



PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: FULL-SIZED PROJECT

THE GEF TRUST FUND

Submission Date: April 3, 2009

Re-submission Date: Jan 22, 2010

PART I: PROJECT IDENTIFICATION

GEF PROJECT ID¹: PROJECT DURATION: 36 months

GEF AGENCY PROJECT ID: 607573

COUNTRY(IES): Botswana

PROJECT TITLE: Demonstration project for decontamination of POPs contaminated soils using non-thermal treatment methods

GEF AGENCY(IES): FAO

OTHER EXECUTING PARTNER(S): Secretariat of Basel Convention, UNEP Chemicals, UNIDO, Department of Environmental Affairs

GEF FOCAL AREA (S)²: Persistent Organic Pollutants

GEF-4 STRATEGIC PROGRAM(S): POPs-SP1, POPs-SP3 (see preparation guidelines section on exactly what to write)

NAME OF PARENT PROGRAM/UMBRELLA PROJECT (if applicable) AFRICA STOCKPILES PROGRAMME (ASP)

INDICATIVE CALENDAR*	
Milestones	Expected Dates mm/dd/yyyy
Work Program (for FSP)	04/01/2010
CEO Endorsement/Approval	04/30/2011
Agency Approval Date	06/30/2011
Implementation Start	09/01/2011
Mid-term Evaluation (if planned)	01/31/2013
Project Closing Date	08/31/2014

* See guidelines for definition of milestones.

A. PROJECT FRAMEWORK

Project Objective: The detailed characterisation, selection of treatment option and decontamination of approx. 18,000 tonnes of POPs and pesticide contaminated soil at the Sebele Farm site and associated contaminated sites in Botswana

Project Components	Indicate whether Investment, TA, or STA ^b	Expected Outcomes	Expected Outputs	Indicative GEF Financing ^a		Indicative Co-Financing ^a		Total (\$) c=a+b
				(\$) ^a	%	(\$) ^b	%	
1. Strengthening of regulatory sector for environment and waste management	TA	Review of environmental and waste management legislation related to permitting and operating of national waste disposal options	1. Revised environment legislation and regulations related to permitting of waste treatment facilities; 2. Revised waste management legislation related to operation of waste treatment facilities.			200,000	100	200,000
2. Detailed site characterisation at Sebele Farm and associated contaminated sites	TA	Detailed report on level and type of contamination at sites identified as part of the national inventory completed under the NIP and ASP Southern Africa ASP project	1. Analytical report on level of contamination verified by independent laboratory; 2. Detailed site characterization and environmental assessment of the risk to public health and environment posed at each location; 3. Development of risk based strategies for treatment of contaminated sites based on research completed by University of Wageningen.	100,000	29	250,000	71	350,000
3. Environmental Assessment of disposal options	TA	Independent assessment of suitability of	1. Review of potential disposal technologies commercially available			100,000	100	100,000

¹ Project ID number will be assigned by GEFSEC.

² Select only those focal areas from which GEF financing is requested.

for soil decontamination		commercially available non-thermal treatment options for soil decontamination	<p>for operation in Botswana;</p> <p>2. Assessment of suitability of potential disposal options based on level of contaminants, soil types and waste volumes under local conditions;</p> <p>3. Comparative analysis of financial and economic feasibility of using treatment technologies.</p>					
4. Pilot studies on treatment of soil based on soil characterization study and technology feasibility study	TA	Selection of the most appropriate treatment option based on bench top / laboratory / small scale field studies	<p>1. Laboratory tests for potential disposal options;</p> <p>2. Small scale field trials for selected technologies based on results of laboratory tests;</p> <p>3. Assessment of destruction efficiency of disposal options;</p> <p>4. Revised feasibility study for in-country operation based on field trial data;</p> <p>5. Negotiations with technology supplier.</p>	50,000	17	250,000	83	300,000
5. Implementation of treatment option	TA	Treatment of contaminated materials and elimination of risk	<p>1. Mobilisation of treatment option to Botswana;</p> <p>2. Commissioning of treatment plant and trials for permitting;</p> <p>3. Pre-treatment of contaminated materials based on analytical survey;</p> <p>4. Destruction of contaminants through operation of the disposal option.</p>	1,000,000	47	1,150,000	53	2,150,000
6. Monitoring and Evaluation	TA	Independent evaluation of impact of treatment option on public health and environment	<p>1. Emissions monitoring plan developed and approved by government;</p> <p>2. Report on commissioning of treatment option and impacts to air, water, land;</p> <p>3. Report on total impact as a result of operation of disposal option.</p>	77,000	44	100,000	56	177,000
7. Project management				136,000	32	287,000	68	423,000
Total project costs				A1,363,000		B2,337,000		3,700,000

^a List the \$ by project components. The percentage is the share of GEF and Co-financing respectively of the total amount for the component.

^b TA = Technical Assistance; STA = Scientific & Technical Analysis.

B. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE and by NAME (in parenthesis) if available, (\$)

Sources of Co-financing	Type of Co-financing	Project
Project Government Contribution	Cash and in-kind	347,000
GEF Agency(ies)	Grant	50,000
Bilateral Aid Agency(ies)	Grant	850,000
Multilateral Agency(ies)	Grant	840,000
Private Sector	Grant	250,000
NGO	(select)	0
Others	(select)	0
Total Co-financing		B2,337,000

C. INDICATIVE FINANCING PLAN SUMMARY FOR THE PROJECT (\$)

	Previous Project Preparation Amount (a) ³	Project (b)	Total c = a + b	Agency Fee
GEF financing		1,363,000	1,363,000	136,300
Co-financing		2,337,000	2,337,000	
Total		3,700,000	3,700,000	136,300

D. GEF RESOURCES REQUESTED BY AGENCY (IES), FOCAL AREA(S) AND COUNTRY(IES)¹

GEF Agency	Focal Area	Country Name/ Global	(in \$)		
			Project (a)	Agency Fee (b) ²	Total c=a+b
FAO	Persistent Organic	Botswana	1,363,000	136,300	1,499,300
(select)	(select)				
(select)	(select)				
(select)	(select)				
(select)	(select)				
(select)	(select)				
(select)	(select)				
(select)	(select)				
(select)	(select)				
Total GEF Resources			1,363,000	136,300	1,499,300

¹ No need to provide information for this table if it is a single focal area, single country and single GEF Agency project.

² Relates to the project and any previous project preparation funding that have been provided and for which no Agency fee has been requested from Trustee.

PART II: PROJECT JUSTIFICATION**A. STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:**

An indicative inventory of obsolete pesticides and contaminated sites completed in the 1990s by the Ministry of Agriculture identified a series of government stores which were believed to be heavily contaminated with pesticides. By far the largest contaminated site was identified as Sebele Farm on the then outskirts of Gaborone with an estimated 15,000 tonnes of contaminated soil. The site has a long history (over 30 years) of use to store pesticides used for migratory pest control (POPs and non-POPs). An initial estimate of the amount of contaminated material at the site concluded that approx. 15,000 tonnes of soil required some form of treatment with approximately 2,000 – 3,000 tonnes of similarly contaminated soil identified at a limited number of other locations. The level of contamination at these locations was confirmed by visual inspection by FAO in December 2007. Large areas show staining from pesticide contamination and the level of odour in the areas indicates that there are significant levels of pesticide remaining in the soil.

³ Include project preparation funds that were previously approved but exclude PPGs that are awaiting for approval.

Botswana took the initiative, and in 2002 paid for the removal and environmentally sound disposal of over 300 tonnes of obsolete pesticides by an international contractor. The challenge of dealing with the heavily contaminated soil at Sebele has, until now, not been addressed.

Based on the original survey completed in 1990s this large quantity of highly contaminated material was included the FAO inventory data of obsolete stocks for Africa. The estimated 17,000 tonnes of contaminated soils in Botswana therefore form a considerable percentage of the total of 50,000 tonnes of pesticide and heavily contaminated soils included within the overall scope of the ASP Phase 1 documents approved by GEF Council in 2002. At this moment in time there is no analytical data on the type and level of contamination at the stores, and quantities of contaminated material have been estimated based on a visual inspection of the site.

The planned MSP for Southern Africa will assist in providing a more detailed pre-liminary analytical survey of the site to allow a more objective quantification of the type and level of contamination. The level of funding within the MSP for Southern Africa will not, however, be sufficient to allow a detailed investigation of the sites. Based on the preliminary data a detailed project proposal will be developed in late 2009 for the more detailed analytical investigation of the site and development of a risk based strategy for remediation of the contaminated sites. It is anticipated that the strategy will include the use of a series of non-thermal remediation options for decontamination of the soil in Botswana. This is of increasing importance as the farm was originally situated many kilometers out of the Gaborone city limits. Increasing urbanisation in Botswana is placing increasing land use pressure in and around the store location.

The project will include the following main activities:

1. Review of environmental and waste management legislation related to permitting and operating of national waste disposal options:
 - a. Revised environmental legislation and regulations related to permitting of waste treatment facilities. Currently Botswana has limited waste management capacity, consisting of a number of engineered landfill sites, used to dispose of a wide variety of wastes. The operation of local disposal / treatment options will require the formulation of regulations for permit issue to the facilities treating POPs and pesticide contaminated materials. The permit system will need to ensure that internationally accepted standards defined in the ASP Disposal Technology Options (DTO) study completed in Phase 1 of the ASP are being met;
 - b. Revised waste management legislation on the operation of waste treatment facilities. Related to the point above, the use of treatment options in Botswana will require legislation to control the operating standards for control waste handling. The strengthening of this aspect of national regulation will assist Botswana in the future as more complex disposal / treatment options are developed to handle increasing levels of industrial waste produced in other manufacturing and industry sectors.
2. Preparation of a detailed report on level and type of contamination at sites identified as part of the national inventory completed under the NIP and ASP Southern Africa ASP project. The report will include:
 - a. Detailed analytical data on the level of contamination at all sites listed in the NIP and Ministry of Agriculture inventory completed under the MSP. It is anticipated that much of the analysis will be completed at the Department of Environment Laboratory in Gaborone and that field kits will be used where possible to minimize the need for costly laboratory analysis of the estimated 1,000s of samples. The quality of the report will be verified by an independent laboratory in the Region;
 - b. Detailed site characterization and environmental assessment detailing the risk to public health and environment posed at each location. Based on the analytical data the project will complete a comprehensive assessment of the potential and / or actual impact of the contamination. The study will relate the location of the site and level / type of contamination to the broader environment (such as proximity to ground water, urban settlement etc) and quantify the risk to public health and environment;
 - c. Development of risk based strategies for treatment of contaminated sites based on research completed by the University of Wageningen in Mali and Mauritania. FAO in cooperation with the University of Wageningen in the Netherlands has developed a risk based system to determine the most appropriate strategy for dealing with contaminated sites. This system has been successfully used in Mali during Phase 1 of the ASP to develop strategies to mitigate the health and environmental impacts from pesticide contamination through a combination of in-situ treatment options and general management of the location to minimize impacts. The system aims to reduce the quantity of contaminated soil requiring sophisticated and costly treatment technologies to a minimum, based on risk and level of contamination. The system will be applied in Botswana to identify a strategy combining a suite of non-thermal treatment options.
3. Independent assessment of suitability of commercially available non-thermal treatment options for soil decontamination:
 - a. Review of potential treatment options available or implementable in Botswana. Following completion of the strategy development (point 2 c above) a study of commercially available treatment options suitable for the highest risk /

most highly contaminated materials will be completed. The study will examine the latest technology data available from a variety of sources (including GEF STAP, ASP DTO, Basel / Stockholm guidance etc) to assess options for non-thermal and thermal treatment options. The assessment will only consider technologies with a proven track record and a history of meeting BAT / BEP disposal standards;

- b. Assessment of suitability of potential treatment options based on level of contaminants, soil types and waste volumes under local operating conditions. The review in 3 a will also include the assessment of the suitability of each potential technology to treat the waste as defined by the analytical survey. Factors such as use of technologies to treat similar waste matrices, similar contaminant and infra-structure requirements will be included in the assessment;
- c. Comparative analysis of financial and economic feasibility of using treatment in a developing country context. As a final stage in the review it will be necessary to assess the economic feasibility study on the various treatment options identified in steps 3 a and b. The use of the technology under local operating conditions (power supply, access to water etc) will be included in the study. The final report will provide an assessment of the most appropriate technologies available ranked in terms of their theoretical suitability to deal with the waste, operate to the required standard, complete the operation in a timely manner and within the available budget.

4. Selection of the most appropriate treatment option based on bench top / laboratory / small scale field studies:

- a. Laboratory tests and small scale field trials for potential disposal technologies. In theory a number of technologies will be capable of treating the contaminated soil in Botswana. There is, however, the need to confirm their suitability and identify any operating constraints before committing to an in-country treatment option. The project will therefore require technology suppliers to undertake a series of laboratory and field trial tests to determine suitability and capacity to handle the waste. Prospective suppliers will be expected to complete trials on bulk samples of waste from the sites;
- b. Assessment of destruction efficiency of disposal options. Based on the results from the trials, an independent assessment of the destruction efficiency of each option will be conducted and a comparison of all options under study will be completed. The various options considered will be ranked in terms of their ability to treat the waste;
- c. Revised feasibility study for in-country operation based on field trial data. This will include a revised assessment of cost and time needed to treat the contaminated soil earmarked as needing a sophisticated treatment option. The assessment will be combined with the destruction efficiency data to identify the most viable option for treatment of the contaminated soils in Botswana;
- d. Negotiations with technology supplier. Following identification of the most appropriate disposal technology, negotiations will be initiated with the supplier to provide and operate the technology in Botswana. As a minimum this will include a contract to supply and commission the equipment, train local staff in its operation, provide maintenance and support whilst the plant is operating and decommissioning and possible buy-back of the equipment at the end of the project. Leasing options will also be explored as an alternative to direct supply and operation.

5. Treatment of contaminated materials and elimination of risk:

- a. Mobilisation of the treatment option to Botswana and commissioning of the facility. The contract with the technology will require the supply of the equipment to Botswana, its commissioning and permitting under the revised regulations developed in 1 a and b above. The contractor will be required to complete all activities, with logistical assistance where needed from the Government of Botswana and FAO;
- b. Pre-treatment of contaminated materials based on the analytical survey. The contractor will be required to screen all contaminated materials based on the analytical data collected in point 2 above to ensure only high risk materials are considered for treatment by the disposal option. This will commonly include filtering of material to remove large grain size material which is commonly only contaminated to low levels. This step will be an additional important factor in limiting the quantity of material needing treatment through the imported equipment;
- c. Destruction of contaminants through operation of the treatment option. The supplier will then be required to operate the facility in Botswana on a management / supervision basis following the training of local personnel. .

6. Monitoring and Evaluation

- a. Emissions monitoring plan developed and approved by government. The introduction of a new treatment technology will require adequate controls to ensure no adverse impact on public health and the environment as a result of its operation. The development of regulations as presented in 1 a and b is only part of the control system needed to ensure effective operation and safe destruction of the contaminated materials. A comprehensive independent emissions monitoring plan will need to be developed for implementation during the operation of the facility. National environmental NGO groups could play a role in development and delivery of this activity;
- b. Report on commissioning of treatment option and impacts to air, water and land. The emissions monitoring plan will include an assessment of impact during the commissioning phase of the project to ensure that the plant is operating to the required standards;
- c. Report on total impact as a result of operation of disposal option. The emissions monitoring plan will also include a

complete analysis of the total environmental burden as a result of the disposal operation including carbon footprint and any potential impact in terms of climate change through emissions to atmosphere.

This project therefore aims to address the contamination at Sebele and other contaminated sites already identified in Botswana through completion of a detailed site survey and analytical report in the type and concentration of pesticides at the various locations. The studies will go on to review available treatment options and develop a short list of 3 - 5 non-combustion technologies which could be considered as viable methods of disposal. The selection of potential treatment options will call heavily on the Disposal Technologies Option (DTO) study completed as part of Phase 1 of the ASP. Companies will then be invited to trial their technologies and develop fully costed proposals for treatment of the wastes. Based on a review of technical and financial proposals one supplier will be selected to complete the remediation of the contaminated sites. It should be noted that this work is over and above the inventory, environmental assessment, safeguarding and disposal strategy development planned under the Southern African MSP proposal to be submitted to GEF. It is felt that the scale of contamination in Botswana requires a bespoke full size project which deals with waste treatment as a separate project to the general issues related to POPs and pesticide management commonly dealt with under the ASP. The data collected during this project on the suitability of non-thermal treatment options for soils in the developing country context, will add greatly to the body of scientific evidence which may be used by other countries with similar problems around the world.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL/REGIONAL PRIORITIES/PLANS:

Botswana is a ratified party to the Stockholm Convention and has completed a NIP. The proposed project addresses all of the identified priorities relating to POPs and other pesticides in the assorted NIP documents and will assist Botswana in meeting its obligations under the Stockholm Convention. The project will also provide useful reference data for other countries which face similar problems from POPs and pesticide contaminated soils.

C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS:

The FSP will contribute to the GEF-4 strategic objective of reducing and elimination production, use and especially the release of POPs into the broader environment. It will address specifically SP-3 Partnering in the demonstration of feasible, innovative technologies and best practices for POPs reduction. The use of non-thermal treatment options for treatment of POPs contaminated materials is relevant to all countries and will provide useful data on the suitability of a series of potential treatment options.

D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES:

GEF resources will be provided as a Grant. The activities planned under this project are of a nature that do not lend themselves well to loan arrangements since they will not result in income being generated. The GEF grant will also be matched by funds from other donors that will be granting their contributions without expectation of reimbursement.

E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:

The project falls under the GEF umbrella programme, *Phase 2 of the Africa Stockpiles Programme (ASP)* led by FAO and the World Bank. The experience of other ASP POPs and obsolete pesticides projects, plus the supporting guidelines and tools developed by ASP during Phase 1 will be used by the project to facilitate effective implementation. Lessons learnt in the project during implementation will be disseminated through the Africa region and will contribute to the success of the whole programme, with emphasis of developing treatment systems for high risk locations affected by POPs contaminated soils.

The project will also look to coordinate with related initiatives in the areas of chemicals management (SAICM), waste management (Basel Secretariat) and environmental protection (UNEP Chemicals). The project will also coordinate its activities with the EC funded project on improved implementation of Multi-lateral Environmental Agreements (MEAs) implemented in the Africa, Caribbean and Pacific regions by FAO and UNEP.

The project in Botswana will also link with Crop Life International's efforts on emergency safeguarding and management of pesticide containers. The project will look to replicate models of engagement with the pesticide industry which have been successfully developed in the ASP project in South Africa during Phase 1 of the programme.

The project builds on previous projects related to obsolete pesticides completed in Botswana. The assessment of non-thermal

treatment options for POPs contaminated materials will be of use to all countries, especially those in the ASP.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING :

The locations identified in this project have suffered a long term contamination from POPs and other pesticides. The GEF contribution to the project will assist in risk reduction from these contaminated sites and will address a need identified in the NIP. The project will look to maximize the use of local, low cost solutions to manage the waste in an environmentally sound manner. The overall cost of the project is, however, too large for a single donor to cover.

The GEF contribution therefore forms an integral part of the overall funding envelop for the project. Significant levels of co-finance have already been secured for the project but failure to secure the GEF contribution will result in a readjustment of project emphasis and a significant reduction in the project scope and resultant impact. The inclusion of GEF resources in the project has been a key factor in attracting other donors to support the project.

The project can be considered as a technology demonstration for use of non-thermal options for treatment of POPs contaminated wastes. As such the results and assessment of the various technology options will have direct relevance to other countries faced with similar problems. The project will also complete an assessment of the suitability of technologies in the developing country context. The results of the project will provide GEF with a practical example which it can use to assist countries facing similar problems to develop remediation strategies for POPs contaminated materials.

G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED, AND IF POSSIBLE INCLUDING RISK MITIGATION MEASURES THAT WILL BE TAKEN:

RISK	MITIGATION MEASURE	LEVEL OF RISK
Poor stakeholder involvement at national level	Successful project implementation will require the development of close linkages between national stakeholders from government departments (Agriculture, Environment and Health), civil society / NGOs and the pesticide industry. FAO has been successful in establishing multi-stakeholder working groups and project management committees in similar projects in the region and will provide the necessary technical and administrative support in each country to ensure collaboration between all stakeholders.	Low
Lack of resources directed to civil society and NGO partners	FAO project agreements with countries will include identification of specific activities which are suited to specific partners (including NGO groups). Funds will be directed to partners through the local FAO office based on the final project agreement ensuring that there is no potential conflict of interest as has been identified during Phase 1 of the ASP.	Low
Lack of interest from technology suppliers	The area of soil treatment and POPs decontamination continues to grow with increased land / population pressure. Discussions held to-date with technology suppliers for similar projects in other countries / regions indicate that there remains strong interest in offering local solutions to waste management problems. Economic conditions in Asia, Europe and the USA also mean that companies are increasingly looking for work overseas to broaden their markets. A number of suppliers have recently commercialized technologies which will be assessed for suitability under local conditions during the project.	Low

Failure to mobilize donor support to enact risk reduction strategy	Project agreements will be designed to ensure that the responsibility for raising subsequent funding is shared between partners and that the Government of Botswana takes an active role in local fund raising and mobilization of bi-lateral donor inputs. FAO will continue to act as the overall coordinator for fund raising based on local initiatives at country level. Botswana will also be required to allocate national resources (cash and in-kind) from government budgets to ensure that key activities and available capacities are used in support of the project.	Moderate
Insufficient funds to treat all contaminated materials identified in the surveys	The adoption of the risk based survey strategy developed by FAO will allow available funds to be prioritized to maximize the risk reduction impact.	Low

H. DESCRIBE, IF POSSIBLE, THE EXPECTED COST-EFFECTIVENESS OF THE PROJECT:

The project is based on cost sharing between two principle donors, the GEF contribution and a contribution from the European Commission for improvement of implementation of MEAs in the Africa, Caribbean and Pacific (ACP) region. Neither contribution would be sufficient to address all of the issues related to treatment of the large volume of wastes under consideration. The adoption of a risk based local treatment solution strategy will also result in significant cost savings compared to the option of export for thermal treatment overseas. The risk based strategy will also maximise the use of relatively low-input solutions to treat as much of the waste as possible, based on the screening of materials to assign them to the most appropriate treatment option. Only wastes showing significant levels of contamination and exhibiting the correct physical characteristics will be submitted to the more costly, technologically sophisticated solutions under consideration.

I. JUSTIFY THE COMPARATIVE ADVANTAGE OF GEF AGENCY:

FAO's comparative advantage in the context of the Stockholm Convention on POPs is recognized in GEF Council Document GEF/C.28/15 of 9 May 2006. This document relates to the phase-out and replacement of POPs pesticide use and the elimination of POP pesticide stockpiles.

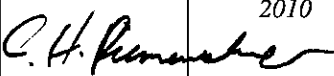
PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S): (Please attach the country endorsement letter(s) or regional endorsement letter(s) with this template).

NAME	POSITION	MINISTRY	DATE (Month, day, year)
Mr David Aniku	Director	Department of Environmental Affairs Ministry of Environment, Wildlife and Tourism	March 31 st 2009

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for project identification and preparation.

Agency Coordinator, Agency name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Charles Riemenschneider, Director, Investment Centre Division Technical Cooperation Department, FAO		January 19, 2010	Mark Davis Chief Technical Advisor – Obsolete Pesticides Programme FAO	+390657055192	Mark.Davis@fao.org
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