantities, condition, and location of pesticides as far as they are able. They should also provide details of other pesticide issues such as contaminated sites, pesticide wastes and contaminated materials of which they are aware.

In addition to providing the information, the stakeholders should also provide an indication of the method that was used to gather their information, the age of the information and their perception of how it reflects the current position in terms of its accuracy and completeness. This will allow the PMU to assess the level of reliance that may be placed on the information.

STEP 3

PMU identifies the nature and scale of pesticide issues

The PMU should consolidate all the information gathered from stakeholders to build the indicative inventory and prepare a report on the pesticide issues faced by the country. An overlap of information from a number of the stakeholders is possible, so it is important that the PMU does not double count it. However, an overlap of information can be helpful where the two lots of data can be correlated. The PMU will be able to place a higher level of reliance on this confirmed data. Table 2.1 below gives a useful matrix for consolidating the information that allows the holders to be prioritized for inclusion in the inventory. The sectors referred to in the table may include groupings of stakeholders such as commercial farmers, migratory pest control bodies, government agencies, pesticide industry, etc. The relative importance of each sector will differ based on the specific country situation. The matrix therefore allows the PMU to estimate the relative importance of all sectors based on the information collected during the indicative inventory.

Depending on the quality of the information available to the PMU, it will be able to fill in the table with quantitative information, qualitative information or both. Reviewing the table will allow the PMU to:

- Assess whether the information is sufficient to recommend undertaking an inventory.
- Identify the priority sectors, types of pesticide and locations to be surveyed.
- Determine the need for a preliminary survey to improve the PMU's understanding of the pesticide issues, before considering embarking on a full inventory (perhaps by completion of a rapid assessment methodology).

The PMU should report back to the SC the outcome of their review of the nature and scale of the problem and their recommendations for the inventory. This is particularly crucial in the event that the PMU's findings indicate that there will be difficulties in achieving the preliminary scope set out by the SC. In the light of the findings, the SC may choose to revise the scope and focus of the project.

Table 2.1
Matrix for prioritizing sectors for inclusion in the inventory.

Sector/holder	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6
A Estimate of number of locations where pesticides are stored						
B Estimate of average quantity of pesticides at each location						
C Estimate of total quantity of pesticides in the sector (Row A x Row B) or from previous inventory						
D Score the storage conditions (1 for good, 10 for bad)						
E Factor (Row C x Row D)						
F Ranking priority for inclusion in the inventory (1 for highest factor in Row E, 2 for next highest etc.)						

STEP 4

PMU develops detailed scope, budget and plan

Project scoping and planning are the most important processes that the PMU undertakes as it sets the nature and scale of the project. Without effective scoping and planning, the project has a high risk of failure.

Scoping involves the PMU in three mutually dependent processes:

1 defining the detailed scope for the project (the objective);
2 setting the detailed budget for resources;
3 preparing a detailed work plan (setting the time limit).

Section 3 below gives a detailed review of the options for the project scope.

STEP 5

SC approves detailed scope, budget and plan

Before moving into the implementation phase of the inventory, the PMU should present the detailed scope, budget and detailed plan to the SC for formal approval. Throughout the implementation of the plan, there will be unforeseen events and delays that the PMU will have to manage and resolve. Where doing so requires modifications to the scope or budget, the modifications should also be approved by the SC.

3 Scope of Inventory

This and subsequent sections of the document assume that an indicative inventory (as defined in Section 2 above) has been completed and that the country has a preliminary idea of the scale of the problem which it faces from poor pesticide management. The following sections therefore focus exclusively on the process needed to develop a detailed inventory.

As indicated above, the scope of the detailed inventory has a significant impact on the overall inventory project. The scope will help define which stakeholders take a key role in the implementation of the inventory and will ultimately affect the implementation methodology to be adopted. Setting an appropriate scope therefore has a far-reaching influence on the time frame for implementation, the stakeholders' role and the resources needed to complete the inventory safely.

Before looking at the options with respect to scope and how this can influence the implementation phase of the project, it is important to define the terms presented in Section 1.4 above.

3.1 Definitions

3.1.1 Pesticide

A pesticide is any substance or mixture of substances intended for preventing, destroying or controlling any pest. (Pests include vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs.) A pesticide is also any substance administered to animals for the control of insects, arachnids or other pests in or on their bodies or substances intended for use as a plant growth regulator, defoliant, desiccant or agent for thinning fruit or preventing the premature fall of fruit. The term can also be used for substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.

3.1.2 Obsolete pesticides

Obsolete pesticides are those pesticides that cannot be used for legal or technical reasons, which may include the following :

- banned for use;
- physically degraded;
- chemically degraded;
- ineffective as a pesticide;
- expired;
- not needed;
- unidentified (e.g. no label or labelled in a foreign language);
- non-compliant with local regulations (e.g. wrong package);
- unsuitable formulation (e.g. cannot be used with available application equipment).

The photos below show a range of pesticides from various locations. Inspections of the label showed that all were past the two-year manufacture date and so are classed as "obsolete". In some cases, the products have no labels or may have been transferred into new containers losing their original identity. All would need to be included in the inventory of stocks.

200-litre drums of pesticide.

Mixed packages of drums and boxes.

Products in a local supermarket.

Pesticide that has leaked contaminating the store.

1-litre aluminium flasks in boxes.

25-kg sacks of powder pesticide.

Ideally, a national inventory should also include pesticides used in all sectors, not solely agriculture. This is likely to include the health sector where DDT[6] or other pesticides are used for disease vector control. DDT may still be used for vector control with specific exemptions under the Stockholm Convention in some countries, but is not permitted for use in agriculture anywhere in the world. The need to prevent transfer of DDT and other vector-control pesticides from the health to the agriculture sector is important, and appropriate management systems including needs assessment, storage, distribution and disposal of old containers must be factored into the management plan. The inclusion of usable DDT in the inventory may provide a mechanism for monitoring usage and also ensure that old containers do not find their way into the local market for resale.

3.1.3 Associated wastes

It is an unfortunate fact that pesticides are often stored under poor conditions resulting in exposure to excess heat, humidity, rain/snow and so on. In addition, lack of appropriate storage space can often mean the storage of pesticides with a wide range of other materials. These can include other agricultural inputs such as fertilizer and seeds but may also extend to machinery, tools and a wide variety of other non-related materials. Problems occur when pesticides (whether usable or obsolete) leak from their containers and cause contamination of not only the store itself (including the floor and walls) but also other items in the store. As a result, the scope of an inventory generally goes beyond just the pesticides: FAO recommends that the inventory includes all materials which are contaminated with pesticides.

Associated wastes may therefore include contaminated floors (in many cases soil), building materials (walls, etc.), seeds, fertilizers, equipment and all other items which may be contaminated through contact with pesticides. As far as is practical, it is advised that the inventory includes

6 DDT or dichlorodiphenyltrichloroethane is an organo-chlorine based insecticide originally developed for the control of malaria and thyphus in the Second World War. After the war, the pesticide was used widely in agriculture. In 1962 Rachel Carson's *Silent Spring* highlighted the impacts of wide-scale DDT use. The use of DDT in agriculture was banned internationally in 2001 under the Stockholm Convention on Persistent Organic Pollutants (POPs) but its controlled use for malaria control is still permitted.

BOX 3.1
Obsolete pesticides

Which type of pesticides should be included in the inventory? Is it limited to insecticides, herbicides, fungicides or a combination of all? The simple answer is that the inventory should include all types of pesticides as defined above. This will include insecticides, herbicides, fungicides and all other types of chemicals used to control pests and diseases. The inventory should not be limited to or exclude any class of chemicals. Bio-pesticides should also be included.

The inventory should also include all package types from 200-litre containers to small paper packets. Inventory forms from PSMS provide the user with options to select the most appropriate type and size of package from a list. The question of including useable pesticides in the inventory or limiting the scope to pesticides which are obsolete at the time of the inventory will also influence the time and resources needed for the inventory. The photos below give examples of types of pesticide packaging.

Methyl Bromide cylinders (ozone depleting).

Paper bags of Diazinon.

1-kg plastic bottles of 2,4 – D powder.

Plastic bottles of Fyfanon liquid.

Cardboard boxes with bags of Sevin powder.

200 litre steel drums of usable Queletox.

Plastic bags containing Dusban.

Cardboard carton containing Sevin.

BOX 3.2
Persistent organic pollutant (POPs) pesticides

One group of particular interest during the inventory are POPs pesticides. The majority of the 12 original POPs chemicals were pesticides and their use in agriculture is banned under the Stockholm Convention. The original POPs chemicals were Polychlorinated Biphenyl or PCB, Dioxin, Furans (all industrial chemicals or biproducts of the combustion of chlorinated wastes) and Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachor, Mirex, Toxaphene and Hexachlorobenzene (all pesticides).

As of May 2009 the POPs list was expanded to include 21 chemicals which now includes an additional 5 pesticides including the organochlorine pesticide Lindane, which has been used widely in agriculture over the past 40 years.

An inventory of POPs pesticides is of particular importance not only because of their status as banned chemicals but also as an entry point for discussions with international institutions such as the Global Environment Facility (GEF) for funding for disposal. Examples of POPs pesticides are shown below.

Heptachlor from Ethiopia.

DDT from Eritrea.

Dieldrin from Yemen.

DDT from the United Republic of Tanzania.

an estimation of all contaminated materials. The inventory of these items can be facilitated by a series of PSMS formats for recording the data have been prepared and are available from the PSMS Web page, http://psms.fao.org/psms/resources.htm

These include formats for:

- contaminated soils;
- contaminated containers;
- contaminated equipment (spray application etc.);
- contaminated building materials;
- buried pesticides.

3.1.4 Publicly owned

Pesticide-management projects funded through the donor community have typically focused on the disposal of obsolete pesticides owned by the government or public sector institutions. This strategy has developed because of the need to eliminate large stockpiles of government-owned pesticides that have become obsolete. Since the 1990s, the general move away from centralized government purchase and improved stock management has resulted in a decrease in the rate of accumulation of obsolete stocks. Moreover, the move to commercial farming where market forces will limit the amount of obsolete pesticides produced in the future should slow the rate of future accumulation further. The push to increase agricultural production could lead to pressure on farmers to use increased levels of chemical inputs, including pesticides. FAO promotes the

BOX 3.3
Other wastes

Below are some examples of other wastes commonly found in stores with pesticides. Whoever is completing the inventory will need to make an on-site assessment as to whether the materials in the store are contaminated or not.

Ethiopia: Large numbers of old pesticide spray equipment stored with pesticides. There is no data available relating to when the equipment was last used, for what pesticides it was used and if the equipment was rinsed after use. The inventory included the items and this material was added to the final list of waste for which an environmentally sound disposal solution was needed.

Mozambique: In addition to drums of pesticide, other items such as motorbikes, ploughs and other agricultural equipment were found in this store. Inspection of the store indicated that no pesticides had leaked and that there was no indication of contamination of the other items in the store. As a result, they were not included in the inventory of waste. The items were washed to remove any small traces of contamination and removed to an alternative storage site away from pesticides. All wash water and cleaning materials were packaged and treated as waste and included in the inventory list.

Ethiopia: Long-term leakage of pesticides has resulted in seepage of liquid into the walls and floors of the store. This information needs to be reported in the inventory so that the safeguarding strategy can ensure the site is decontaminated adequately or that the building is scheduled for demolition.

Yemen: Old pesticide containers may have accumulated in very large quantities in pesticide storage locations. These are likely to be contaminated and must be treated as hazardous waste unless they can be decontaminated thoroughly. The containers can be crushed for packaging and shipping to reduce their volume.

Mali: Contaminated soil and buried pesticides may be present in some sites. Pesticides that have leaked from their containers will have contaminated a very large volume of soil with a plume of chemicals in concentrations varying from very high to very low. A careful and specialized assessment of the site will need to be carried out. However, for the purposes of inventory, an estimate of the volume of contaminated soil and the volume and number of containers of chemicals buried must be provided.

sustainable intensification of production through agro-ecological approaches and does not support the automatic increase in the use of inputs without careful assessment. If the use of inputs does increase, it is more important than ever that there is strong regulation and effective stock management to limit the level of future accumulation. Certain areas where large volumes of pesticides are still used remain under centralized or government control. These include locust and other migratory pests and disease-vector control.

FAO therefore supports the principle of transfer of ownership of unwanted pesticides held by other groups such as farmers and other end users into public/government ownership for possible inclusion in any subsequent safeguarding and disposal operation. The costs for government dealing with this waste will need to be analysed on a case-by-case basis and a number of models for operation of this collection process exist and will be presented later in these guidelines. It is not, however, recommended that a country should include privately owned stocks held within the distribution network (manufacturers, formulators and distributors/retailers) or pesticide production wastes that have not entered the distribution cycle in the inventory or disposal project funded through public funds. Such wastes need to be dealt with on a "Polluter Pays" principle and government should develop a system to ensure these wastes are included in an industry-based waste management plan.

3.2 Scope of inventory

At any point in time, a country is likely to have a mixture of obsolete and usable pesticides in circulation within the government and among farmers and other end users. The inventory of all obsolete stocks and associated wastes, as defined above, is a starting point in the safe elimination of the problem as indicated in Section 1.3. Most national inventories focus on obsolete pesticides to begin with. There is the potential, however, to broaden this scope to include usable pesticides. This may be of particular interest in countries which have large strategic stockpiles of government-purchased pesticides to combat migratory and other pests such as locust, army worm and quelea birds. The improved management of these stocks can be a major factor in preventing the future accumulation of obsolete pesticides, and the inventory will help countries to achieve this aim. In more complex markets where large amounts of pesticides are supplied directly to farmers by commercial distributors it may not be feasible to complete a comprehensive inventory of all pesticides in the distribution chain.

In addition, during the inventory process it is likely that significant quantities of expired pesticides (which are classed as obsolete) will be identified. As indicated above, it is possible that these pesticides may still be effective and have not degraded. In such cases, it is advised that the products be identified as requiring further testing both in the laboratory and in field application trials.

A final consideration when defining the scope of an inventory is the limitation of the exercise to agricultural pesticides owned by government or the broadening of the exercise to include all obsolete/usable stocks irrespective of ownership. The scope can be widened to include stocks held by other government departments, farmers, pesticide distributors and the manufacturing sector. The inclusion of old disposal sites may also need to be considered. The widening of the scope will, however, have an impact on the complexity of the process, the time frame for implementation and the cost.

Widening of the scope to include obsolete pesticides in the manufacturing and distribution sectors does not mean that the waste must be included in the final safeguarding and disposal plan. A country may decide to include the manufacturing sector in the inventory stage of the project as a means of gaining a better understanding of the waste-management issues related to pesticide supply. The process may also assist the pesticide industry in meeting environmental regulations concerning the development of industrial waste-management plans.

Other factors that may influence the final scope will include national capacity and personnel and other resources to complete the work, the time frame for completion, budget and political will. When looking at the scope, it is important to examine the roles that each stakeholder in the project may take. For example, a country may decide to include all farmer-held stocks in the inventory. This may require the pesticide distributor and NGOs to take a more prominent role in the inventory process than if the scope were limited to government-held stocks.

3.3 Setting the scope

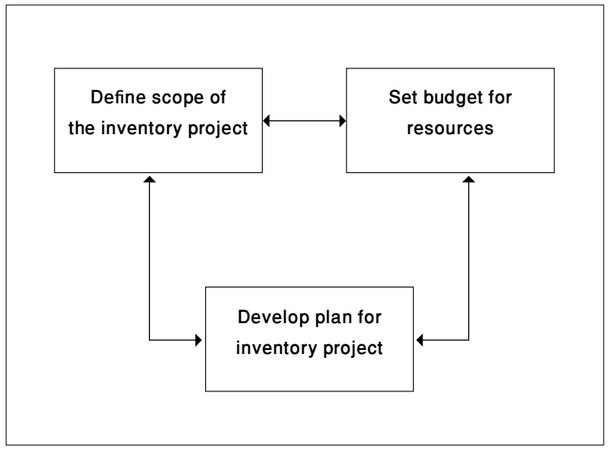
When setting out on developing an inventory it is therefore important to pose the following questions for consideration by a wide range of stakeholders. This may be achieved most effectively through the holding of a national inventory planning workshop with representatives from national government departments, regional/provincial government, the pesticide industry, farmers groups and NGOs/civil society groups. Ideally, the meeting will provide consensus on how to move forward at the start of the process, which will aid subsequent implementation. Typical questions include:

- Do we limit the inventory to obsolete pesticides?
- Do we include usable pesticides and if so which ones (government owned, pesticide distribution chain)?
- Do we include associated wastes, including soils, containers and buried stocks?
- Do we limit the inventory to stocks owned by government?
- Do we include farmer-held stocks?
- Do we include old disposal sites at production and formulation plants?

At this stage of the inventory process, the main concern is with what should be included. This is not an examination of how the inventory should be completed or who will be responsible for implementation. It should also be noted that an inventory can be as comprehensive as possible and used to then focus attention on key areas where the risk to public health and the environment are highest. It may also result in separate initiatives to address problem areas highlighted by the inventory.

Figure 3.1 shows the mutual dependency between the three factors of scope, budget and work plan. It is likely that iterative review will be needed before the detailed scope, detailed budget and detailed plan are consistent and fixed.

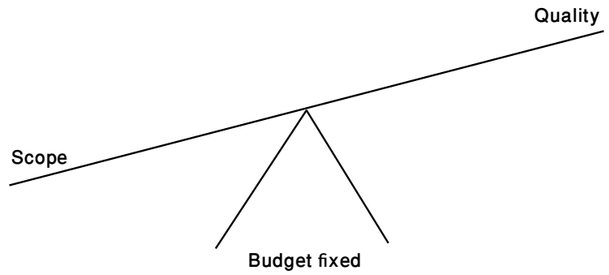
FIGURE 3.1
Interrelationship between the scope, budget and work plan



BOX 3.4
Fixing the budget

Where the budget for the project is fixed, the only variables that can be changed by the PMU are: (i) the scope of the inventory; and (ii) the quality of the inventory. These variables are inversely proportional. If the PMU wishes to increase the quality of the inventory, the scale of the scope has to be reduced and vice versa. Figure 3.2 illustrates this.

FIGURE 3.2
Relationship between scope and quality



It is suggested that the PMU start the process by developing a strategy for the inventory on the basis of the SC's initial scope and budget. The strategy will set out how the inventory should be undertaken and will address:

- the sectors to be surveyed (including a review of why they have been selected, an estimate of the scale of their pesticide issues);
- the regions to be surveyed (including a review of why they have been selected);
- the specification for the materials to be surveyed;
- the methodology for undertaking the survey of each sector (including the reason for the selection of methodology);
- the phasing for each sector or geographic survey.

In order to ensure that the survey can be achieved within the outline budget provided by the SC, the PMU may have to limit the scope or quality of the inventory.

Fixing the scope

This can be achieved by a combination of the following:

- Limit the sectors to be included in the survey, by selecting those that are perceived to be a priority by the SC, or have been identified as representing the greatest risk during the review, as set out in Step 3.
- Limit the geographic region to be surveyed, and concentrating on those areas which are perceived to be a priority by the SC, or have been identified as representing the greatest risk during the review, as set out in Step 3.
- Limiting the materials that are included in the survey to those that are perceived to be a priority by the SC, or have been identified as representing the greatest risk during the review, as set out in Step 3.

continues

BOX 3.4 *cont.*
Fixing the budget

Setting the quality

This can be achieved by a combination of the following:

- Select a survey methodology that requires fewer resources, for example using more questionnaire-based surveys and less site inspections, bearing in mind the level of accuracy needed by the project..

In most cases the budget is fixed by access to defined resources from government and / or donors. If the inventory is to be of value then the quality of the data collected is also fixed. The only variable which can be altered is therefore the scope of the inventory. This may result in the inventory data being limited to a particular sector (usually government) with the responsibility of farmer held stocks being passed to another partner such as the pesticide industry or a local NGO.

3.4 Information to be collected

Assuming that the indicative inventory data is collected and has been reviewed, it is now necessary to complete a detailed inventory. The data collected in the detailed inventory will require an inspection of the pesticides and the stores in which they are held currently. It will be necessary to collect information about the pesticides and any contaminated materials, with a focus on data related to the toxicity of the material, the quantity of each product and the condition of the pesticide containers in terms of size and the amount of leakage. There is also a need to collect information about the storage location to include a review of the amount of contamination, the soundness of the store structure and the relationship of the store with the surrounding environment. An explanation as to why the information is needed and how it is used to assist in project implementation is provided in the EMTK, Volume 1.

Copies of the EMTK, other related guidelines and the formats for data collection based on the PSMS database system can be downloaded from the obsolete pesticide programme Web page at: www.fao.org/ag/obstocks.htm and the PSMS web page http://psms.fao.org/psms/resources.htm

3.5 Strategy for analysis of stocks

No inventory scope would be complete without a strategy for dealing with unknown products and expired pesticides that may be of potential use. The scope will therefore need to examine the national capacity for sampling and analysis of pesticides. Access to existing laboratories in the government or private sector will have a direct impact on the cost of the inventory and may determine the number and type of samples taken in a country. Export of samples for analysis is complex and costly and (where possible) alternative strategies should be adopted as presented below.

3.5.1 Unknown products

The inventory process will doubtlessly identify a large number of pesticide containers which are either not labelled, or the label is not readable (not compliant with the Code of Conduct[7]) or where, in some cases, the pesticide has been repackaged into a new container, so losing valuable information from the original label.

7 *The International Code of Conduct on the Distribution and Use of Pesticides 2002*, published by FAO and WHO, hereafter referred to as "the Code".

BOX 3.5
The importance of labels

The vast majority of information on the pesticides in a store will come from close examination of the label. The PSMS formats are designed to allow the user to collect information commonly included on labels. The interpretation of the data is then completed by the database through cross-reference to publications such as the *Pesticide Manual*, "the WHO Recommended Classification of Pesticides by Hazard" , the IMDG and other key documents. Both the label on the individual pesticide container plus any outer packaging such as boxes will be of importance.

Aldrin powder formulation.


Aldrin liquid formulation.


Labelling on outer shipping carton.

Labelling on outer packaging.

Sumithion ULV formulation (95%).


Sumithion EC formulation (50%).

Ficam label on sack.


Cymbush 25% EC forumation.

Malathion 50% EC formulation.

Amongst other information, the label should provide information on the manufacturer, commercial name, active ingredient, date of manufacture, WHO toxicity classification, formulation percentage, formulation type, quantity in each container and any specific hazards from the material such as flammability.

It is important that all stakeholders understand why it is necessary to know what pesticides are being dealt with:

1 The FAO PSMS database adopts a "worst-case" scenario and categorizes all unknown pesticides identified at inventory as Extremely Hazardous (WHO Class Ia). This has a direct impact on the pesticide risk factor calculated for the contents of the store, resulting in a high value. This may result in a store being classed as a high risk when in fact the contents may be of low toxicity and so of lower priority.
2 The safeguarding of unknown materials requires the adoption of a worst-case scenario in terms of risk to the personnel handling the waste pesticide. This will result in the application of high levels of personal and environmental protection and the associated increase in the cost of the safeguarding operation. The identification of the waste will therefore allow the completion of an adequate risk assessment and the adoption of the correct level of personal and environmental protection based on the hazards of the chemicals being handled.
3 The transport of unknown pesticides and other hazardous chemicals by sea is not allowed under the IMDG. For IMDG requirements, it is necessary to provide at least the pesticide family (organochlorine, organophosphate etc.) and preferable to identify the principle pesticide active ingredient (AI) such as Lindane, Diazinon, and so on. Where there is a mixture of AIs, it is necessary to identify and specify at least the two AIs with the highest WHO toxicity class. For liquid formulations, it is also important to have data on the solvent as this can affect the flammability of the pesticide and so have an impact on the hazard categories and labelling for the material ("flammable and toxic" or just "toxic"). This will limit the options in terms of disposal of these products.
4 Transport of unknown waste materials for disposal is not allowed under the Basel Convention. The waste notification procedure requires that all wastes are identified clearly and that a chemical analysis is available for an adequate description of the waste. If a waste is delivered to a disposal facility and it is found to be different from the description given in the notification process, penalties will be applied to the producer of the waste.
5 In addition to the transport requirements, hazardous-waste-disposal facilities are not allowed to accept unknown materials under normal licensing conditions. The impact of a wrongly described or unknown material at a facility such as a hazardous waste incinerator can result in the release of harmful emissions with adverse impacts on public health and the environment, and potentially result in the prosecution or even closure of the facility.

3.5.2 Expired but potentially usable products

As outlined above, during the inventory process it is likely that products will be identified, which although they have passed the manufacturer expiry date (and are therefore classed as obsolete), may be of use in the country setting. In order to determine if the pesticides in question should be used it is important that the country follows the following steps:

STEP 1

Determine if the product is banned internationally or nationally:

A banned product such as Heptachlor or Chlordane may still be usable after many years of storage. The characteristic which makes them usable (their chemical stability and hence their environmental persistence) has resulted in them being banned for use internationally under the Stockholm Convention because of their environmental persistence. In this case, the fact that they are usable is outweighed by the fact that they are banned.

STEP 2

Determine if the products are needed:

The inventory is likely to include pesticides which are expired (and so obsolete) but which are usable in terms of their physical and chemical characteristics. The problem may arise in cases where there is no need for the pesticide in the country setting. These include pesticides imported or purchased locally to meet a specific pest outbreak that never materialized. In the interim period, an alternative, less toxic alternative or a biological control system may have been developed. The original pesticide is therefore no longer needed and should therefore be classified as obsolete.

STEP 3

Determine if the products have degraded physically:

The use of expired (obsolete) pesticides requires an assessment of their physical as well as their chemical characteristic. Separation of emulsifiers, solvents and other components may result in the material no longer being fit for safe application. Although the pesticide AI may still be effective the breakdown of the other components in the formulation can result in the pesticide being classed as obsolete.

STEP 4

Determine if the products have degraded chemically:

In contrast to Point 3 above it is possible that the formulation matrix is still usable but that the pesticide AI has broken down. This may not only affect the effectiveness of the pesticide but can result in highly toxic breakdown products, posing a risk to the environment and public health. Chemical analysis is the only way to determine if the pesticide AI concentration is within the limits set through the Code.

STEP 5

Determine if the pesticides are still effective:

FAO recommends the use of field tests and trials if all of the above points have indicated that the pesticide is still needed and is usable. This will allow a reassessment of the appropriate application rates for the expired product based on local conditions.

STEP 6

Assign a revised expiry date:

Assuming that the pesticide has passed field trials, the country regulatory body needs to assign a new expiry date for the product. It is recommended that all pesticides be extended for a limited time period of no more than 12 months. Thereafter, the process of determining if the material is still usable will need to be repeated.

STEP 7

Monitor use by the new expiry date:

It is important that the use of any pesticides which are assigned an extended life through this process be monitored. A system to track their distribution and usage will need to be developed and personnel assigned to ensure that all stocks are used by the revised expiry date.

STEP 8

Emergencies:

Cases where expired and obsolete pesticides have been used to control pest outbreaks have been reported. While this strategy can result in the immediate control of an outbreak, there is no information concerning the long-term environmental damage from the use of these materials. Countries need to make alternative arrangements and develop contingency strategies to address unexpected pest outbreaks that do not require the use of obsolete pesticides.

This process should not be applied to any banned pesticides such as POPs pesticides.

3.5.3 Options for sampling and analysis

Guidance on the taking of samples for either the identification of unknowns or for the verification of AI levels and the usability of a product is well documented. The reader is directed to a number of reference texts, including:

- International Standards Organisation (ISO) web page www.iso.org – search for standard analytical methods for pesticide sampling and analysis;
- United States Department of Labor, Occupational Safety and Health Administration (OSHA) Web site, at http://www. osha.gov/dts/sltc/methods/index.html
- United States Environmental Protection Agency (EPS) Index of Standard Methods (2003), at http://www. epa.gov/region1/info/testmethods/pdfs/testmeth.pdf
- Pesticide Action Network, United Kingdom (PAN-UK) eco-toxicology training, at http:// www. pan-uk.org/Projects/Poverty/index.htm

As an alternative, the responsibility for sampling products can be contracted out to a specialist company. In all cases, the sampling methodology must be disclosed by the company and approved as meeting the requirements of the project.

The access to affordable, nationally operated analytical services in either the government or private sector can assist greatly in the inventory process. However, in reality, in many developing countries, access to such facilities is scarce or the available facilities may not operate to the required standard to provide reliable results. All laboratories selected for analysis should be accredited to ISO standard 17025 as a minimum and have a proven track record of applying standard analytical methods for pesticide analysis (usually established by annual audit). More information on ISO 17025 can be found at a wide variety of Web sites, including www.iso.org, www.labcompliance.com and www.pqa.net

The country is therefore faced with a number of options in terms of analysis:

1. **Develop/upgrade existing laboratory capacity:**
   - This takes time and often a significant amount of capital investment for equipment.
   - It requires operating systems and protocols.
   - It requires training of personnel.
   - It must be based on the long-term needs assessment for analysis in the country.
   - It needs a long-term commitment from the government to manage and operate the laboratory after the project through government funding.
   - For certified analysis, the laboratory needs to be accredited to standard ISO 17025 and be awarded the status of following good laboratory practice (GLP). This is a difficult process and takes many years to achieve.

2. **Export samples to an accredited laboratory overseas:**
   - Many GLP laboratories internationally can offer the required service.
   - The transport of samples to the laboratory can be complex.
   - The costs of overseas analysis can be high (in the range of US $250–US$1200 per sample), depending on the type of analysis required, excluding delivery.

3. **Use of field/bench test:**
   - This can provide a useful alternative to laboratory-based analysis.
   - It can be completed by staff following a basic training programme.
   - Generally, it uses immunoassay techniques to determine the pesticide family and in some cases the specific pesticide AI.
   - It can be tailored to the needs of the project by the equipment supplier.
   - There are no infrastructure or capital costs.
   - It can be used to identify the bulk of samples and then be verified using a reduced number of laboratory tests.

It has relatively low cost (US $10–100 per sample, depending on the type of product and number of samples). Generally, as the number of samples increases, the unit cost of analysis decreases but this technique has not been actively used in many projects to date.

Guidance on the selection and use of these kits can be found through the US Environmental Protection Agency Web site (http://www.epa.gov/). A number of systems are available commercially and choosing the correct system will require a case-by-case needs and cost–benefit analysis. While the number and types of pesticide that can be detected using these methods are increasing, there is not a total coverage of kits for every pesticide.

4. **Contract sampling and analysis to the safeguarding/disposal company:**
   - A country may decide to sub-contract the analysis of unknowns and expired pesticides to a specialist contractor.
   - This is typically done as part of an agreement to complete the inventory by a third party or as part of the subsequent safeguarding and disposal contract.
   - The company can be given responsibility to identify all products to enable safe transport and disposal.
   - The company may use its own laboratory services operated as part of the disposal facility.
   - In some cases, based on the number of samples and relative costs, the company may decide to use a mobile test laboratory at major collection centres.
   - Subcontracting of any activity such as analysis will result in increased costs.

3.6 Confirmation of scope

By the end of the scoping process, the country team should have made a decision on the:

- inclusion of usable and obsolete pesticides in the inventory;
- inclusion of associated wastes in the inventory;
- inclusion of farmer and other end user stocks;
- inclusion of production sites, formulation sites and old disposal sites for inventory purposes only;
- strategy for the identification of unknowns and expired pesticides which may be usable.

When this is complete, the project team needs to move to the stakeholder analysis and thereafter the development of a workable methodology for completing the inventory.

BOX 3.6
Unknown materials

It is also common to come across products that have no identification or are supplied with labels that are not readable. These unknown products need to be entered into the inventory database and an assessment made as to the need for identification by analysis.

The PSMS adopts a worst-case scenario for unknown pesticides, assigning a WHO classification "Extremely Hazardous" (Class Ia). This can have a significant impact on the risk factor assigned to a product and/or a store. So, where possible and economically viable, all unknown materials should be analysed and the active ingredient(s) identified.

As noted above, the Basel Convention on the Transboundary Movement of Hazardous Wastes and the IMDG code also prohibits the shipment for disposal of all unknown hazardous chemicals. If shipment to a disposal facility overseas is needed, the active ingredient in the pesticide needs to be identified as a minimum to allow shipment. For mixtures of AIs the two most toxic products must be identified. Additional information regarding flash point, heavy metal content and other physiochemical factors may also be required.

Unknown products of uncertain origin.

Product with no labels.

Unreadable label.

Unlabelled powder in plastic bag.

4 Stakeholder analysis

The completion of the indicative inventory will provide useful data on the stakeholders who are known to have obsolete and/or usable pesticides. There is a need to review this data and broaden the list of stakeholders based on the final scope as described in Section 3 above. Table 4.1 below shows a list of the types of individual and organization likely to have pesticides. It also indicates the type of pesticide (usable or obsolete) and where they are likely to be found.

4.1 Potential stakeholders

In addition to the stakeholders who might be holders of pesticides, it is important to consider those stakeholders who may not have pesticide, but who may play a role in completion of the inventory and the collection of important information. The total list of stakeholders will be country specific, but examples of the varied mix of stakeholders who may be involved in the inventory stage of the project include:

- the ministries of agriculture, veterinary services, forestry, environment, health, roads and highways, national parks; customs authorities, etc.
- regional/provincial and local administrations;
- the national focal point for the Stockholm Convention (responsible for completion of an indicative inventory of all POPs under the National Implementation Plan – NIP of the Convention);
- other UN agencies such as WHO, the United Nations Environment Programme, the United Nations Industrial Development Organization and the United Nations Development Programme;
- donor representatives;
- farmers associations, crop production boards and farmers cooperatives and unions;
- NGOs and civil society groups;
- universities and other academic institutions;
- commercial pesticide users;
- pesticides industry (manufacturers, formulators, distributors, retailers);
- trade unions;
- community groups near the pesticide stores;
- cultural and religious leaders.

The relative importance of these and other stakeholders will vary country by country and will also be affected by the scope of the project directly. The limitation of the scope to stockpiles of government-owned obsolete stocks will clearly limit the number of stakeholders in the project and define their role very clearly. The broadening of the scope to include usable pesticide and/or the stocks of obsolete stocks held in the farming sector will require the broadening of the list of stakeholders and also definition of their roles during project implementation.

TABLE 4.1
Where pesticides are found

Holder	Typical nature of pesticide holdings	Location of pesticides	Issue
Farmers (small scale)	• Small quantities in small-pack sizes • Holdings can include prohibited and obsolete pesticides • Pesticides may not be contained within original packaging • Old pesticide containers, potentially used for storing other materials	• House • Farm buildings • Fields	• Reluctance to admit to holding obsolete pesticides: - for fear of prosecution for breaking law - to retain "effective" prohibited pesticides • Large number of individual farmers, distributed over large area • May operate in groups as cooperatives
Farmers (large scale)	• Larger quantities in large-pack sizes • Holdings can include prohibited and obsolete pesticides • Pesticides may not be contained within original packaging • Contaminated containers	• Farm buildings • Dedicated pesticide stores	• Reluctance to admit to holding obsolete pesticides, - for fear of prosecution for breaking law - to retain "effective" prohibited pesticides • Of increasing importance as agricultural production becomes more market driven • May be wide geographic distribution posing logistical problems for inventory at the farm
Farmers cooperatives and banks	• Larger quantities in large-pack sizes • Holdings can include prohibited and obsolete pesticides • Pesticides may not be contained within original packaging • Contaminated areas where bulk quantities of pesticides have been repacked into smaller containers	• Central stores in geographical areas	• Potential for contamination if bulk quantities have been repackaged into smaller packs
Contract pesticide sprayers	• Larger quantities in large-pack sizes • Holdings can include prohibited and obsolete pesticides • Pesticides may not be contained within original packaging • Contaminated areas where pesticides have spilled during filling of equipment	• Stores in and outside the area of intervention	• Reluctance to admit to holding obsolete pesticides, - for fear of prosecution for breaking law - cost of disposal • Small number of individual contractors • Located mainly close to agricultural regions
Air strips	• Contaminated soil where pesticide-spraying aircraft cleaned and emptied their tanks • Pesticides for use on the air strip	• Adjacent to air strips	• Identifying location of contaminated soil can be complex

continues

TABLE 4.1 *CONT.*
Where pesticides are found

Holder	Typical nature of pesticide holdings	Location of pesticides	Issue
National government departments • Agriculture and livestock • Migratory pest control • Extension services • Forestry • Health • Roads & highways • Railways • Parks • Military • Prisons	• Large quantities in small-and large-pack sizes • Holdings may include prohibited and obsolete pesticides • Pesticides may not be contained within original packaging • Contaminated buildings • Contaminated soil • Contaminated equipment • Contaminated seeds, fertilizers and other materials	• Central stores • Regional stores	• PMU should have good access to information about pesticide locations within all ministries
Local government departments • Agriculture • Forestry • Health • Roads & highways • Parks • Cemeteries	• Small quantities in small-and large-pack sizes • Holdings may include prohibited and obsolete pesticides • Pesticides may not be contained within original packaging	• Local stores	• Small number of individual contractors
International agencies • Migratory pest control • Bilateral projects	• Strategic stocks in large quantities	• Central stores • Regional stores	• PMU should have good access to information about pesticide locations within all agencies.
Customs and border control	• Embargoed imports • Confiscated smuggled pesticides • Out-of-specification pesticides	• Compounds at border controls and airports	• Smuggled pesticides are likely to require analysis to determine their composition • Ownership and responsibility for confiscated pesticides will be determined by local and international laws • Where substandard product is returned to its originator, it is possible that they could attempt to resell it or dispose of it inappropriately. It may be more environmentally responsible for the country to sequestrate it and dispose of it directly

continues

TABLE 4.1 *CONT.*
Where pesticides are found

Holder	Typical nature of pesticide holdings	Location of pesticides	Issue
Households	• Small quantities of a range of pesticides for garden and domestic use	• Within the home	• Large number of individual holders • Widely distributed through urban and rural locations
Shops and markets	• Small quantities in small-and large-pack sizes • Holdings may include prohibited and obsolete pesticides • May include smuggled pesticides • Empty pesticide containers for sale for use for storage	• Shop premises • Warehouse	• Smuggled or illegal pesticides are likely to require analysis to determine their composition • Reluctance to admit to holding smuggled or obsolete pesticides: • for fear of prosecution for breaking law • cost of disposal
Importers and distributors	• Large quantities in small-and large-pack sizes • Large stores with a wide range of products • Holdings may include prohibited and obsolete pesticides • May include smuggled pesticides	• Warehouses • Transport and distribution centres	• Smuggled pesticides are likely to require analysis to determine their composition • Reluctance to admit to holding smuggled or obsolete pesticides - for fear of prosecution for breaking law - cost of disposal
Manufacturing and formulation plants	• Production wastes: • out of specification products and formulations • Historic disposal sites for production wastes: • landfill sites • evaporation ponds • Holdings may include prohibited and obsolete pesticides • Contaminated buildings • Contaminated soil	• Factory warehouses • Formulation buildings and machinery • Waste-disposal sites • Waste water treatment plants • Closed-down factories and abandoned sites	• Small number of well-defined locations • Information about closed and abandoned sites may be scarce and/or hidden • Reluctance to admit to holding or having buried pesticide wastes
Hotels, leisure resorts, golf courses, race courses, sports arenas	• Pesticides to control weed growth	• Ground maintenance workshop and stores	• Reluctance to admit to holding smuggled or obsolete pesticides: - for fear of prosecution for breaking law - cost of disposal

4.2 Sectors

These guidelines use the term "holder" to describe any individual or organization that may have or use pesticides. Various types of holders have been listed in Table 4.1 above. For the purpose of undertaking the inventory, it is useful to group together holders that have similar characteristics – the term "sector" is used here.

Similarities between the holders in a particular sector mean that it may be possible to adopt a common strategy for undertaking the inventory for all the holders within the sector. The similarities of the holders in a particular sector could include:

- the size and nature of their pesticide stocks;
- their structure (e.g. government, commercially owned organizations or individuals);
- the number and distribution of the locations that their pesticides are stored;
- channels that can be used for communication;
- their attitude towards pesticides and the inventory;
- how much is known about their pesticide holdings.

Examples of sectors are:

- government-controlled pesticide stores and migratory pest-control agencies;
- manufacturers, formulators, importers, distributors, and wholesalers;
- retailers (shops and markets);
- commercial farmers;
- farmers cooperatives, production boards and crop associations;
- small-scale farmers and other small-scale users such as householders;
- other users – parks etc.

Once the analysis of the scope of the project is finalized (and the analysis of the stakeholders complete) and the various sectors identified, the PMU must now decide on the most appropriate mechanism or methodology for obtaining the necessary inventory data.

5 Methodologies for collecting inventory data

A number of different methodologies can be used for gathering information about pesticides. This section describes the principle methodologies. It identifies their uses, strengths and weaknesses, comparative costs, effectiveness, reliability and resource requirements.

The methodologies can be divided into two groups: (i) indicative and (ii) quantitative. Countries may decide to adopt an indicative approach in order to define the scope of the problem and then complete a more detailed quantitative follow-up to fully define the scale of the problem. For this reason, the various methodologies for completing both a preliminary indicative inventory and a subsequent more detailed quantitative inventory are outlined below.

5.1 Indicative methodologies

Indicative methodologies are useful for identifying estimates of pesticide stocks, pesticide issues, how pesticides are used, how the supply chain works, pesticide life cycle, communications channels, and distribution channels, mechanisms for organizing the collection of obsolete stocks, and opportunities for preventing further accumulations. They can provide information that enables the prioritization of further surveys, and the collection of obsolete stocks.

Indicative methodologies do not provide the level of detailed information that is needed for planning a safeguarding or disposal operation. Indicative surveys can be used to identify problem sites, which can be followed up with a site inspection. Indicative methodologies include:

- desk research of existing information;
- focus group meetings;
- questionnaire surveys:
  - postal
  - supply chain
  - NGO
  - telephone
  - email/Web based
  - face to face
- statistical methods.

5.1.1 Desk research of existing information

Research of existing information invariably plays a part in the initiation of any inventory project, and usually provides the PMU with a baseline for determining the project's scope.

Some information about the pesticide holdings and the locations of pesticide stock is likely to be held within government ministries. (For instance, the decision to undertake an inventory project may have been triggered by a country when it discovers that it has pesticide stocks.) The stakeholders may also have readily available information about pesticide stocks.

Desk research of existing information is critical for obtaining an overview of the potential nature and scale of a country's pesticide stocks and issues. The existing information could be in the following forms:

- reports of surveys and inventories undertaken previously;
- reports of ministry officials on routine inspections of pesticide stores;
- storekeepers' records – records of purchases;

- records of donations;
- reports from NGOs;
- reports from manufacturers and importers; and
- customs import records.

In addition to reports, PMU ministry staff generally have first-hand experience of pesticide stocks, including their location, quantity and condition. They may be aware of particular locations where the pesticides present a risk to the environment and public health.

The information obtained from this research can be either quantitative or qualitative. The quantitative information from different reports will require evaluation, and possibly manipulation, before it can be combined to summarize the overall situation in the country. Qualitative information can be used to help identify the nature of the pesticide issues and the likely risks that they pose. Together, the qualitative and quantitative information can be used to build a picture of the nature, scale, issues and likely priorities for a pesticide inventory.

However, it must be pointed out that the scale of the pesticide issues identified in the research of existing information is likely to be significantly different from the reality in the stores. The example of the inventory project in Ethiopia in Box 2.1 above is a case where the actual inventory was three times more than the initial estimate derived from desk research.

5.1.2 Focus group meetings

Focus group meetings are a tried and tested mechanism used in market and political research to explore the attitudes and behaviours of groups of individuals. In this case, they can be useful in understanding the pesticide issues that the holders face, and their likely response to new initiatives.

It is advisable to undertake some focus group meetings in advance of designing a questionnaire. The output of the focus group meeting will assist in identifying the important subject areas of the questionnaire and the precise formulation of the questions.

As a focus group meeting has only a loose agenda, it allows the facilitator to explore responses in more depth. In contrast, a questionnaire seeks responses to only very specific questions and doesn't allow for clarification and elucidation through follow-up questions.

A focus meeting typically involves a small group of holders (typically no more than ten) working with a facilitator. The facilitator will have some predefined subject areas to explore and will encourage the individuals to express their opinions freely. Likewise, the facilitator should not influence the outputs of the meeting. The facilitator should be somebody who will not inhibit the openness and responsiveness of the holders – perhaps an impartial NGO or an external specialist facilitator. It is unlikely that ministry officials would be appropriate to facilitate a focus group meeting because the holders may be reluctant to speak openly and honestly in front of them.

With very large groups of holders, such as small-scale farmers and householders, focus group meetings can be an effective mechanism to identify their pesticide issues, obtain information for prevention activities and for identifying potential mechanisms for dealing with pesticide wastes. Collecting mechanisms for pesticide amnesties can be explored, along with identifying potential barriers to their effectiveness.

5.1.3 Questionnaire surveys

Using questionnaires to survey pesticide stocks is a methodology that has been used successfully in a number of inventory projects. This entails designing a questionnaire that can be completed by the holder of pesticide stocks.

The advantage of a questionnaire survey is that it does not involve the time and expense of sending an expert to undertake the inventory. It has generally been used in cases where there are a large number of individual holders of pesticides, distributed over a large area, and each likely to hold a relatively small stock of pesticides. For example, this has been used to evaluate the stocks held by a large number of farmers within a region, as in Danish Development Agency (DANIDA) project completed in the early 2000s to survey obsolete pesticides in southern Africa.

5.1.3.1 Steps in developing an inventory by questionnaire

STEP 1

Outline plan for a questionnaire survey:

Questionnaire-based surveys require considerable preparation, in particular in understanding the issues of the sector and developing a framework for the survey. The questionnaire needs to be designed and tested thoroughly in a test sample of stakeholders and revised before it can be launched. Significant effort needs to be made in raising the awareness of the individuals and organizations in each sector.

STEP 2

Identify the issues in the sector:

As a first step, it is important to explore fully the pesticide issues within the sector. This is best achieved by means of focus group meetings as described in Section 5.1.2 above. Neutral venues and impartial facilitators will have to be chosen together with the topics for discussion. The output of the focus groups will determine the priorities for any subsequent questionnaire survey and the potential issues that will need to be addressed.

STEP 3

Set the framework for the questionnaire:

To encourage participation in the questionnaire, the PMU should agree with the government the legal basis for the survey and any related amnesty for surrendering obsolete pesticides, incentives for participating and penalties for not.

STEP 4

Design the questionnaire:

The design of the questionnaire is crucial. Ideally, it should be simple and quick to complete and, at the same time, capture all the information that is required to evaluate the pesticides. In practice, these two objectives are mutually exclusive and a balance must achieved. So, it may be necessary to sacrifice some of the information that would be desirable in order to keep the form simple.

Designing a good questionnaire requires specialist skills, and the PMU should consider engaging specialists in the field to undertake the task. They can first explore the issues that were agreed as priorities for the sector following the focus group meetings.

At this stage, it is also important to plan the mechanisms for distributing and facilitating the completion of the questionnaire, and receiving the completed questionnaires. The mechanism for capturing the information from the completed questionnaire is also an issue that should be addressed during its design. The questionnaire should be tested with a small sample of individuals in the sector to ensure that it is easy to understand and that they can complete it.

STEP 5

Conduct an awareness-raising campaign:

To ensure the maximum success for the survey, it is essential that all relevant sectors are made aware of it and of their obligations to participate. The team should determine the most effective communications channels for reaching the sector and for the publicity, which could include one or more of the following:

- briefings for press and television;
- newspaper editorials and articles;
- advertising campaign;
- government briefings.

STEP 6

Distribute the questionnaire:

Depending on the decision about the level of assistance to be given to each sector in completing the survey, there are two options:

a. Where the holder will complete the questionnaire by themselves unaided, the methods for distributing the questionnaire can include any of the following:
   - as a supplement to journals, magazines, newspapers that are read by the target group;
   - directly as a letter through the postal service.
b. Where the holder will be assisted in the completion of the questionnaire, the distribution mechanism can include:
   - through the supply chain for agricultural products;
   - through local government and community leaders;
   - delivered directly by farm inspectors or extension officers;
   - through trade unions;
   - through NGOs.

STEP 7

Control the returned questionnaires:

The returned questionnaires should be checked against the distribution list so that the team can identify and chase up those organizations and individuals who have not responded. Likewise, the questionnaires can be screened to identify cases where the information is not complete or appears to be outside the norm. These cases can be followed up by site visits or telephone calls to confirm the information. In addition, random checks of completed questionnaires can be made to provide a level of assurance about the quality of the information.

STEP 8

Capture and analyse data:

The usual way to capture data from the questionnaires is by entering it into a database. An analysis of the data will then provide information about pesticides within the sector. This information should be assessed against the objectives for the survey, the conclusions drawn and recommendations made for the subsequent activities. Where the data captured is similar to that for a site-inspection survey, it may be possible to use the same database to capture and analyse the information.

5.1.3.2 Issues with questionnaires

As a questionnaire relies on the pesticide holder to provide the information, some issues need to be considered before embarking on a questionnaire-based survey. First, the PMU needs to take the hidden costs into consideration when deciding on a questionnaire-based inventory strategy. Although there are savings in not having to visit sites, significant management time can be taken up with awareness raising, communications, identifying holders, distributing questionnaires, and following them up. As response rates tend to be low, considerable time and resources can also be spent chasing up holders to complete and return the questionnaires. Other issues include:

- As noted above, the design of the questionnaire is crucial. Ideally, it should be simple and quick to complete and, at the same time, capture all the information that is required to evaluate the pesticides. In practice, these two objectives are mutually exclusive and a balance has to be achieved, sacrificing some of the information that would be desirable in order to keep the form simple. Designing a good questionnaire requires specialist skills, and, as noted above, the PMU should consider engaging specialists in the field to undertake the task.
- It is important to test the questionnaire with a small sample of the target sector. This will help refine it and improve its effectiveness.
- Motivating the holder to complete the questionnaire is likely to be difficult. There are many reasons why holders may not want to complete the questionnaire:
  - not knowing about the survey;
  - not being able to afford the time;
  - not perceiving pesticide issues as a priority;
  - having problems reading and understanding the questionnaire;
  - concerns that they will face legal or financial liabilities if they admit to having obsolete pesticides;
  - wanting to retain the obsolete pesticides, which they perceive to be more effective than the modern alternative products; or
  - perceiving that the obsolete pesticides have a value and want compensation for surrendering them.
- The quality of data that the holder enters in the questionnaire will not be as reliable or complete as when undertaken by an expert.

There are a number of ways a country can overcome some of these issues:

- Create a legal framework for the obsolete pesticides activities. This will allow the government to make participation in the survey obligatory for all pesticides holders.
- Run awareness campaigns to ensure that all holders are informed of the survey.
- Provide an amnesty for holders who relinquish obsolete pesticides within a time frame.
- Provide incentives for those who complete questionnaires correctly.
- Hold a random inspection regime for a sample of completed questionnaires to check their accuracy.
- Organize assistance for holders to complete the questionnaires (this could include NGOs, ministry staff and trade unions).
- Where holders have submitted questionnaires that indicate a significant holding, these could be followed up by site inspections to check the validity of the data and to obtain additional information about the store.
- Provide sufficient time for holders to complete the questionnaires.

It is also possible to impose disincentives – such as financial and legal penalties – for the holding of obsolete pesticides. However, this must be managed carefully because it could encourage uncontrolled disposal and the abandonment of pesticides in the countryside. Where disincentives are introduced, it is recommended that the government undertakes a wide-scale awareness campaign beforehand and provides a free-of-charge amnesty for surrendered pesticides.

5.1.3.3 Distribution mechanisms for questionnaires

A number of mechanisms can be used to distribute the questionnaires and facilitate the holder compiling the information.

1. Postal distribution

Postal distribution involves the questionnaire being delivered directly to the holder through the mail delivery system. In cases where the names and addresses of the holders are known, it is possible to organize a direct mailing to the named individuals. It may be possible to distribute the questionnaire as an additional enclosure with a regular mailing sent to the holders, such as an agricultural magazine or an official communication from the ministry.

2. Supply chain distribution

The supply chain can be used to distribute the questionnaires. Suppliers of pesticides and other agricultural commodities could be used to pass questionnaires to their customers/users. This mechanism needs to be considered carefully and managed as members of the supply chain may perceive the inventory as a threat to their business and attempt to frustrate the process.

3. NGO distribution
Non-governmental organizations may have direct communications channels to holders who are members. Typical NGOs could be trade unions, agricultural cooperatives, or local environmental NGOs. Their communications channels can be an effective mechanism of distributing questions to their members. Again, careful consideration needs to be given to this mechanism because the NGO may attempt to skew the results of the survey by influencing its members in their responses to questionnaires.

4. Telephone questionnaire
Where the holders have telephones and their numbers are known, they can be contacted by trained telephone operators who ask the questions and compile their responses over the phone. This has advantages in that the responses can be entered directly into a computer system, the telephone operator can help the holder to understand the questions, and can also make judgements about the holder and the quality of the information that they provide.

The results are also instant in that there is no time lag between the distribution questionnaire and its return. In addition, the response rate is likely to be higher, because it is a proactive process, and does not depend on the initiative of a holder.

5. Email and Web questionnaires
In countries where pesticide holders have reliable access to the Internet, questionnaires can be emailed to holders or they can complete them online. This has the advantage that their responses can be input directly into a computer system without having to re-enter the data manually.

6. Face-to-face completion of questionnaires
Teams can be established to go out to meet the holders and complete the questionnaire with them. This has the advantage that the teams can assist the holders in the understanding of the questions and ensure that they respond. The teams can be drawn from ministry staff, NGOs or the supply chain. However, the choice of the team has to be made carefully. Team members should have sufficient expertise to be able to assist the holders in understanding and responding to the questionnaires. Holders should not perceive them as a threat, as this may influence their responses. This could be the case if the team were to comprise government enforcement officials. The team also needs to be impartial so that it does not influence the holders' responses and skew the results.

5.1.4 Statistical methods
Statistical surveying is a technique that can be used to validate the desk research in establishing the initial information before undertaking a full inventory. It can also be used to select holders for physical inspections while the total population is surveyed with questionnaires. The results of both surveys can be correlated to give greater confidence in the results.

Statistical surveying is a technique in which a representative sample of holders from a sector is selected and surveyed. The results of the survey for the sample of holders are then extrapolated to give an indication of the likely characteristics for all the holders in the sector. This is similar to techniques adopted by market research organizations and opinion poll surveyors. It provides a low-cost mechanism to estimate the characteristics of the whole sector without needing to survey every single holder within it.

The sampling technique should ensure that the sample is as representative as possible of the total population of holders within the sector. This means that the geographic distribution and range of activities of the sample is in line with the overall population. The size of the sample should be sufficiently large in relation to the overall population, to ensure that the extrapolated results are "statistically significant".

Statistical methods can be applied to any of the surveying methodologies, questionnaires or site inspections.

5.2 Quantitative methodologies
Quantitative methodologies are used for identifying pesticide stocks and related waste in detail, together with information for assessing their potential risks to public health and the environment. The level of detail allows pesticide locations to be prioritized for safeguarding and disposal. These guidelines identify one quantitative methodology – the inspection of sites.

5.2.1 Inspection of sites
The preparation of an inventory by a physical inspection of the sites has been the preferred methodology for FAO-sponsored pesticide projects. The methodology involves staff who are trained to undertake pesticides inventories visiting the stores and listing their contents. The staff will have been trained to gather all the information that is necessary for an effective inventory. They will also ensure that the information is in the correct format to be consolidated with all the other inventories.

There are many advantages to a physical inspection by a team of experts:
- The PMU can place a high reliance on the information being accurate.
- Experts can determine the contents of the containers accurately.
- Taking photographs of the labels and the containers provides a record for later scrutiny that will assist in resolving queries about the contents or condition of the containers after the inspection. This will also assist the future collection and planning of disposal of the observed obsolete stocks.
- Where there is doubt about the contents of pesticide containers, experts are able to take samples for later analysis.
- Experts can also assess any signs of leakage or contamination at the sites, as well as the security of the store. Where containers are leaking, they may be able to take remedial action to prevent further leaks.
- They will also be able to identify the store's proximity to local communities and water supplies, which will later help determine the priority level for the store's remediation.
- They will be able to assess the accessibility of vehicles to the store, a consideration for planning the removal of the pesticides.
- Taking GPS coordinates allows geographical plotting of the site, assisting in future collection activities prior to disposal.

FAO has developed standard forms to use when taking an inventory. The forms are designed to allow the inspection teams to capture all the relevant information about the store and each pesticide in a consistent format. Using a standard form means that the consolidation of data from a number of stores is simplified. In addition, the forms are paper based. This low-tech approach has advantages in situations where computer-based solutions could prove dangerous, such as in stores where there is an explosion risk, or in dusty environments where computers may not be reliable.

The forms are a part of FAO's PSMS and examples are presented as Annex 1 of this document. The forms are designed to facilitate easy collection of data at the site and for its entry into the PSMS database. Printed forms are available from FAO or may be downloaded, along with instructions for their use, from the PSMS page at the obsolete pesticide programme Web site, www.fao.org/ag/obstocks.htm

As previously indicated, the forms capture information about:

- the site;
- the store;
- the risks that it poses to the environment and public health;
- the pesticides and contaminated materials that it contains.

Table 5.2 gives a summary of the strengths and weaknesses of the site visit methodology. The decision to adopt this methodology has far-reaching implications in terms of the time frame for project implementation, training and resource requirements and the need for access to competent staff. As with all the methodologies reviewed, there is also a need for significant levels of stakeholder cooperation if the investment in completing the detailed inventory is to be maximized. The need to train focal points from all concerned stakeholders must be considered. The overall benefit of this methodology is the level of detailed information collected which allows objective decision-making in terms of the future safeguarding and disposal strategies to be developed and adopted.

TABLE 5.2.
Strengths and weaknesses of site visit methodology

Strengths	Weaknesses
• Completeness of information • Accuracy of information • Documentation to support information: • Photographs • Plans and drawings • Obtain information about pesticides • Obtain information about store • Obtain information about its immediate surroundings • Potentially builds national capacity to be involved in the safeguarding phase	• High cost • High resource requirement: - trained staff - subsistence • Vehicles and logistics • In addition to technical expertise, strong project management skills and coordination of varied stakeholders are needed • Time consuming

If a detailed inventory is to be completed there is a need to complete the activities as part of a fully funded programme for elimination and disposal of obsolete pesticides. As noted in Section 1.7 above, an inventory is valid for only a relatively short period of time (months) and so it is vital to act on the findings as soon as possible after the inventory is completed.

5.2.2 Farmer-completed inventories

In countries where the scope of the programme includes all farmer-held pesticides, it will not be possible to adopt a system of site inspections to collect inventory data. The collection of inventory data from a large number (perhaps thousands) will require a different approach. Under certain circumstances, it may be possible to develop an inventory system which relies on the farmer to provide the project team with the information necessary to assess risk and schedule a collection and safeguarding exercise.

The adoption of such a system will require an assessment of the willingness of the farmer to provide the necessary information in a usable format. The design of forms and associated data-collection system will be critical to the success of any farmer-completed inventory system. While this option for inventory of stocks offers a number of clear advantages, the costs associated with operating a system can be substantial. There will be a need to integrate the initial inventory process with a coherent system for clear guidance to farmers on how to store unwanted products pending collection safely.

5.3 Comparison of methodologies

Table 5.3 provides a comparison of the two most commonly used inventory strategies (questionnaire and site inspection). It outlines the relative strengths and weaknesses for both methodologies as presented in Tables 5.1 and 5.2 above. As has been mentioned above, it may be necessary to complete a preliminary indicative inventory using the questionnaire methodology to provide a relatively quick and low-cost picture of the scale of the pesticide management problem in a country. This could allow the completion of a targeted, detailed, quantitative inventory using the site-visit methodology focused on specific sectors of stakeholders.

BOX 5.1
Examples of systems

Examples do exist of systems which require the farmer to provide a minimum amount of inventory data through a booking system. The *ChemClear* system operating in Australia is designed to remove the relatively small quantities of unwanted or expired products which accumulate on farms during normal agricultural production. Pesticide product bans or changes in production focus will continue to result in small-scale accumulations. The *ChemClear* programme uses a system of toll-free telephone booking where the farmer makes contact with the project team to register his or her stocks. The system then requires the farmer to complete a booking form which includes a preliminary inventory form which is returned to the project team. A unique booking reference and item label (for each entry) is then provided to the farmer and a collection date scheduled through a subcontract specialist waste contractor.

If the inventory list includes unknown materials, a follow-up is made by the waste contractor and if necessary sampling and analysis of the materials are completed, either prior to collection or at the time of collection. A collection location and time is then given to the farmer along with instructions on how to transport the materials to the collection point safely. At the collection point the waste is inspected by a qualified chemist working for the waste-management contractor and packaged into UN approved transit crates. The crates are loaded directly onto the vehicle which is registered to carry waste according to national regulations. The selection of the collection point is a key area and the waste-management contractor and *ChemClear* team work with local government authorities to select locations which meet minimum environmental standards. Waste is collected according to a strict farmer delivery schedule and so the need for overnight storage of the waste at the collection point is avoided. Any materials delivered by the farmer which cannot be identified are quarantined and transported using separate, UN-approved steel transit crates.

All waste is then delivered to a licensed hazardous waste handling or transfer depot where further sorting of materials and any further analysis is completed. From there, it is dispatched for environmentally sound disposal in accordance with national regulations and the requirements of the Basel and Stockholm Conventions.

More information on this example can be found in Annex 2 to this guideline including examples of the inventory forms used to collect data from farmers. Readers are directed to the Web site, www.chemclear.com.au for a more detailed review of the programme.

TABLE 5.3
Comparison of methodologies

	Physical inspection	Questionnaire survey
Effective for:	• Holders with large quantities of pesticides • Holders with complex or multiple pesticide issues • Where there is a requirement for safeguarding and disposal	• Large numbers of holders with small quantities of pesticides • Holders with simple or single pesticide issues
Applicable for sectors	• Government stores • Migratory pest control agencies • Manufacturers and formulators • Importers and distributors • Contract pesticide applicators • Large-scale farmers • Farmers cooperatives • Abandoned sites • Waste sites	• Small-scale farmers • Shops • Nurseries • Households
Accuracy	High level of accuracy	Potential Low level of accuracy
Completeness	Higher	Lower
Cost and resource requirement per holder	Higher	Lower - although significant time is required to follow-up
Capable of capturing data on:	Pesticides, wastes, contaminated sites, contaminated soils, Condition of the stores, environmental and health risks posed by store, transport access to the store	Pesticides in containers

5.4 Sector-based strategy

A country's overall inventory strategy will be most effective if it is built up from specific methodologies for each of the stakeholder sectors. The methodologies used in each sector may be different depending on the inventory objective set for the sector. The sectors could be those identified in Section 4.2 above.

In general terms, the various methodologies would be used as follows:

- Desk research and focus group meetings can be used to develop an understanding of the sector.
- The questionnaires may be used to survey the sectors that have large numbers of widely dispersed holders of smaller quantities such as farmers other end users and retailers.
- Physical inspections would be used for sectors that have holders with larger stores in well-defined locations such as government and international agencies, manufacturers, importers, formulators and distributors. Physical inspections will be required in those sectors where there is a requirement for the safeguarding and disposal of obsolete stocks.

In cases where holders might be reluctant to cooperate fully with the inventory process, it could be appropriate to survey the sector in more than one way. For example, a commercial organization may be reluctant to admit the use of certain pesticides. By surveying the work force through its trade union or an NGO, it will be possible to develop an understanding of pesticide usage in the sector. This can be followed up by official inspections of the commercial organization by ministry staff.

In sectors where there is very little information about the holders and their pesticides, it is sensible to take a two-stage approach. The first stage would be an indicative survey to establish the scale, nature and distribution of the pesticide issues facing the sector. The findings of the indicative survey can be used to determine the strategy and prioritization of a more detailed follow-up survey (the second stage), which could include a quantitative investigation.

BOX 5.2
South Africa: Africa Stockpiles Programme, Country Project 2007– 2010

The review of the inventory scope and a stakeholder analysis were completed through a workshop involving representatives from the national government (Departments of Environment, Agriculture and Health), representatives from six of the nine provincial departments of environment or agriculture, national NGOs and the pesticide industry. The workshop concluded that although there were potentially large quantities of obsolete pesticides within the provincial departments, the majority of obsolete stocks were likely to be found at the 60 000 commercial farms in the country. It was agreed that the most effective mechanism for engaging the commercial agriculture sector in the inventory would be through an awareness and communications campaign headed by the pesticide industry (principally the pesticide distributors), in cooperation with organized agriculture as represented by farmers associations and cooperatives.

Inventory methodology development workshop.

As the project progressed into the implementation phase, it became apparent that the most effective mechanism for implementation of an inventory of farmer-held stocks would be to combine the inventory with the collection of stocks to a set of strategic collection points. The inventory of the stocks would be completed by trained teams at the collection centres rather than by the farmers who may not have had the time or the necessary skills to complete the inventory formats. This decision was made in part as a result of the problems encountered using the questionnaire methodology in a similar project completed in South Africa in 2001/2002. It was decided that farmers would be contacted through a targeted communications campaign and given simple instructions on how to deliver their obsolete pesticides to the appropriate collection point. It was agreed that in order to develop a workable methodology that a pilot collection and inventory project would be completed in a single province. This will be selected based on a review of the scale of commercial agriculture plus any commitment of local resources to assist in the inventory exercise. Following a series of meetings with provincial representatives, Limpopo was identified as the pilot province.

The methodology involved the identification of a provincial organization willing to act as a focal point for the collection exercise at provincial level. In this case, a farmers cooperative was contacted and, in cooperation with the local pesticide distributors and the Department of Agriculture, agreed the scope of services that could be provided. This included floor space at the network of local cooperatives in the province (24 in total). All stores were evaluated using the FAO EMTK, Volume 1 EA criteria, and, based on this evaluation, were prepared to allow acceptance of the obsolete pesticides. This preparation included the distribution of new packaging materials, provision of emergency equipment, briefing of staff and the distribution of posters and fliers for a month before the collection started. When everything was in place, the collections process was initiated.

The collection process was allowed to continue over a two-month period. Farmers delivered their stocks of pesticides to the nearest collection point where they were segregated and prepared for inventory.

continues

BOX 5.2 *cont.*
South Africa: Africa Stockpiles Programme, Country Project 2007– 2010

The original methodology allowed for the completion of the inventory at each of the 24 primary collection points using trained staff from the provincial Department of Agriculture, the farmers cooperative and the pesticide distribution network. The list of chemicals and associated information would then be used to develop a safeguarding plan to be implemented by a local hazardous waste management contractor. The safeguarding of the stocks would be completed at the primary collection points and thereafter centralized to a main collection point awaiting transport for environmentally sound disposal.

Project poster at Limpopo Cooperative. Other communications included SMS alerts to farmers by distributors, radio and television broadcasts and magazine articles. One-on-one meetings with provincial departments were also held.

The project, however, ran into some operational difficulties. At the start of the process, the best estimate of the total amount of stocks in the province was made at between 20 and 30 tonnes, including all provincial government and commercial farmer-held stocks. At the end of the collection period, the majority of the collection points were overwhelmed with obsolete pesticides, indicating that the communications and awareness programme had been a huge success. A total of over 80 tonnes of obsolete pesticides and associated wastes were collected. In the interests of safety a decision was made, therefore, to centralize all stocks to a single main collection point within the province as a matter of urgency and to combine the inventory and safeguarding exercise with inputs from a local hazardous waste-management company working in close cooperation with project personnel.

Stocks delivered to one of the 24 primary collection points.

The example provides some valuable lessons to other countries wishing to embark on an inventory of farmer-held obsolete pesticides. The lessons learned showed that:

- Developing the scope, stakeholder analysis and the sector methodology as a group exercise assists the design process.
- Basing the methodology on lessons learned from previous initiatives is important to avoid duplication of past mistakes.
- The pesticide industry, farmers associations and farmers cooperatives play a vital role in collecting stocks from farmers groups.
- Farmers can hold significant stocks that are not apparent from any indicative inventory data.
- Good communications are key to the effective retrieval of stocks.
- Contact with farmers requires a well-defined, multifaceted communications and awareness strategy if all obsolete stocks are to be retrieved.
- A combination of the inventory and safeguarding exercises can result in unforeseen problems and should be separated as far as practically possible.

continues

BOX 5.2 *cont.*
South Africa: Africa Stockpiles Programme, Country Project 2007– 2010

- It is necessary to prepare a contingency plan in case of emergencies or if it is necessary to remove stocks to a final collection point quickly. In South Africa the availability of a mature hazardous waste-management industry with the capacity to deal with the problem at the main collection point was essential to its safe implementation. Most developing countries do not have this and so must make alternative plans.
- Close cooperation between national and provincial government departments and clear areas of responsibility are critical to a coordinated effort.

The project subsequently adopted a similar booking line system to that developed in Australia. The South African government working with the pesticide industry and with donor funding and technical support from FAO has developed a plan based on the valuable lessons learned during the pilot project and the experience from a mature programme operated to the highest standards in a neighbouring country.

Stocks at centralized collection point.

Safe working area set up for inventory.

Trained team completing inventory and safeguarding.

6 Developing the inventory implementation strategy

6.1 Introduction

By following Steps 1–5 indicated in Figure 2.1, it is possible to develop a plan for inventory. Using the guidance in Section 3 allows the development of a country-specific scope. Completing a stakeholder analysis based on the scope enables the identification of the various stakeholder sectors of importance in a given country. Based on the analysis of the stakeholders and the sectors, it is also possible to decide which methodology or methodologies to apply to each sector.

All of the above should be completed in consultation with a wide range of stakeholders – from government, civil society, farmers groups and the pesticide industry. All will have a role to play depending on the country-specific situation, and the relative importance of each stakeholder will change based on the country-specific situation.

6.2 Developing the project plan

Once the basic research to confirm the scope, identify stakeholders, assign roles and responsibilities, and review the various methodologies is complete, the project team can now complete a brief inventory project outline. A format for the outline is presented below.

The outline should be prepared as a collaborative effort with key stakeholders (FAO can facilitate in this process). The end result of this process should be a working document, a budget and a detailed work plan for the implementation of the inventory in every sector identified.

Ultimately, this document should be submitted to the SC for endorsement before any funds are committed or work completed. The document should then be used by the PMU to set assignments for stakeholders and to manage project implementation. The work plan and budget will be of particular importance to allow monitoring and evaluation of the project delivery and performance by each group of stakeholders. FAO can provide further assistance for the development of a detailed work plan and an associated M&E framework.

As a guideline, the project outline should contain the consolidation of all the relevant research completed during the project design phase. The project outline should contain the following sections:

1. Introduction

Country setting; Causes of accumulation; The need for a detailed inventory; Approach used; Objectives; Participants/organizations involved; Relevance of the inventory; Inputs so far to include details of all workshops, meetings, consultations, facilitation and inputs from partners such as FAO; Expected outputs.

2. Scope of inventory

Decision on limitation of inventory to obsolete pesticides or to include all pesticides; Decision on limiting the focus to government-held stocks or to include farmer and other end users; Decision on the inclusion of manufacture and formulation sites in the inventory to determine the scale of the impact on the environment; Decision on whether the project includes associated wastes such as old containers, equipment and contaminated soils; and Strategy for unknown materials and sampling and analysis of stocks which may be expired but potentially usable.

3. Stakeholder analysis
Identification of the important stakeholders; Roles and responsibilities of each stakeholder group; Grouping of stakeholders into sectors; Description of how sectors have been selected and prioritized for inclusion in the inventory; Institutional arrangements for management and implementation of the inventory in each sector (see below).

4. Sectors and methodologies
Review of the inventory methodologies to be used for each sector; Justification of methodology selection.

5. Activities and resources
For each sector and methodology, list all activities and assign responsibilities; Estimate resources needed to complete an activity (personnel and equipment) for each methodology for each sector; Estimate training needs for completion of the inventory of each sector.

6. Cost & budget
Estimate, based on actual cost data as far as possible; the cost budgets for each sector plan, including any contingencies; Costs allocated to specific activities; Calculation of the planned distribution of budgeted costs over the duration of the project.

7. Work plan
Plan of all activities in simple logical framework and time-flow or Gantt chart, preferably using proprietary project management software showing the interrelationships between the activities for each sector.

8. Monitoring
Based on the work plan, a series of project milestones in terms of a set of deliverable outputs to be produced by a given date. This could include milestones such as the completion of an inventory in a given province or region by a specified time; Set a series of performance indicators based on safety and compliance with standards such as lack of injuries. FAO can provide a format for this, which will allow simple project implementation tracking.

9. Risks
Identification of the main risks to each sector plan, and the overall project; An analysis of the strategies to mitigate risk.

10. Management report
Details on the types and frequency of reports to the SC (management and audit reports).

6.3 Implementation of the strategy

Following endorsement by the SC, the project team will need to implement the project based on the detailed work plan described above. Assistance in the technical training for completing the inventory plus access to the FAO PSMS system can be provided through the Pesticide Risk Reduction Group based in the Plant Production and Protection Division at FAO Head Quarters (AGP).

The focus on project design and the development of the work plan must be considered as critical steps in completing the inventory of stocks. Experience has found that issues related to data collection and data management/interpretation will be relatively straightforward provided the project design has been considered carefully.

BOX 6.1
Inventory training

Although this guideline focuses on the planning of the inventory, it is useful to also provide some practical examples of what completing an inventory of pesticides is likely to entail. As mentioned in the main body of the guidelines, following the completion of the inventory planning exercise the project enters the implementation phase.


Planning includes logistics.


Training is highly participatory.


Training includes practical exercises such as use of PPE.

This commonly involves the training of national personnel (either from government department[s], an NGO, the pesticide industry, a private-sector company or a combination of all or some of the above) in the process of inventory data collection. The training typically involves a three-day classroom session focusing on the health and environmental hazards of pesticides, the selection and use of personal protective equipment (PPE), the completion of the inventory forms and the collection of other data, such as site and product photographs. This is followed by a site visit to an affected store where trainees are required to complete an inventory of stocks and an EA (both in PSMS format).


Briefing of trainees by FAO staff.


Information from the store keeper.


Trainees using PPE before entering the store.

Assessment of all participants follows the completion of the planning exercise and the initial training. The assessment is based on their performance in the field-site visit (following principles from the classroom and the accuracy of data collected), their active participation in the training exercises and discussions plus a written examination. Trainees are then awarded either a Certificate of Participation or a Certificate of Competence. Only those with Certificates of Competence are considered for the actual inventory exercise. This ensures that the quality of data collected is of a minimum standard. In some instances, a second field-site visit can be completed to allow trainees to learn from their initial mistakes.

continues

BOX 6.1 *cont.*
Inventory training

Practicalities of completing an Inventory by site inspection

The data-collection phase follows the planning and the inventory training. Typically, teams are dispatched as per the work plan to complete the inventory in a given region or province.

The team is provided with all necessary PPE to complete the work at the sites and complete an initial assessment of the risk at each location from the indicative inventory (see Section 3.1 above).

Store keepers are trained in using PPE by trainees.

One team completes the EA questionnaire.

Second team completes inventory of stocks.

The involvement of local stakeholders is important. Inventory teams may need to therefore present themselves to local authorities and make arrangements in advance for the provision of a regional counterpart to assist in finding possible storage locations not already identified. Communications with other local bodies such as community leaders, emergency services and local administrations may also be required. Of central importance is the coordination of the availability of the key holder to the store at the appointed time on the appointed day. The responsibility for this and communications with the local administrations is often passed to the regional counterpart.

Inventory by site inspection invariably involves spending extended periods of time in close proximity to hazardous chemicals. The safety of the inventory team and any support staff is vital, and all necessary precautions must be taken to minimize exposure and to provide appropriate worker protection. Staff are trained to complete a risk assessment at each location when they arrive and it is based on this that the level of PPE needed for safe working is ascertained. Staff are advised to undergo regular health surveillance as presented in EMTK Vol. 4.

Regional counterpart and project manager working together (Ethiopia).

Same approach in China.

continues

BOX 6.1 *cont.*
Inventory training

Following the completion of the inventory and the EA forms, the data-capture and validation process begins. This component to the inventory process is dealt with in the PSMS Training and Guidance note supplemental to these guidelines.

Project staff and store keeper collect data.

In some cases, low levels of PPE may be needed.

Project staff work with international NGO monitor to complete EA forms.

Annex 1

Formats for inventory data collection from the FAO Pesticide Stock Management System (PSMS)

1. SITE INFORMATION — Site information

Country | Site name | Number of stores

Site location

Address

Phone | Nearest fax | Name of nearest settlement to site | its distance from site (kms)

Reported by...

Reported by

on date

Services

Electricity supply (in store and at site) | Working hours

Lighting (in store) | Loading facilities and equipment (please mark on the siteplan)
☐ Forklift/truck ☐ Ramp
☐ Drum barrow ☐ Other (specify)

Water supply (in store and at site) | Storage available for equipment, empty drums, tools
Covered (m^2) | Open (m^2)

Washing and toilet facilities on site | Comments

Cellphone networks and signal strength

Owner

Name
Owner type
Address
Phone
Cellphone
Fax
E-mail
Distance to site (km)

Contact person

Name
Address
Phone
Cellphone
Fax
E-mail
Distance to site (km)

Key holder

Name
Address
Phone
Cellphone
Fax
E-mail
Distance to site (km)

Nearest Doctor / Clinic

Name
Address
Phone
Cellphone
Fax
E-mail
Distance to site (km)

Nearest Ambulance

Town
Phone
Distance to site (km)

Nearest Fire Service

Town
Phone
Distance to site (km)

Nearest Police

Town
Phone
Distance to site (km)

Please continue with the risk analysis questions 1 to 6 at the back of this form

2. SITE PLAN — Site plan

Access road from main road to site

Road surface and features | Distance from main road (km) | Max vehicle weight (tonnes)
Max vehicle width (m) | Max vehicle height (m)
Road condition | Seasons when road is impassible (months and reasons)

Site gate

Gate to site width (m) | Gate to site height (m)

Layout of buildings and store, location of storage for equipment, location of loading facilities and equipment, fences, gates, roads, direction to water sources and towns

Add arrow showing direction of north and include a scale for the plan (grid is 1cm squares)
Mark on the plan the position where each photo was taken - photo number and an arrow to show direction of camera

Photos

1. Photo of gate	File name	Description
2. Photo of general view 1	File name	Description
3. Photo of general view 2	File name	Description
4. Photo of covered storage / other services	File name	Description
5. Photo of loading facilities / other services	File name	Description

Store Plan

3. STORE PLAN

Site name

Store name

Store dimensions

Store length (m)	Store width (m)
Door height (m)	Door width (m)

Store GPS

Latitude N S	Longitude E W	Altitude (m)

STEPS

1. Draw exterior of the store
2. Make photos of exterior
3. Repeat 1 and 2 for each store on the site
4. Enter Store
5. Complete Store plan with interior and location of materials
6. Make photos of interior
7. Undertake inventory

Store plan showing walls, windows, doors, heights of the walls and roof, location and nature of damage to walls and roof, internal walls, position of pesticides/materials, and areas of contamination.

Add arrow showing direction of north and include a scale for the plan (grid is 1cm squares)
Mark on the plan the position where each photo was taken - photo number and an arrow to show direction of camera

Photos

1. Photo of entrance	File name	Description
2. Photo of walls	File name	Description
3. Photo of roof	File name	Description
4. Photo showing the general conditions inside the store	File name	Description
5. Photo of inside showing position of stocks	File name	Description

Please continue with the risk analysis questions 7 to 9 at the back of this form
(modify the answers to questions 1 to 6 if the inspection of the store indicates that the information provided was incorrect)

4. RISK ANALYSIS — Risk analysis

Answer Yes or No

1. Store conditions: management procedures		
1.1	Is there any storekeeper assigned for the management of the store?	
1.2	Does the storekeeper check pesticide containers at least once a week?	
1.3	Is/are there any guard(s)?	
1.4	Is/are the guard(s) assigned 24 hours a day?	
2. Store conditions: safety		
2.1	Is there any fire safety equipment on the site?	
2.2	Is there a first-aid kit on the site?	
2.3	Is there any means of communication (radio, telephone, etc.)?	
2.4	Is appropriate personal protective equipment available for the storekeeper?	
2.5	Does the storekeeper wear personal protective equipment?	
3. Environmental conditions: hazards affecting the store		
3.1	Is the store located in a zone prone to natural disasters (flood, earthquake, hurricane, fire, etc.)?	
3.2	Is the store located in close proximity to a chemical factory, flammable materials storage or other industrial hazard (less than 1km)?	
4. Environmental conditions: human settlements		
4.1	Is the store located in an urban area?	
4.2	Is there any human settlement within 500 metres from the store?	
4.3	Is there any public facility within 500 metres from the store (hospital, school, etc.)?	
4.4	Does the public complain about pesticide odours around the vicinity of the store?	
5. Environmental conditions: water sources and soil		
5.1	Is the store located within 250 metres from a borehole or a well?	
5.2	Is the store located within 500 metres from a lake, a pond or a river?	
5.3	Is the store located up-stream or uphill from a borehole, a well or surface water?	
5.4	Has soil contamination been reported?	
6. Environmental conditions: Agriculture, Livestock Activities, Wildlife and Biodiversity		
6.1	Is the store located within 250 metres from crops and pastures?	
6.2	Is the store located within 250 metres from storage of food and feedstuff?	
6.3	Is the store located in a national park or recreational area?	
7. Store conditions		
7.1	Is there a roof?	
7.2	Is the roof waterproof?	
7.3	Are there complete walls?	
7.4	Are the walls solid and impermeable?	
7.5	Is there a solid and impermeable floor?	
8. Store conditions: content of the store		
8.1	Is there any equipment stored together with pesticide?	
8.2	Are there any foodstuffs stored together with pesticides?	
8.3	Are there any fertilizers or seeds stored together with pesticides?	
8.4	Are there any veterinary products stored together with pesticides?	
8.5	Are there any chemicals (other than pesticides, fertilizers or veterinary products) stored together with pesticides?	
8.6	Are pesticide containers safely stacked on shelves or pallets?	
9. Store conditions: security		
9.1	Does the store have a door that can be locked?	
9.2	Is there a complete fence around the store?	
9.3	Does the fence have a lockable gate?	

front side

PESTICIDE FORM

SITE & WAREHOUSE INFORMATION

1. Site name
2. Warehouse name

LABEL INFORMATION

3. Labels on containers ☐ Yes ☐ No
4. Labels are legible ☐ Yes ☐ No
5. Commercial name
6. Manufacturer's name & address
7. Formulator's name & address
8. Formulation type ☐ EC ☐ ULV ☐ DP Other
9. Active ingredient name — A | B | C
10. AI concentration
    Unit: ☐ g/l ☐ g/kg ☐ % w/v ☐ % w/w
11. Batch No. or ☐ Not shown on label
12. Manufacture date (dd / mm / yyyy) or ☐ Not shown on label
13. Expiry date (dd / mm / yyyy) or ☐ Not shown on label
14. UN Chemical Hazards Classification

(Circle 1 or 2 to indicate primary and secondary hazards or write the hazards as a comment on the reverse)

☐ Not shown on label

15. How supplied ☐ Central Government purchase ☐ Donation (indicate donor in comments on reverse) ☐ Extension service ☐ Farmer purchase ☐ Unknown ☐ Other (specify)
16. Name of supplier

OBSERVATIONS & QUANTITY

17. Condition of product ☐ Usable ☐ Appears NOT to be usable
18. Physical form ☐ Granules ☐ Liquid (pumpable) ☐ Powder (flowable) ☐ Sludge ☐ Solidified ☐ Liquid (separated) ☐ Powder (caked)
19. Container type ☐ Drum (closed head) ☐ Drum (open head) ☐ Bag ☐ Bottle ☐ Jerry can ☐ Woven sack ☐ Other (specify)
20. Container material ☐ Aluminum ☐ Steel ☐ Glass ☐ Jute ☐ Plastic ☐ Other (specify)
21. Container condition ☐ Destroyed & contents dispersed ☐ Leakage ☐ Some damage but no leakage ☐ Intact
22 Seal intact ☐ Yes ☐ No
23. Amount in container ☐ Full ☐ 75% ☐ 50% ☐ 25% ☐ Empty
24. Container size (enter the size of the container as a number of the units in #25)
25. Unit of measure ☐ Kilogram ☐ Litre ☐ Other (specify)
26. Quantity (only complete one of 26a or 26b)
    Either 26a When containers are intact and can be counted **Number of Containers**
    Or 26b When containers are broken and contents dispersed / cannot be counted - estimate the dimensions of the pile
    Length (m) **Width (m)** **Height (m)**

PICTURES

27. Picture of label: Filename Description
28. Picture of container: Filename Description
29. Photo of contamination: Filename Description

reverse side

Question Number and Detailed Comment	Counterpart barcode labels		
	000 001	000 001	000 001

VETERINARY PRODUCT FORM

comment on reverse

	1	Store Name						☐
	2	Owner (if different from owner of store)						☐
INFORMATION FROM THE LABEL	3	Labels on Containers	☐ Yes ☐ No	4	Readable labels	☐ Yes ☐ No		☐
	5	Commercial Name						☐
	6	Active Ingredient name			☐ unknown	Sample number if appropriate		☐
	7	AI Concentration	% ☐ W/W ☐ W/V ☐ V/V		☐ unknown	Sample only if > 1 Tonne		☐
	8	Manufacturer's name and address						☐
	10	Batch number	_____ *or* ☐ not shown on label					☐
	11	Date of Manufacture	dd/mm/yyyy *or* ☐ not shown on label					☐
	12	Expiry Date	dd/mm/yyyy *or* ☐ not shown on label					☐
	13	UN Chemical Hazards Classification (warning diamonds on the containers)	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ use 1 & 2 to indicate primary and secondary hazards or write the hazards as a comment ☐ not shown on label					☐
	14	How supplied / Name of Supplier	☐ Central Government purchase ☐ Donation (indicate donor in comments section) ☐ Extension service ☐ Farmer purchase ☐ Unknown ☐ Other (specify)		Name of supplier			☐
	15	Formulation Type	☐ injectable ☐ liquid ☐ paste ☐ pour on ☐ powder ☐ spray ☐ tablets ☐ wetable powder ☐ Other (specify)					☐
OBSERVATIONS and QUANTITY	17	Condition of product	☐ appears to be usable ☐ appears NOT to be usable					☐
	19	Physical form	☐ granules ☐ liquid (pumpable) ☐ liquid (separated) ☐ powder (flowable) ☐ powder (caked) ☐ sludge ☐ solidified					☐
	20	Container type	☐ Aerosol ☐ Bag ☐ Bottle ☐ Box ☐ combination pack (specify) ☐ Drum (open head) ☐ Drum (closed head) ☐ FIBC ☐ IBC ☐ Jerry can ☐ Syringe ☐ Tube ☐ Vial ☐ Woven sack ☐ none					☐
	21	Container material	☐ Aluminium ☐ Cardboard ☐ Glass ☐ Jute ☐ Plastic ☐ Paper ☐ Steel ☐ Wood					☐
	22	Have containers been opened	☐ Yes ☐ No					☐
	23	Container size	enter the size of container as a number of the units in box 24					☐
	24	Unit of Measure of the Container size	☐ Cubic Metre ☐ Cubic centimetre ☐ Gallon (Imp.) ☐ Gallon (US) ☐ Gram ☐ Kilogram ☐ Litre ☐ Millilitre ☐ Piece ☐ Pint UK ☐ Pint US ☐ Pound (lbs) ☐ other (specify)					☐
	25	Amount in container	☐ 100% ☐ 75% ☐ 50% ☐ 25% ☐ 0%					☐
	26	Container Condition	☐ Completely broken - contents dispersed ☐ Leakage ☐ Surface damage no leaking ☐ Undamaged					☐
	27	Quantity (only complete one of 27a or 27b)	***Either 27a*** When containers are intact and can be counted: Number of Containers		***Or 27b*** When containers are broken and contents dispersed / cannot be counted - estimate the dimensions of the pile	Length (m)		☐
						Width (m)		
						Height (m)		
	28	Photo of label	File name	Description				☐
	29	Photo of Containers	File name	Description				☐
	30	Photo of Contamination	File name	Description				☐

Question Number	Detailed Comment

EMPTY CONTAINER FORM

comment on reverse

	1	Store Name					☐
	2	Owner (if different from owner of store)					☐
INFORMATION FROM THE LABEL	3	Labels on Containers	☐ Yes ☐ No	4	Readable labels	☐ Yes ☐ No	☐
	5	Commercial Name					☐
	6	Active Ingredient name			☐ unknown	Sample number if appropriate	☐
	7	AI Concentration	% ☐ W/W ☐ W/V ☐ V/V		☐ unknown	don't sample if AI is known	☐
	8	Manufacturer's name and address					☐
	9	Formulator's name and address					☐
	13	UN Chemical Hazards Classification (warning diamonds on the containers)	☐ ☐ ☐ ☐ ☐ ☐ ☐ use 1 & 2 to indicate primary and secondary hazards or write the hazards as a comment ☐not shown on label				☐
	14	How supplied / Name of Supplier	☐ Central Government purchase ☐ Donation (indicate donor in comments section)	☐ Extension service ☐ Farmer purchase ☐ Unknown ☐ Other (specify)	Name of supplier		☐
OBSERVATIONS and QUANTITY	18	Level of contamination	☐ clean ☐ residues	☐ other (specify)			☐
	20	Container type	☐ Bag ☐ Bottle ☐ Box	☐ combination pack (specify) ☐ Drum (open head) ☐ Drum (closed head)	☐ FIBC ☐ IBC ☐ Jerry can	☐ Woven sack	☐
	21	Container material	☐ Aluminium ☐ Cardboard	☐ Glass ☐ Jute	☐ Plastic ☐ Paper	☐ Steel ☐ Wood	☐
	23	Container size	enter the size of container as a number of the units in box 24				☐
	24	Unit of Measure of the Container size	☐ Cubic Metre ☐ Gallon (Imp.) ☐ Gallon (US)	☐ Kilogram ☐ Litre ☐ Piece	☐ Pint UK ☐ Pint US ☐ Pound (lbs)	☐ other (specify)	☐
	26	Container Condition	☐ Completely broken / corroded ☐ Surface damage ☐ Undamaged	☐ Compacted ☐ Shredded ☐ other (specify)			☐
	27	Quantity (only complete one of 27a or 27b)	***Either 27a*** When containers can be counted: Number of Containers	***Or 27b*** When containers are broken and cannot be counted - estimate the dimensions of the pile: Length (m), Width (m), Height (m)			☐
	28	Photo of label	File name	Description			☐
	29	Photo of Containers	File name	Description			☐
	30	Photo of Contamination	File name	Description			☐

Question Number	Detailed Comment

CONTAMINATED SOIL FORM

comment on reverse

	1	Store Name		☐
PESTICIDE CONTAMINANT	5	Commercial Name	if the name of the pesticide that contaminated the soil is known	☐
	6	Active Ingredient name	if the AI of the pesticide that contaminated the soil is known	☐
	8	Manufacturer's name and address	if the name of the manufacturer of the pesticide that contaminated the soil is known	☐
	9	Formulator's name and address	if the name of the formulator of the pesticide that contaminated the soil is known	☐
	13	UN Chemical Hazards Classification (warning diamonds on the containers)	☐ ☐ ☐ ☐ ☐ ☐ ☐ use 1 & 2 to indicate primary and secondary hazards or write the hazards as a comment ☐ not shown on label	☐
	14	How supplied / Name of Supplier	☐ Central Government purchase ☐ Donation (indicate donor in comments section) ☐ Extension service ☐ Farmer purchase ☐ Unknown ☐ Other (specify) — Name of supplier	☐
OBSERVATION AND QUANTITY	18	Level of contamination	☐ dry stain ☐ saturated ☐ strong odour ☐ visible contamination ☐ weak odour	☐
	19	Type of soil	☐ dry clay soil ☐ dry loam ☐ dry sandy soil ☐ wet clay soil ☐ wet loam ☐ wet sandy soil — "Loam" is equal mixtures of sand clay and organic mater, it is typical agricultural soil	☐
	20	How stored or type of container	☐ in situ (unexcavated) ☐ in a pile — or excavated and repacked into: ☐ Drum (open head) ☐ FIBC ☐ IBC	☐
	21	Container material	☐ Aluminium ☐ Plastic ☐ Steel ☐ Wood	☐
	23	Container size	enter the size of container as a number of the units in box 24	☐
	24	Unit of measure for the Container size	☐ Cubic Metre ☐ Gallon (Imp.) ☐ Gallon (US) ☐ Kilogram ☐ Litre ☐ Pound (lbs) ☐ other (specify)	☐
	25	Amount in container	☐ 100% ☐ 75% ☐ 50% ☐ 25% ☐ 0%	☐
	26	Container Condition	☐ completely broken - contents dispersed ☐ Leakage ☐ Surface damage no leaking ☐ Undamaged	☐
	27	Quantity (only complete one of 27a or 27b)	*Either 27a* When containers are intact and can be counted — Number of Containers:	☐
			Or 27b when the soil is in-situ or excavated in a pile - estimate the dimensions — Length (m); Width (m); Height/depth (m)	
PHOTOS	28	Photo of label	File name / Description	☐
	29	Photo of in-situ soil/ pile / containers	File name / Description	☐
	30	Photo of in-situ soil/ pile / containers	File name / Description	☐
	31	Photo of Contamination	File name / Description	☐
	31	Photo of Contamination	File name / Description	☐
SAMPLES (core samples from hot spots)		sample bottle number	Description, location and depth	☐
		sample bottle number	Description, location and depth	☐
		sample bottle number	Description, location and depth	☐
		sample bottle number	Description, location and depth	☐
		sample bottle number	Description, location and depth	☐
		sample bottle number	Description, location and depth	☐
		sample bottle number	Description, location and depth	☐
		sample bottle number	Description, location and depth	☐
		sample bottle number	Description, location and depth	☐

Question Number	Detailed Comment

CONTAMINATED EQUIPMENT FORM

comment on reverse

	1	**Store Name**		☐
	2	**Owner (if different from owner of store)**		☐
PESTICIDE CONTAMINANT	5	**Commercial Name**	if the name of the pesticide that contaminated the equipment is known	☐
	6	**Active Ingredient name**	if the AI of the pesticide that contaminated the equipment is known	☐
	8	**Manufacturer's name and address**	if the name of the manufacturer of the pesticide that contaminated the equipment is known	☐
	9	**Formulator's name and address**	if the name of the formulator of the pesticide that contaminated the equipment is known	☐
	13	**UN Chemical Hazards Classification (warning diamonds on the containers)**	☐ ☐ ☐ ☐ ☐ ☐ ☐ use 1 & 2 to indicate primary and secondary hazards or write the hazards as a comment ☐ **not shown on label**	☐
	14	**How supplied / Name of Supplier**	☐ **Central Government purchase** ☐ **Donation (indicate donor in comments section)** ☐ **Extension service** ☐ **Farmer purchase** ☐ **Unknown** ☐ **Other (specify)** — **Name of supplier**	☐
OBSERVATIONS and QUANTITY	18	**Level of contamination**	☐ **surface** ☐ **impregnated** ☐ **saturated** ☐ **other (specify)**	☐
	19	**Physical form**	☐ **sprayer (portable)** ☐ **sprayer (vehicular)** ☐ **Tools** ☐ **other (specify)**	☐
	23	**Size of equipment**	enter the size of the equipment as a number of units in number 24	☐
	24	**Unit of Measure of the size of equipment**	☐ **Metre** ☐ **Cubic Metre** ☐ **Square Metre** ☐ **other (specify)**	☐
	27	**Quantity (only complete one of 27a or 27b)**	***Either 27a*** When equipment can be counted — Number of pieces of equipment: ***Or 27b*** When equipment cannot be counted - estimate the dimensions of the pile — Length (m); Width (m); Height (m)	☐
	28	**Photo of label**	File name	Description ☐
	29	**Photo of equipment**	File name	Description ☐
	30	**Photo of contamination**	File name	Description ☐

Question Number	Detailed Comment

CONTAMINATED MATERIAL FORM

comment on reverse

	1	Store Name						☐
	2	Owner (if different from owner of store)						☐
PESTICIDE CONTAMINANT	3	Labels on Containers	☐ Yes ☐ No	4	Readable labels	☐ Yes ☐ No		☐
	5	Commercial Name	if the name of the pesticide that contaminated the material is known					☐
	6	Active Ingredient name	if the AI of the pesticide that contaminated the material is known					☐
	8	Manufacturer's name and address	if the name of the manufacturer of the pesticide that contaminated the material is known					☐
	9	Formulator's name and address	if the name of the formulator of the pesticide that contaminated the material is known					☐
	13	UN Chemical Hazards Classification (warning diamonds on the containers)	☐ ☐ ☐ ☐ ☐ ☐ ☐  use 1 & 2 to indicate primary and secondary hazards or write the hazards as a comment ☐ not shown on label					☐
	14	How supplied / Name of Supplier	☐ Central Government purchase ☐ Donation (indicate donor in comments section) ☐ Extension service ☐ Farmer purchase ☐ Unknown ☐ Other (specify)		Name of supplier			☐
OBSERVATIONS and QUANTITY	18	Level of contamination	☐ surface ☐ impregnated ☐ saturated ☐ other (specify)					☐
	19	Physical form	☐ fertiliser ☐ seeds ☐ other (specify)					☐
	20	Container type	☐ Bag ☐ Bottle ☐ Box ☐ combination pack (specify) ☐ Drum (open head) ☐ Drum (closed head) ☐ FIBC ☐ IBC ☐ Jerry can ☐ Woven sack ☐ none					☐
	21	Container material	☐ Aluminium ☐ Cardboard ☐ Glass ☐ Jute ☐ Plastic ☐ Paper ☐ Steel ☐ Wood					☐
	22	Have containers been opened	☐ Yes ☐ No					☐
	23	Container size	enter the size of container as a number of the units in box 24					☐
	24	Unit of Measure of the Container size	☐ Cubic Metre ☐ Gallon (Imp.) ☐ Gallon (US) ☐ Kilogram ☐ Litre ☐ Piece ☐ Pint UK ☐ Pint US ☐ Pound (lbs) ☐ other (specify)					☐
	25	Amount in container	☐ 100% ☐ 75% ☐ 50% ☐ 25% ☐ 0%					☐
	26	Container Condition	☐ Completely broken - contents dispersed ☐ Leakage ☐ Surface damage no leaking ☐ Undamaged					☐
	27	Quantity (only complete one of 27a or 27b)	*Either 27a* When containers are intact and can be counted	Number of Containers	*Or 27b* When containers are broken and contents dispersed / cannot be counted - estimate the dimensions of the pile	Length (m)		☐
						Width (m)		
						Height (m)		
	28	Photo of label	File name	Description				☐
	29	Photo of Containers	File name	Description				☐
	30	Photo of Contamination	File name	Description				☐

Question Number	Detailed Comment

CONTAMINATED BUILDING MATERIAL FORM

comment on reverse

	1	**Store Name**		☐
	2	**Owner (if different from owner of store)**		☐
PESTICIDE CONTAMINANT	5	**Commercial Name**	if the name of the pesticide that contaminated the material is known	☐
	6	**Active Ingredient name**	if the AI of the pesticide that contaminated the material is known	☐
	8	**Manufacturer's name and address**	if the name of the manufacturer of the pesticide that contaminated the material is known	☐
	9	**Formulator's name and address**	if the name of the formulator of the pesticide that contaminated the material is known	☐
	13	**UN Chemical Hazards Classification (warning diamonds on the containers)**	☐ ☐ ☐ ☐ ☐ ☐ ☐ use 1 & 2 to indicate primary and secondary hazards or write the hazards as a comment ☐ **not shown on label**	☐
	14	**How supplied / Name of Supplier**	☐ **Central Government purchase** ☐ **Donation (indicate donor in comments section)** ☐ **Extension service** ☐ **Farmer purchase** ☐ **Unknown** ☐ **Other (specify)** — **Name of supplier**	☐
OBSERVATION AND QUANTITY	18	**Level of contamination**	☐ **surface** ☐ **impregnated** ☐ **saturated** ☐ **other (specify)**	☐
	19	**Physical form**	☐ **asbestos sheets** ☐ **brick** ☐ **canvas** ☐ **concrete** ☐ **other (specify)** ☐ **steel sheets** ☐ **wood** ☐ **wattle and daub**	☐
	24	**Unit of Measure**	☐ **Metre** ☐ **Cubic Metre** ☐ **Square Metre** ☐ **Sheet** ☐ **other (specify)**	☐
	27	**Quantity (only complete one of 27a or 27b)**	***Either 27a*** When the material can be counted or measured in the units specified in 24 — Number of units — ***Or 27b*** When material cannot be counted - estimate the dimensions of the pile — Length (m) / Width (m) / Height/depth (m)	☐
PHOTOS	28	**Photo of label**	File name — Description	☐
	29	**Photo of building material**	File name — Description	☐
	30	**Photo of building material**	File name — Description	☐
	31	**Photo of Contamination**	File name — Description	☐
	32	**Photo of Contamination**	File name — Description	☐
SAMPLES (if appropriate)		sample bottle number	Description	☐
		sample bottle number	Description	☐
		sample bottle number	Description	☐
		sample bottle number	Description	☐
		sample bottle number	Description	☐
		sample bottle number	Description	☐
		sample bottle number	Description	☐
		sample bottle number	Description	☐
		sample bottle number	Description	☐

Question Number	Detailed Comment

Annex 2

ChemClear Programme Documents

INFORMATION ON THE PROGRAM

CLASSIFICATIONS

Group 1 chemicals are **collected free of charge** under the program, these chemicals are currently registered ag and vet chemicals manufactured by companies supporting the Industry Waste Reduction Stewardship initiative.

Group 2 chemicals are those chemicals that are no longer registered, unknown, unlabelled, out of date, or mixed agvet chemicals. A fee applies for disposal unless a state government subsidy is in place.

REGISTER AT
WWW.CHEMCLEAR.COM.AU
OR FREE CALL 1800 008 182

Level 4 AMP Tower
1 Hobart Place, Canberra City,
ACT 2601 / GPO Box 816
Canberra City, ACT 2601

Phone +61 2 6230 4799
Fax +61 2 6230 6710
E chemclear@agsafe.com.au
Web www.chemclear.com.au

COLLECTING UNWANTED AG AND VET CHEMICALS

ChemClear® is a not for profit chemical collection and disposal service for users of Agvet chemicals at the end of their life cycle, or when they become surplus.

The program contributes to the ongoing sustainability of Australia's food and agricultural industries ensuring that unwanted chemicals are collected and destructed in a safe and responsible manner.

The appropriate collection and disposal of these chemicals minimises their impact on the environment if otherwise left unattended. The service ensures that these possible environmental contaminants are retrieved and in turn reduces waste and the possibility of residual contamination.

Unwanted chemicals must be registered for collection. ChemClear® requires users of agvet chemicals to identify the chemicals they are using and storing, assess the chemicals that need disposing of and register them for the next ChemClear® collection in their Shire Council area.

There are only six steps to the program, it's that simple:

Step 1:
Take an Inventory of your unwanted ag and vet chemicals

Step 2:
Register them for collection @ www.chemclear.com.au or Free call 1800 008 182

Step 3:
Continue to store your registered chemicals safely and securely

Step 4:
ChemClear® will contact you direct to advise the location of the collection point for retrieval

Step 5:
Prepare chemicals for delivery to collection site

Step 6:
Deliver your chemicals to the advised retrieval site

WWW.AGSAFE.COM.AU

INVENTORY OF UNWANTED CHEMICALS REGISTRATION FORM

MANU-FACTURER	PRODUCT	REGISTRATION NUMBER	CONTAINER SIZE	NUMBER OF CONTAINERS	QUANTITY REMAINING	CONTAINER INTEGRITY *
EXAMPLE Nufarm	Agritox Selective Herbicide	555/000	20lt	2	10lt 15lt	A A

** **A** Good **B** Fair **C** Poor **D** Enclosed in oversized drum/container*

WASTE HOLDER DETAILS

NAME: .....

ADDRESS: .....

EMAIL: ..... SHIRE COUNCIL: .....

CONTACT/PHONE: .....

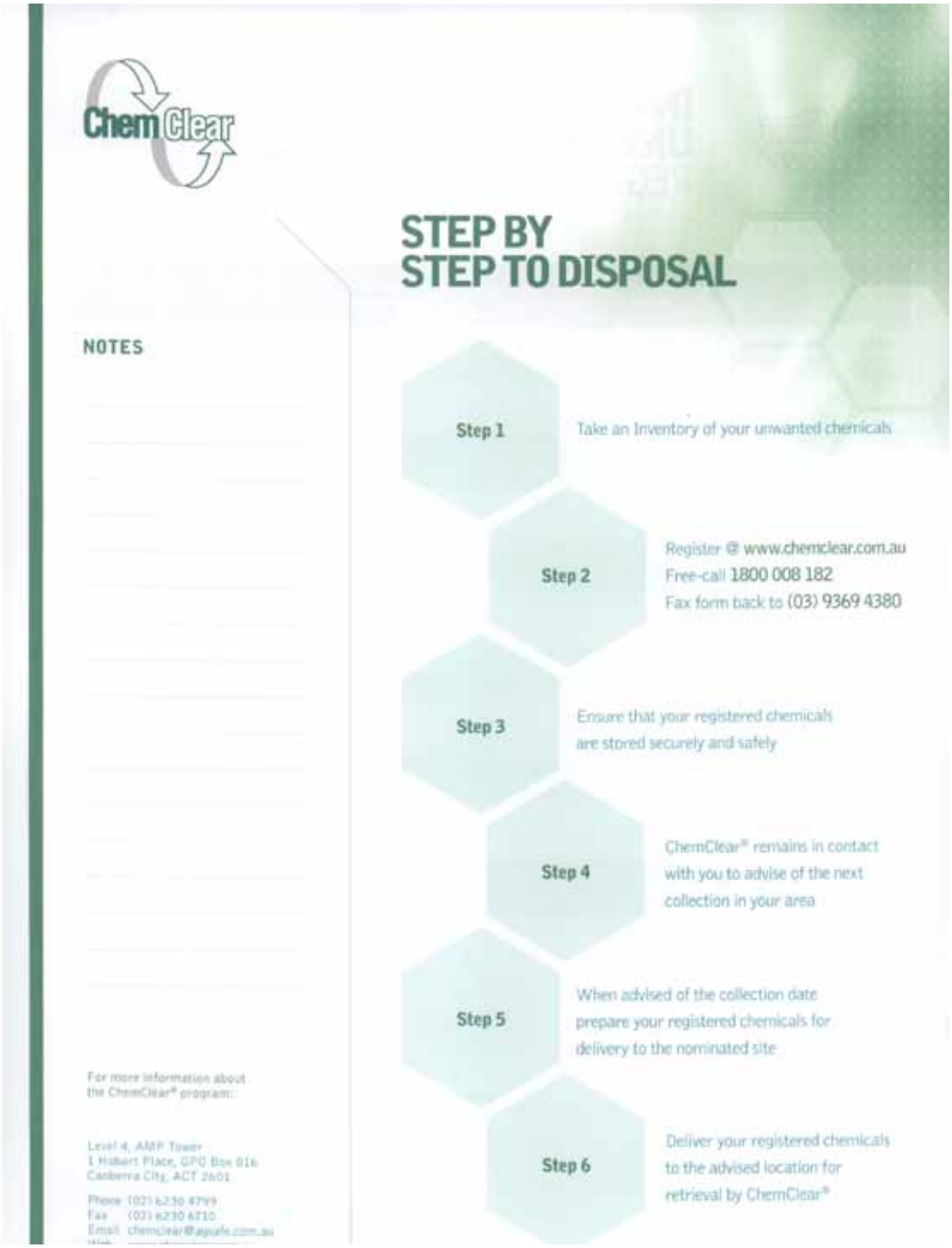
FAX: .....

MOBILE: .....

Please indicate below ✔

COUNCIL
FARMER
BUSINESS
GOVERNMENT

FAX BACK TO 03 9369 4380


ChemClear
STEP BY
STEP TO DISPOSAL
NOTES
Step 1
Take an Inventory of your unwanted chemicals
Step 2
Register @ www.chemclear.com.au
Free-call 1800 008 182
Fax form back to (03) 9369 4380
Step 3
Ensure that your registered chemicals are stored securely and safely
Step 4
ChemClear® remains in contact with you to advise of the next collection in your area
Step 5
When advised of the collection date prepare your registered chemicals for delivery to the nominated site
Step 6
Deliver your registered chemicals to the advised location for retrieval by ChemClear®
For more information about the ChemClear® program:
Level 4, AMP Tower
1 Hobart Place, GPO Box 016
Canberra City, ACT 2601
Phone (02) 6230 4799
Fax (02) 6230 6710
Email chemclear@aguafe.com.au