Evaluation Report for STDF Pesticide Residue Data Generation Projects: ASEAN PG-337, Latin America PG-436 and Africa PG-359

27 March 2019

Evaluation Team:

Stuart Slorach
and
Andrea Spear

Blank page

Table of Contents

Acronyms

ASEAN	Association of South East Asian Nations
ASEC	ASEAN Secretariat
AU-IBAR	African Union – Inter-African Bureau for Animal Resources
CCPR	Codex Committee on Pesticide Residues
Codex, CAC	Codex Alimentarius Commission
COLEACP/PIP	Europe-Africa-Caribbean-Pacific (EU-ACP) Liaison Committee/Pesticide Initiative Programme
EAC	East African Community (Burundi, Kenya, Rwanda, S. Sudan, Tanzania, Uganda)
EPA	US Environmental Protection Agency
EQ	Evaluation question
EU	European Union
EWG-MRLs	Expert Working Group on Harmonisation of Pesticide MRLs among ASEAN Countries
FAO	Food and Agriculture Organisation of the United Nations
GAP	Good Agricultural Practices
GLP	Good Laboratory Practice
GMUF*	Global Minor Use Foundation/Fund
ICA	Instituto Colombiano Agropecuario (the main project partner institution in Colombia)
IICA	Inter-American Institute for Cooperation on Agriculture
IR-4	Interregional Research Project Number 4, headquartered at Rutgers University in the US
JMPR	FAO/WHO Joint Meeting on Pesticide Residues
KEPHIS	Kenya Plant Health Inspectorate Service
LA	Latin America
LAPRW	Latin America Pesticide Residue Workshop
LC-MS/MS	Liquid Chromatography-Mass Spectrometry/Mass Spectrometry
LOQ	Limit of Quantification
MRL	Maximum residue level
MUF*	Minor Use Foundation
OECD	Organisation for Economic Cooperation and Development
QA	Quality Assurance
SDGs	Sustainable Development Goals
SOP	Standard Operating Procedure
SPS Agreement	WTO Agreement on the Application of Sanitary and Phytosanitary Measures
STDF	Standards and Trade Development Facility
ToR	Terms of Reference
USDA-FAS	US Department of Agriculture Foreign Agricultural Service
US	United States of America
WHO	World Health Organization
WTO	World Trade Organization

*The Global Minor Use Foundation (also known as the Global Minor Use Fund) (GMUF) is now called the Minor Use Foundation (MUF). This document employs the name used in the event or activity referenced.

Preface

Commissioned by the Standards and Trade Development Facility (STDF) Secretariat, we have carried out an *ex-post* evaluation of three STDF-funded pesticide data generation projects in Asia, Latin America and Africa (STDF/PG/337, STDF/PG/436 and STDF/PG/359, respectively), which took place between 2013 and 2017. During the evaluation we have obtained information by electronic means and direct interviews from a large number of people and organisations. These included the STDF Secretariat, the 17 main participating countries, the trainers, the US Department of Agriculture Foreign Agriculture Service (USDA-FAS), the IR-4 Project at Rutgers University, the Association of South East Asian Nations (ASEAN) Secretariat, the Inter-American Institute for Cooperation on Agriculture (IICA), the African Union-Inter-African Bureau for Animal Resources (AU-IBAR), the UN Food and Agriculture Organization (FAO) and the Joint Meeting on Pesticide Residues (FAO/JMPR) Secretariat, the US Environment Protection Agency (EPA), pesticide manufacturers/organisations (Dow, Syngenta, Valent/Sumitomo, CropLife) and other private sector stakeholders.

Field visits to Malaysia and Singapore in December 2018, and Colombia and Kenya in January 2019 were an important part of the evaluation process and yielded valuable insights.

We would like to express our appreciation to all those who have taken the time to provide us with information, and share their experiences and opinions about the planning, implementation and follow-up of the projects. In particular, we would like to thank Dr. Jason Sandahl (USDA-FAS) and Dr. Michael Braverman (IR-4/Rutgers University) for rapidly and frankly responding to our many questions about the projects.

Stuart A. Slorach Andrea Spear

Executive Summary

This evaluation covers three projects that the STDF funded between 2013 and 2017: the ASEAN, Latin American and African Pesticide Residue Data Generation Projects (STDF/PG/337, 436, 359, respectively). They were designed to improve technical capacity to generate quality pesticide residue data in line with internationally agreed Good Agricultural and Good Laboratory Practices (GAP, GLP), enhance access to lower-risk pesticides, and establish a replicable model for joint projects. Implemented in 17 countries on three continents, this was a major exercise in collaboration and coordination, not only in national project teams (laboratory and field scientists and technicians), but also among the various other stakeholders, including the USDA/IR-4 implementers, pesticide manufacturers, FAO/JMPR, regional intergovernmental and other organisations, regulatory entities, fruit growers, exporters' associations, etc.

The main objective of this Evaluation was to verify: a) the extent to which the projects achieved the objectives and indicators set out in the project documents; b) the effectiveness, impact and sustainability of the three projects; and c) the contribution to STDF objectives on market access, national and regional SPS situations and Sustainable Development Goals (SDGs).

Main Achievements of the Projects

In the capacity-building phase, more than 160 people (scientists and government officers) were trained in applying Good Agricultural Practices (GAP) and Good Laboratory Practices (GLP) to pesticide residue data generation, through regional workshops as well as hands-on field, laboratory and reporting activities.

In the data generation phase, 62 field trials were carried out in 16 countries (32 in ASEAN, 23 in Latin America, 7 in Africa) resulting in 10 studies: 6 in ASEAN, 3 in Latin America, 1 in Africa (expected in 2019; the project partners extended their support after the STDF project was officially closed on 30 April 2017).

The projects are likely to achieve, to a great extent, their three main specific objectives:

1. *To improve technical capacity to generate, review and interpret pesticide residue data of sufficiently high quality to be accepted by JMPR for the issuance of new MRLs.* Technical capacity has improved visibly, but all respondents to surveys and interviews said they needed further support to consolidate the knowledge and skills acquired and to strengthen their capacity to apply them and pass them on to others.
2. *To facilitate new Codex MRLs* (original goal: six from ASEAN, four from Latin America and one from Africa). The results to date are: 5 MRLs in 2018, 2 more expected in 2019, 1 in 2020, and 2 pending resubmission (hopefully in 2019).
3. *To support national pesticide registration* (and thus offer farmers more low-risk options): To date, all of the ASEAN countries that participated in the trials have registered the pesticide for the crop they tested, as have Colombia, Panamá, Costa Rica, Guatemala, Uganda and Tanzania in Africa. Kenya is in the process.

The country teams in all three regions said the project improved communications and joint activities among them, and contributed to regional harmonisation efforts.

Because the new MRLs were only approved in 2018, and others are expected in 2019 and 2020**, it is too early to assess the impact on market access.**

Key Findings/Conclusions of the Evaluation

The STDF projects proved the hypothesis that the collaborative, hands-on model could deliver the desired results. USDA-FAS/IR4 and country teams are applying the many lessons learned in new projects recently starting in the same three regions. A number of the national teams that participated in the STDF projects are taking on a stronger regional role in the new projects (which include more countries) in line with the goal of reinforcing regional cooperation.

The broadly successful outcomes to date reflect the very active participation and dedication of USDA-FAS (Dr. Jason Sandahl and colleagues) and IR-4/ Rutgers University (Dr. Michael Braverman and colleagues) throughout the projects. An important success factor was their ability to draw on a considerable bank of knowledge and experience and an extensive contact network of international, regional and national public and private organisations working in the pesticides area.

The projects were **highly relevant** and designed to help the beneficiaries meet documented SPS- and trade-related needs. The STDF contribution had clear **value-added**; the partner organisations could not have done this on their own, and no other donor programmes existed for these specific issues.

While **the model proved to be broadly effective,** the **implementation design was overly optimistic**. Many of the delays could have been avoided with more rigorous needs and risk assessments, more thorough planning and risk mitigation, and better communications. Most of the desired results are likely to be achieved, but with significant delays, due to the planning issues mentioned as well as to extraneous reasons like JMPR's backlog and a lack of follow-through. The projects were more cost-effective in Asia and Latin America than in Africa where the many delays and challenges incurred more expense than was foreseen.

In general, the programmed **training activities were delivered on time and within budget.** The **supervised field trials** were undertaken in a systematic fashion, but in some cases budgets and time had been underestimated. A number of field trials had to be repeated, including in four of the six countries in Africa. The **laboratory analysis** phase was the most challenging. Equipment breakdowns, transfer of trained personnel, problems with reagents, need to repeat analyses, etc, caused delays in all three regions.

As mentioned above, participants all noted that they needed further support to consolidate the knowledge and skills acquired. One of the project weaknesses was that in the design, **sustainability was not necessarily addressed as a continuity objective**. The project documents mentioned improved participation in international pesticide residue fora, as well as the ability to join additional projects. These activities indeed help to sustain the knowledge gained during the projects. However, the projects would have benefited by including specific follow-up activities at the national level for verification of results, regular needs assessments, national end-of-project reviews, dissemination of results, ongoing awareness building, sharing of knowledge, etc.

The STDF projects have already had a variety of positive impacts:

- They have contributed to outcomes that could potentially deliver **benefits throughout the 'minor use' crop value chain**, including: a) growing awareness of the lack of MRLs for tropical fruits and its impact on trade and development; b) registration of the lower-risk products, which will help replace some of the higher-risk pesticides; and c) better understanding of the MRL establishment process and more active participation in global priority-setting fora.
- The STDF projects laid the technical foundation and logistical mechanisms for **the establishment of the Minor Use Foundation (MUF),** which aims to provide a coordination mechanism to gather and prioritise pest control needs at a global level, and to coordinate residue data generation projects among multiple countries to establish Codex MRLs, national MRLs and import tolerances. (A country may establish a national MRL for a pesticide registered to be used on a local crop. An 'import tolerance MRL' is established for a pesticide/crop combination not used locally but which is needed for import testing.)
- The FAO/JMPR Secretariat and others (e.g., Global Minor Use Summit) have confirmed that the **countries that participated in the projects have been "significantly more active" in recent years** and that this is in large part due to their participation in the project.
- The projects have also helped to promote activities in all three regions aimed at **harmonising pesticide registration requirements and MRLs for pesticide residues** in fruit and other crops. For example, the African project had a positive impact on the East African Community (EAC) harmonisation process.

This more active and better-informed participation in regional and global standards and priority-setting fora should eventually translate into improvements in market access, food safety and environmental protection.

Lessons Learned

- The model used in the three projects is sound, but it must be adapted to the infrastructure, conditions and resources in each country – 'one size does **not** fit all'!
- The composition of the Study Team is crucial; members should have appropriate technical expertise and be selected from organisations with the ability to dedicate the necessary time, replace members seamlessly, and communicate and coordinate effectively with the other stakeholders.
- Identifying and prioritising pesticide/crop combinations is extremely difficult, as many interests must be balanced.
- Effective and efficient collaboration depends on a clear understanding of roles, responsibilities and mutual expectations.

- Stakeholder engagement requires good strategies and multiple approaches at various levels over the life of the project and after.
- The private sector (growers, exporters and their associations) represents key stakeholders and end-beneficiaries, and needs to have a much stronger involvement.
- 'Champions' that emerged during the projects proved to be important drivers of change and sustainability. Their effectiveness can be enhanced through active nurturing and support during and after the project.
- Sustainability mechanisms should be built into the project at the planning stages, to ensure continuity and consolidation of achievements.

Key Recommendations

Following are the main recommendations emerging from the analysis.

1. Future projects on generation of pesticide residue data should be based on the model piloted in the three projects evaluated, taking into account the lessons learned and adapting the model to the infrastructure, conditions and resources of the participating countries. The composition of the national Study Teams used in the projects appeared to work well and should be replicated as far as possible (i.e., National Focal Point/Testing Facility Manager, Study Director, Quality Assurance Director, Field Research Director and Laboratory Research Director). The Focal Point should be a senior person with sufficient authority to make the necessary decisions and sufficient time to devote to the project. Dedicated staff and equipment should be encouraged where possible. Roles and responsibilities of each member of the team should be carefully and clearly defined. Back-ups for critical staff should be appointed early and involved in training, etc.

Relationships and Communications

2. High-level commitment should be sought from governments and chemical companies to provide the necessary policy, personnel and budget support for their part of the project. The commitments should be communicated internally and followed up vertically so that all relevant levels and offices in government and in the companies are aware of the project and their specific roles in it. Agreements should clearly spell out the mutual expectations, roles, responsibilities and communication matters, and be signed off by both parties.

3. JMPR should establish a better mechanism to inform the applicant, the project coordinator and the relevant country(ies) on the outcomes of its evaluations of the data package submitted by the pesticide manufacturer as the basis for 'estimating' an MRL. Early feedback from JMPR reviewer, enabling the applicant to provide additional information, clarifications, etc, would help to avoid unnecessary delays in the evaluation.

4. Project managers should identify key national decision-makers and stakeholders, determine the role they are to play in the project, and develop strategies to get and keep them onboard at critical points before, during and after the project. Surveys and interviews highlighted the importance of involving the private sector (growers, exporters and/or their associations), universities and extension services (where they exist), in the interest of sustainability.

Planning

5. Future projects would benefit from more thorough planning, including rigorous needs assessments, risk assessments, contingency planning, and regular review of assumptions. 'Sustainability' should be built into the design from the beginning, determining how best to consolidate learning and results both during and after the project. The timeframe should be calculated to include contingency plans and follow-up action.

Capacity development and perpetuating knowledge and skills

6. Capacity building should continue to follow the 'on-the-job' and 'train-the-trainer' principles, with the aim of eventually having a core group of people in each country who have fully acquired the necessary expertise and can pass it on to new staff. The training should enable candidates who already have good basic knowledge of field work or advanced analytical methods (e.g., LC-MS/MS) to improve it in specific areas so that they can carry out field studies and laboratory analyses according to GAP and GLP. Participation in training courses (and study teams) should be contingent on sufficient technical knowledge and language skills to be able to fully benefit from the experience.

7. USDA-FAS/IR-4 are encouraged to develop mentoring programmes, as both a capacity-building and sustainability tool. These could include 'on-call' mentoring (e.g., by Skype or WhatsApp) during critical stages of the project and in the post-project period where scientists are putting to use the skills and knowledge they have acquired.

8. To consolidate knowledge, skills and capacity, the 'second round' of MRL projects should address areas in which laboratories still need to improve in order to generate high-quality data (e.g., SOPs, methods development, performing QA audits, log-filling and report writing).

9. Upon completion of each project, follow-up meetings should be held at both the national and regional level, involving all participants and other interested parties, to communicate the results obtained, discuss lessons learned, and develop recommendations to improve the planning and implementation of future projects.

International organisations and developing countries

10. In order to enable JMPR to establish Codex MRLs for pyriproxyfen on mango and banana, and thus meet a key objective of two projects in which a large investment has been made, Valent/Sumitomo should revise and/or complete their dossiers so that they fulfil JMPR requirements, and resubmit them to JMPR. (JMPR has confirmed to the evaluation team and the parties that this is the correct way to proceed.)

11. The countries that participated in the three projects, in collaboration with other countries, should endeavour to expedite JMPR and CCPR work on extrapolating Codex MRLs from key representative crops to other crops in the same Codex crop subgroup.

12. Countries whose tropical produce is denied access to markets due to the application of MRLs that are stricter than Codex MRLs should raise the issue at the SPS Committee and other international fora and request justification for the stricter limits.

1. Introduction

1.1 Purpose of this Report. This evaluation covers three projects that the Standards and Trade Development Facility (STDF)[1] funded between 2013 and 2017: the ASEAN, Latin American and African Pesticide Residue Data Generation Projects: STDF/PG/337, STDF/PG/436 and STDF/PG/359, respectively[2]. The evaluation was commissioned by the STDF Secretariat in October 2018, and is based on the OECD-DAC evaluation criteria of relevance, effectiveness, efficiency, impact and sustainability. The main objective, as per the Evaluation Terms of Reference (Annex 11), was to determine:

1. the extent to which the projects achieved the objectives and indicators set out in the project documents
2. the effectiveness, impact and sustainability of the three projects
3. the contribution to STDF objectives on market access, national and regional SPS situations, Sustainable Development Goals (SDGs), as per the STDF Medium-Term Strategy for 2015-2019.

The Report is divided into six chapters: Introduction, Methodology, Findings and Analysis, Conclusions, Recommendations and Lessons Learned. This introductory chapter presents the purpose of the evaluation, the objective and rationale of the projects, the institutional environment, the policy context and a project summary.

1.2 Objective and rationale of the projects. The objective of the projects was to enhance participating countries' capacity to meet pesticide-related requirements based on Codex MRLs in order to expand market access for their tropical fruits. This is in line with the STDF programme goal and the STDF vision of sustainable economic growth, poverty reduction, food security and environmental protection in developing countries. The project also aligned with Millennium Development Goals 1, 7 and 8, and Sustainable Development Goals 1, 2, 3, 10, 12, 15, 17 (EQ21).

Rationale

Many of the pesticides required for the production of tropical fruits and vegetables do not have established national or international (Codex) MRLs. Consequently, importing countries often set residue tolerances at 'limits of determination' (the lowest concentration of residue that can be detected by a given analytical procedure). Given advances in analytical methods of detection, this can deter the use of certain critical pesticides altogether. This becomes a big problem when newer, safer (less toxic) pesticides become available on the global market, but cannot be used because Codex MRLs for them do not yet exist. Often the absence of an MRL is due to the lack of residue data for the particular crop/pesticide combination. Many developing countries do not have the technical capacity to generate the high-quality data required for international trade standards, or the wherewithal to champion their cause in the relevant fora, e.g. the Codex Committee on Pesticide Residues (CCPR).

This drawback may force farmers to continue to use more toxic chemicals. This can cause economic losses due to market access restrictions, lower crop productivity (due to increased rate of pest resistance) and negative impacts on environmental, worker and consumer safety. As trading partners begin to ban or restrict the use of older crop protection chemicals, significant economic losses have occurred due to shipments being rejected for pesticide residue violations, because farmers cannot comply with established (or non-existent) international standards.

Pesticide residue data needed to establish Codex MRLs and support product registrations are almost exclusively generated in developed countries/regions such as the EU, US, Canada, Australia or Japan. Very rarely are data generated in developing countries, and therefore few Codex MRLs are developed for crops grown primarily in these regions. Even where Codex MRLs do exist for such crops, the data are usually generated in industrialised countries, where climate and pest pressures - and therefore pesticide use patterns - may be quite different. These differing use patterns can produce residues that exceed Codex limits. Codex MRLs that incorporate data from more countries and regions would thus be more relevant and would enhance developing countries' ability to comply with international trade standards. This rationale underpinned the STDF projects' multi-region, multi-country collaborative approach, and its focus on securing Codex MRLs and registration for lower-risk pesticides on selected tropical crops.

Source: The STDF project reports, 2017

The projects were the brainchild of Dr. Jason Sandahl of USDA-FAS, and Drs. Jerry Baron, Daniel Kunkel and Michael Braverman at Rutgers University IR-4 Project which had hitherto been helping US growers to access pest-control tools in line with regulatory requirements. They saw the possibility to adapt the collaborative approach

[1] The Standards and Trade Development Facility (STDF) is a global partnership that helps developing countries to access international markets by tackling sanitary and phytosanitary (SPS) gaps, and promoting food safety, animal and plant health. Established by FAO, OIE, the World Bank Group, WHO and WTO, the STDF also brings together donors, developing country experts, and other international and regional organisations involved in SPS capacity building, as well as the private sector. See: www.standardsfacility.org

[2] www.standardsfacility.org/PG-436; standardsfacility.org/PG-359; www.standardsfacility.org/PG-337

among government, growers and pesticide firms to a broader international context, with the aim of increasing farmers' access to lower-risk pesticides that would be more acceptable to both regulatory authorities and international standard-setting bodies like the Codex Alimentarius Commission (CAC, Codex). This could solve two problems:

1. The lack (or near lack) of Codex MRLs for 'minor-use' crops that are important for many small farmers and for many developing countries (crops considered too 'minor' by pesticide companies to warrant investment in expensive field trials, registration, and submissions to JMPR)
2. The relatively high rejection rate of crops exported under regimes for which no Codex MRLs exist (since often they must meet a default rate of close to 0%).

In evaluation interviews, exporters of tropical produce confirmed that the lack of Codex MRLs was a big problem, and that the use of lower-cost, but higher-risk, pesticides effectively shut them out of certain markets and distribution chains (e.g., European supermarket chains that demand compliance with standards that are stricter than Codex standards). (Colombia estimates that 13% of its rejections are related to residue issues.)

"While second- and third-generation pesticides are being phased out by developed countries due to human and environmental risks, farmers in developing countries often continue to use these chemicals because of the lack of international MRLs based on newer, safer (less toxic) pesticides for their specialty crops. Due to this situation, farmers are limited in their crop protection tools (continued use of more toxic chemicals) resulting in economic loss (restricted market access), lower crop productivity (increased rate of pest resistance), and negative impacts on environmental, worker and consumer safety. This project helped to resolve these issues, with additional benefits for agricultural productivity, environmental safety and consumer safety."

Source: *Strengthening capacity in Latin America to meet pesticide export requirements*, STDF, July 2018

USDA-FAS and IR-4 combined forces to design three regional projects in ASEAN, Latin America and Africa, in countries where they had been providing GAP/GLP training since 2010. The projects were submitted to the STDF with the support of relevant public and private sector stakeholders in the three regions. In many ways, these were to be pilot projects that would help develop **replicable models** that could take the vision further. The idea of the Minor-Use Foundation (MUF, Annex 3) grew out of this and is rapidly becoming a reality, thanks in part to the STDF-funded projects.

Minor Use Foundation (MUF): An Important Outcome

The three STDF-funded projects were linked to a broader global project that aimed to establish a coordination mechanism for countries to identify common pesticide needs and work together to generate the necessary data to support national registration, establish/adopt international standards for trade, and strengthen their ability to comply with international residue standards through improved pesticide monitoring. One of the primary, long-term objectives resulting from Global Minor Use Summit-2 (FAO, February 2012) was the establishment of a central entity to facilitate this process among growers, governments, research institutes, and pesticide manufacturers around the world. Attaining this objective required the establishment of a framework for coordination and collaboration, plus considerable capacity building in order to ensure meaningful participation by developing countries.

1.3 Institutional environment. The three projects took place within the broader IR-4/Rutgers University framework, in close partnership with the USDA-FAS, which was the main funder. The projects featured a multi-stakeholder approach, involving USDA-FAS, IR-4, a variety of government agencies, regional organisations, pesticide manufacturers, and private sector growers and exporters. The projects also had linkages to other projects and programmes carried out by governments, donors (especially USAID), international organisations and academic institutions.

The IR-4 Model

The STDF/USDA programme was modelled in large part on the longstanding US IR-4 programme, which was set up to help US farmers access pest control tools through collaboration among growers, government and pesticide companies. Incentives were established for pesticide firms to cooperate – as often there is little profit for them in registering products for 'minor' crops with low acreage. These included lower registration costs and longer exclusive use rights. In some cases, IR-4 cooperates with land-grant universities that have agricultural extension people working directly with growers. Growers are formally included in the IR-4 programme through an annual meeting in which grower organisations present priority requests (and universities also provide additional information on priorities). The US Environmental Protection Agency (EPA) participates in these meetings to provide guidance on what is and what is not possible from a regulatory perspective.

The STDF Working Group committed - for the three projects – a total of US$1 457 266 in financial support for general training and coordination activities, field trials, laboratory work and the final report writing. This covered

participation in a variety of activities, and in specific cases, materials, equipment and transport of samples. The STDF also offered a forum for national project participants to take part in learning and discussion activities, and for taking MRL issues to higher levels. A good example is the December 2017 WTO Ministerial Conference in Buenos Aires where a Ministerial Statement acknowledged the "*productive work of the Standards and Trade Development Facility (STDF) in building knowledge and capacity for developing countries in the area of pesticide MRLs*".

USDA-FAS provided overall guidance and oversight, along with a number of experts. IR-4 provided the technical oversight and capacity-building/mentoring teams. The pesticide companies, Dow (Asia, Latin America, Africa), Sumitomo (Latin America, Asia) and Syngenta (Asia) provided pesticide materials (formulation product, analytical standards, etc) and technical (analytical methods, etc), registration and stewardship costs, and staff support and advice. Croplife International, the agrochemical companies' trade association, served as a liaison with the pesticide manufacturers to obtain their collaboration with samples, scientific data, test results, etc.

The regional organisations (ASEAN Secretariat, AU-IBAR, IICA) were responsible for managing funding and reporting on progress, organising a variety of activities and liaising with country partners on administrative and financial matters (e.g., purchases of inputs, logistics for training, reimbursement of approved expenses, etc).

The partner countries were responsible for providing the appropriate people and other resources to undertake the projects. They were specifically responsible for:

1. organising the field trials, in collaboration with the private sector, since commercial plots were used in most countries, although research stations were used in some others, e.g., Panamá and Malaysia.
2. conducting the laboratory analyses and report writing. However, in about half the cases, local laboratories were ultimately unable to perform the necessary analyses (due to changes in the crop/pesticide combination, deficient equipment, etc), and the samples had to be sent to other laboratories, sometimes abroad, to be analysed.

1.4 Policy context

The Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) strongly encourages WTO Members to base their food safety measures, including MRLs for pesticide residues, on Codex standards, guidelines and recommendations, where these exist (Article 3 and Annex A of the Agreement). Members may set stricter MRLs than Codex MRLs, but if other Members believe a measure constrains - or may constrain - their exports, and such measure "is not based on the relevant international standards, guidelines or recommendations, or such standards...do not exist, an explanation of the reasons for such...measure may be requested and shall be provided by the Member..." (Article 5.8). In line with the SPS Agreement, Members expect scientific justification.

In addition, Annex C of the SPS Agreement highlights: "Where an importing Member operates a system for the approval of the use of food additives or for the establishment of tolerances for contaminants in food, beverages or feedstuffs which prohibits or restricts access to its domestic markets for products based on the absence of an approval, the importing Member shall consider the use of a relevant international standard as the basis for access until a final determination is made."

The process for establishing and adopting Codex MRLs for pesticide residues is illustrated in the following box.

(Simplified) Process for Establishing and Adopting Codex MRLs for Pesticide Residues

1. Request CCPR to put the pesticide/crop combination on the priority schedule for JMPR evaluation.
2. When the combination is on the JMPR priority schedule, submit data package, including toxicology and residue data, label, etc (usually done by the pesticide manufacturer, but countries may submit residue data directly to JMPR). If JMPR has already evaluated the toxicology data for the pesticide*, it is only necessary to submit the residue data, label, etc. for the crop concerned.
3. JMPR evaluates the data and 'estimates' an MRL for the pesticide/crop combination.
4. CCPR discusses the MRL and forwards it to Codex Alimentarius Commission (CAC) for adoption via the Codex step procedure.
5. CAC adopts the MRL, usually by consensus, but occasionally some Members reserve their positions on certain MRLs (for example, at the 2018 CAC, the EU, Norway and Switzerland reserved their positions on the adoption of the Codex MRL for spinetoram on avocado (this project's Colombian study contributed to that MRL)
6. Codex has a system for crop classification, and discussions are ongoing on extrapolating MRLs for a few key representative crops to other crops within the same Codex subgroup ('crop grouping').

*JMPR usually recommends, among other things, an acceptable daily intake (ADI) (i.e. the daily intake, on a body-weight basis, that can safely be ingested by a person) for each pesticide, regardless of the food source of the pesticide. For more information about JMPR and CCPR, see Annex 9.

Ideally, Codex MRLs would be adopted by the CAC, by consensus (no reservations), for all pesticides and tropical fruits and be applied by all WTO Members and food traders, so that MRLs would not constitute a barrier to international trade in these commodities. Unfortunately, this is not the current situation, because:

- **Codex MRLs have not been established for many pesticide/tropical fruit combinations, especially 'minor crops'.** The main reason is that the data needed to establish them have either not been generated or have not yet been evaluated by JMPR. (JMPR has a backlog of files waiting to be evaluated and has increased the number of its meetings to deal with this problem.) The three projects evaluated were designed to generate pesticide residue data for the establishment of Codex MRLs for tropical fruits. These data, derived from studies carried out in countries that are important producers and exporters of tropical fruits, are particularly relevant for setting MRLs for international trade in these commodities.
- **Some countries and/or food business operators apply MRLs that are stricter than Codex MRLs**. The **US** EPA strives to harmonise its MRLs with Codex as much as possible within the confines of the risk standards of the US Federal Food, Drug and Cosmetic Act. At the 2018 CCPR meeting, the **EU** explained that its current policy was to align EU MRLs with Codex MRLs if three conditions were fulfilled: a) that the EU sets MRLs for the commodity under consideration, b) that the current EU MRL is lower (stricter) than the Codex MRL and, c) that the Codex MRL is acceptable to the EU on aspects such as consumer protection, supporting data and extrapolations (CCPR, 2018, para. 27). Some food business operators, e.g., some retail chains, apply private standards, e.g. "Global Gap", that are stricter than Codex standards.

Harmonisation of pesticide registration requirements and MRLs

In many parts of the world there is little or no harmonisation of requirements for the registration of new, reduced-risk pesticides, especially for use on 'minor crops'; rather, each country sets its own requirements. This delays or prevents such registration, since pesticide manufacturers are reluctant to spend time and money to prepare different applications for different countries, especially if the potential market for the pesticide is small. Therefore, it is in the interest of developing countries to harmonise requirements for pesticide registration as far as possible. Although the three projects were not specifically designed to promote regional harmonisation of pesticide registration data requirements, the African project had a positive impact on the East African Community (EAC) harmonisation process. The projects in the other two regions may also have contributed to ongoing work on regional harmonisation of pesticide registration requirements and MRLs for pesticides.

1.5 Summary of the projects

Brief Description of the Projects Evaluated

Overall objectives: To facilitate market access for tropical fruits by helping beneficiaries meet pesticide-related export requirements based on international (Codex) standards, with a focus on expanding lower-risk pesticide options for tropical produce.

Specific objectives: To improve technical capacity in the beneficiary countries to generate, review and interpret pesticide residue data for specific minor-use speciality crops; to support national pesticide registration processes; to facilitate the establishment of new Codex maximum residue limits (MRLs); to develop a replicable model for joint pesticide residue projects.

Inputs: Total value as per project documents: US$3 501 866, consisting of the STDF commitment of $1 457 266 and the inputs in kind and in money from a variety of partners, including approximately $1 800 000 from USDA-FAS/IR-4. In the end, according to project financial reports, the STDF contribution was US$1 309 194, or $148 072 (10%) less than foreseen.

Activities: Training in GAP and GLP, including workshops and hands-on application during the whole process of field trials, laboratory analysis, report writing, quality assurance, etc.

Outputs: Field trial and laboratory analysis reports (countries); data package submissions to JMPR (pesticide companies, partner countries).

Outcomes: New Codex maximum residue levels (MRLs) for several tropical fruit/pesticide combinations

ASEAN Pesticide Residue Data Generation Project (STDF/PG/337)

Approved Oct. 2011. Commenced: 1 Dec. 2012. Original end-date: 30 Nov. 2015. Revised end-date: 30 Nov. 2016.

Total project value: US$1 242 000; approved STDF contribution: US$637 000, of which US$603 518 was used.

Beneficiaries: Brunei Darussalam, Indonesia, Malaysia, Singapore, Philippines, Thailand and Viet Nam. (Cambodia, Laos and Myanmar participated as observers and attended some training courses).

Administrators/Implementers: ASEAN Secretariat (ASEC) / IR-4 Project (Rutgers University)

Partners: Government agencies and institutions from the beneficiary countries, the ASEAN Expert Working Group on Harmonisation of MRLs of Pesticides (EWG-MRLs), USDA-FAS, US Environmental Protection Agency (EPA), FAO/WHO

Joint Meeting on Pesticide Residues (JMPR) Secretariat and pesticide manufacturers (Dow, Syngenta, Valent/Sumitomo).

Pesticides and products tested: Pyriproxyfen/mango (Malaysia/Singapore); pyriproxyfen/papaya (Philippines, Malaysia and Brunei Darussalam); spinetoram/mango and spinetoram/lychee (Thailand); azoxystrobin and difenoconazole/dragon fruit (Indonesia and Viet Nam).

Results: Six residue studies (one each for lychee and papaya, two each for dragon fruit and mango) for submission to JMPR for possible Codex MRLs in 2017. In the seven countries that completed the residue studies, registrations of these reduced-risk pesticides were successfully completed.

Latin American Pesticide Data Generation Project (STDF/PG/436)

Approved March 2013. Commenced: 1 Oct. 2013. Original end-date: 30 Sept. 2015. Revised end-date: 30 Sept. 2016.

Total project value: US$1,195,416; approved STDF contribution: US$374,116, of which $314,603 used.

Implementers/Administrators: USDA-FAS, IR-4 (Rutgers University), Instituto Interamericano de Cooperación para la Agricultura/Inter-American Institute for Cooperation on Agriculture (IICA)

Beneficiaries: Bolivia, Colombia, Costa Rica, Guatemala, Panamá

Partners: Government agencies and institutions from the beneficiary countries, USDA-FAS, US EPA, FAO/WHO JMPR, pesticide manufacturers Dow and Valent/Sumitomo, Croplife Latin America, Interamerican Development Bank

Pesticides and products tested: Spinetoram/avocado (Colombia), spinetoram/banana (Bolivia), pyriproxyfen/pineapple (Panamá), pyriproxyfen/banana (Costa Rica/Guatemala)

Results: Three residue studies (one for pineapple, one for banana and one for avocado) for submission to JMPR (the Bolivia spinetoram/banana trial data were not analysed). New MRL established in Sept. 2018 for spinetoram/avocado. Registrations: The products have been registered in all the countries that participated in the trials.

African Pesticide Residue Data Generation Project (STDF/PG/359)

Approved October 2012. Commenced: 1 May 2013. Original end-date: 30 April 2016. Revised end-date: 30 April 2017. Trials and analyses were repeated in 2018-19 at project partners' expense, after the official end of the STDF project.

Total project value: US$1,064,450; approved STDF contribution: US$446,150, of which $391,073 used.

Implementers/Administrators: USDA-FAS, IR-4 (Rutgers University), African Union Inter-African Bureau for Animal Resources (AU-IBAR)

Beneficiaries: Ghana, Kenya, Senegal, Tanzania, and Uganda

Partners: government agencies and institutions from the five partner countries, USDA-FAS, US EPA, FAO, COLEACP (Europe-Africa-Caribbean-Pacific Liaison Committee), pesticide manufacturer Dow

Pesticide and product tested: sulfoxaflor/mango (all five countries)

Results: One residue study for sulfoxaflor on mango. Efficacy trials in at least three countries completed in 2018. Registrations of the compound completed in Tanzania and Uganda; pending finalisation of efficacy report in Kenya. Four of the original six projects were repeated in 2018-19, plus an extra trial by Senegal. Data packages are being prepared by USDA/IR4. The aim is to submit residue data to JMPR in late 2019 for a review in 2020. The STDF project also contributed directly to the East African Community's adoption of regional guidelines to harmonise registration processes.

Status of the MRL Objectives of the Three Projects

Study	Countries participating	Data submitted to JMPR	Status
Spinetoram on lychee	Thailand: 6 trials, 1 study	2017	Codex MRL established in 2018
Spinetoram on mango	Thailand: 6 trials, 1 study	2017	Codex MRL established in 2018
Spinetoram on avocado	Colombia: 6 trials, 1 study	2017	Codex MRL established in 2018
Azoxystrobin plus difeno-conazole on dragon fruit	Indonesia (6 trials), Viet Nam (1 trial): 2 studies*	2017	2 Codex MRLs established in 2018
Pyriproxyfen on papaya	Brunei (1 trial), Malaysia (3 trials), Philippines (3 trials):1 study	2017	Codex MRL expected in 2019
Pyriproxyfen on pineapple	Panama: 6 trials, 1 study	2017	Codex MRL expected in 2019
Pyriproxyfen on mango	Malaysia (6 trials), Singapore (lab analysis): 1 study	2017	Codex MRL was expected in 2019 but is pending clarification and possible resubmission
Pyriproxyfen on banana	Costa Rica (7 trials), Guatemala (1 trial): 1 study	2017	Codex MRL was expected in 2019 but is pending clarification and possible resubmission
Sulfoxaflor on mango	Ghana (2 trials), Kenya (2 trials), Senegal (1 trial), Tanzania (1 trial), Uganda (1 trial): 1 study	by Nov. 2019	Codex MRL expected in 2020

Spinetoram on banana	Bolivia: 3 trials; samples not analysed, so no study.	n.a.	n.a.

*Azoxystrobin and difenoconazole is considered as two studies as these compounds generated two separate MRLs from the mixture.

2. Methodology

2.1 The **Evaluation Team** was comprised of Dr Stuart Slorach and Ms Andrea Spear. Dr Slorach has more than 30 years' experience of Codex work and chaired the Codex Alimentarius Commission during 2003-2005. He has worked for more than 15 years on food safety training programmes for developing countries, financed by the Swedish International Development Cooperation Agency. In 2008 he carried out a review of the STDF. He has also evaluated food safety activities for the European Commission and the New Zealand, Singapore and Norwegian Governments.

Ms Spear has extensive experience in international trade and WTO issues, as well as in evaluation and aid effectiveness. Many of her evaluations of trade-related development assistance projects have had SPS and international standards components, since these are so integral to trade development. Examples include: food safety and other agri-business issues in the Balkans; assessments of the impact of EU's association agreements in Eastern Europe and Caucasus with a strong focus on agriculture; evaluations of Swedish Government SPS/TBT support to Middle Eastern countries. All the projects had an underlying aim of meeting EU import/regulatory requirements.

Neither Dr Slorach nor Ms Spear had any previous connection with the STDF-funded projects being evaluated, and there is no conflict of interest.

2.2 The Evaluators followed the "Guidelines for the Evaluation of Projects Funded by STDF", drawing on the individual projects' logical frameworks and project documents.[3] The fact-finding and analysis were based on the OECD/DAC evaluation criteria (relevance, effectiveness, efficiency, impact, sustainability) and lessons learned, with particular emphasis on impact and sustainability. An Evaluation Matrix was prepared to guide assessment of the evaluation questions, evidence, and verification sources and methods (see Annex 2). The results, findings and recommendations were double-checked and verified to the greatest extent possible. The approach was set out in a *Proposed Framework for the Evaluation of Three STDF Projects*, approved by the STDF Secretariat in Nov. 2018.

2.3 The team employed a **mixed-methods approach**, collecting and analysing both qualitative and quantitative data. Information was collected from both primary sources (surveys, semi-structured interviews, focus groups, etc) and secondary sources (programme and other documentation, presentations, analyses, etc).

2.4 The **main sources of both primary and secondary information** were the STDF Secretariat, the implementers (USDA-FAS and IR-4 Project officers and field advisers), the pesticide companies, the administrators (ASEC, IICA and AU-IBAR), and the key members of the country Project Teams (Study Directors, Quality Assurance Directors, Field Trial Managers and Project Coordinators where these existed). The evaluation team also selected the other stakeholders that were involved in or supported the projects, including private sector representatives (e.g., tropical fruit growers/exporters), Codex, the FAO/JMPR secretariat and regional organisations (e.g., East Africa Community). The lists of stakeholders consulted and documents reviewed are in Annexes 1and 8.

2.5 Initial **fact-finding and desk analysis** took place in November and December 2018. **Survey questionnaires** in English and Spanish were designed, based on OECD/DAC criteria and tailored to the different target groups (beneficiaries, implementers, trainers, administrators, pesticide companies, etc.). Most were sent out in November and early December 2018; some took longer as emails bounced and new contact details had to be obtained. Most responses were received and followed up in December and January; with additional clarifications being sought in February. The response rate was, in the end, quite satisfactory (over 90%), although it proved a challenge to find some key people more than two years after most of the projects had finished.

2.6 The **responses to the surveys** yielded very useful information that helped to double-check initial findings from the desk reviews, and highlighted areas that required further investigation. This was used in the design of the **field visits** and of **more targeted interviews** by email and Skype. The **countries for the field visits** were chosen in consultation with the STDF Secretariat. The budget allowed for one visit per region, so it was important to ensure that the country selected would add real value to the evaluation and that the key stakeholders would be

[3] The completed STDF Project Grant Application Forms and the Final Reports of the three projects can be accessed via the STDF website (www.standardsfacility.org).

available. In organising the visits, the team sought meetings with those responsible for planning and implementing the different phases of the projects, especially the practical implementation of field trials, laboratory analysis and preparation of the data for submission to JMPR. At this stage, **additional targeted questionnaires** were prepared for individual semi-structured interviews and focus group meetings.

2.7 Field visits. During 10-14 December 2018 Dr. Slorach visited **Malaysia** (Kuala Lumpur) and Singapore. In Kuala Lumpur he met Mr. Mohammad Nazrul Fahmi bin Abdul Rahim (National Focal Point), Dr. Ngan Chai Keong (Malaysian Agriculture Research and Development Institute), Ms. Nor Hasimah Haron (Laboratory Services Division, Department of Agriculture) and Ms. Nurhayati Kamyon (Malaysian secretariat for MRL setting). In addition to discussions about Malaysia's experience from participation in the project, information was provided about the work of EWG-MRLs, which is chaired by Dr. Keong. Although the Malaysian Team, together with the Singapore Team, completed their work on pyriproxyfen in mango successfully and the data were submitted to JMPR, an MRL was not established in 2018. The reasons for this frustrating development ("labelling issues") were discussed.

2.7.1 At a meeting on 13 December at the Agri-Food & Veterinary Authority of **Singapore** (AVA), Veterinary Public Health Centre, Dr. Slorach met Dr. Wu Yuan Sheng (National Focal Point, Deputy Director Pesticide Residues), Ms. Helen Phang, Mr. Luk Seow Cheng and Ms. Chua Mun Choy Joachim from the Veterinary Public Health Laboratory Chemistry Department and Dr. Foo Chin Lui, Deputy Director Special Projects. Singapore´s experience from participation in the project and suggestions on how future projects could be improved were discussed. The transport of samples from Malaysia for analysis in Singapore worked smoothly due to careful planning and good communication between all concerned. The fact that border control in Singapore is carried out by the same organization (AVA) that carried out the analysis certainly helped.

2.7.2 Ms Spear undertook field visits in January 2019 to Colombia and Kenya, respectively. In **Colombia**, nine extensive interviews and focus group sessions took place over the 5-day visit. These included: meetings with local staff of the project administrator, the Instituto Interamericano de Cooperación para la Agricultura (IICA); a focus group session with the STDF Project Team (Dra. Adriana Castañeda, Dr. Edwin Barbosa, Dr. René Castro) and Niny Arango, Asohofrucol (fruit producers association); interviews with the current Instituto Colombiano Agropecuario (ICA, the project partner) team (Dra. Anamaría García, Oscar Dix, Javier Soriano, Field Trial Director in the Project); a focus group session with the ICA National Laboratory Analysis Team; interviews with the Ministry of Commerce (Giovanni Sambrano); and a meeting with the National Planning Department (Juan Fernando Cifuentes and Natalia Acosta, Secretaría Técnica de la Comisión Intersectorial de Medidas Sanitarias y Fitosanitarias). Also interviewed members of the Project Technical Team: Amy Wang, Field Trial trainer (Costa Rica) and Milena Ramírez, GLP Laboratory trainer (México).

2.7.3 In **Kenya, s**even interviews and focus group sessions took place over three days. These included several meetings with the regional project administrator/implementer, the African Union-Inter-African Bureau for Animal Resources (AU-IBAR): Director-General Prof. Ahmed El-Sawalhy, John Oppong-Otoo, head of the Standards and Trade Secretariat, Charles Lodiaga, Accounts Officer; a focus group session and laboratory visit with the Kenya Plant Health Inspectorate Service (KEPHIS): Dr. Esther Kimani, Director-General, Lucy Namu (Study Director), Robert Koigi (Deputy and Field Manager), Peter Kamuti Mwangangi (Lab Analyst). Also met Japheth Mbandi, Technical Manager, Keitt Fruit and Vegetable Export Company, one of Kenya's largest fruit export companies.

2.7.4 **Field discussions focused on achievements, challenges and lessons learned**. Time was also spent on verifying facts, figures and reporting. The missions yielded useful input, as well as clarifications of numerous issues outstanding and constructive suggestions for future projects. In both missions, those interviewed said they appreciated the opportunity to review the project in depth. They suggested that this ought to be an integral part of projects henceforth: getting country teams together at the end of the project with a facilitator to examine results, challenges and lessons, and to decide on next steps. Participants said they had learned a lot during the project and were applying the GLP skills they had acquired (differing degrees in the two regions). The Colombian teams said they had achieved the six main project objectives by the end of 2016. KEPHIS officers said they expected to achieve the objectives by 2020, when the last project MRL may be approved by JMPR. All said it would be important to continue working in this area in order to consolidate what they had learned. Such an opportunity appears to be imminent, with new regional projects being developed by IR-4/USDA in 2019. The private sector interviews provided useful inputs and suggestions for improving producer/exporter participation in such projects and in improving horizontal and vertical communications on MRL issues. Lists of people met are in Annex 1.

Following the field missions, the Evaluation Team analysed the additional documentation and interviews, and continued consultations to fill gaps and to double-check facts and figures before writing the report.

2.8 Challenges and limitations

- Since most of the projects finished two years ago, numerous people with key roles in the projects had moved on and were difficult to track down. In the end, however, with the help of IR-4 trainers and other professionals involved in the projects, most of the key people were contacted and provided useful inputs into the evaluation.
- Even with the assistance of ASEC, it has not been possible to obtain responses to the Survey Questionnaire from Laos P.R. and Myanmar, which participated as observers in the ASEAN project. Similarly, Guatemala did not respond despite repeated efforts.
- The FAO/JMPR Secretary responded rapidly to requests for information when in the office, but was out of the office for quite some time when we were drafting the report.
- Visits to field trial sites had been sought during country visit planning, but the logistics and timing proved to be complicated. In addition, many of the people in the field who had been involved with the trials were no longer available. Detailed interviews with field trial investigators and trainers, illustrated by photos and videos, proved to be a good second option.

3. Findings and Analysis

3.1 This section provides the answers to the Evaluation Questions (EQs) that were set out in the Evaluation Matrix (Annex 2). It comprises four parts: the Overall Response to the EQs, and individual write-ups for each of the three regions: ASEAN, Latin America and Africa.

3.2 Overall Response to the Evaluation Questions

Relevance

1. Were the projects the right answer to the SPS-related needs of the beneficiaries?

Yes. The needs were well documented and the rationale was strong. (See *Introduction*.) In particular, the projects provided the support and tools to develop the participants' technical capacity to address trade constraints and food safety issues related to pesticide residue limits in both domestic and international markets.

2. What was the value-added of these projects, compared to other support programmes?

There were no other specific support programmes targeting the particular knowledge and skills required to meet JMPR requirements for the issuance of new MRLs for minor tropical crops. While many of the beneficiaries had received GLP training before the project (including from USDA), they did not know how to apply it to generate pesticide residue data for MRL purposes.

3. Were local contexts, ownership, processes and stakeholders adequately taken into account in the design and implementation of the project?

The main emphasis in project documents was the SPS/MRL context of the participating countries. The operating context (field, lab) was assessed during the pre-project stages, but later experience showed that this assessment had not been thorough or current enough to identify the bottlenecks and weaknesses that caused significant delays later. Also, capabilities that had been adequate for certain pesticide residue analyses were not so when the pesticide/crop combination changed. One comment relating to the local context was that "The field phase was done following the US field trial protocols which differed from national practices. Time to train and equip national staff to such practices under local conditions should be considered in the project timeframe."

Ownership and stakeholder issues also required greater attention - before, during and after the projects. Senegal wrote: "The design of the project... deserves to be improved in its preliminary phase with an inclusive or participative approach of the actors directly concerned, for better taking into account certain details in the implementation." Numerous others noted the importance of including the private sector - growers/exporters or their associations - and the Ministries of Commerce in a more constructive way.

4. Was sustainability (including follow-up activities, scaling up and dissemination of results) adequately considered at the project design phase and throughout the project?

Issues related to sustainability were mentioned in project documents, but not as a continuity objective. The project documents mentioned improved participation in international pesticide residue fora, as well as the ability to join

additional projects. However, they did not include specific national follow-up activities for verification of results, regular needs assessments, national end-of-project reviews, dissemination of results to end-beneficiaries, ongoing awareness building, sharing of knowledge, etc.

Quality of the Programme Design and Logical Framework

5. Has the implementation design proved to be realistic in terms of delivering the desired results, meeting expectations and managing risks?

While the model proved to be effective overall, the implementation **design** was found to be overly optimistic early enough for all the projects to request a one-year, no-cost extension in 2015, due to delays in assigning final pesticide/crop combinations and related issues. One of the reasons for this was insufficient risk assessment and contingency planning in the design and implementation stages. Another reason was insufficient needs assessment and communication weaknesses.

While most of the desired results are likely to be achieved, many have been delayed significantly (MRL adoption, for example), partly due to extraneous reasons like JMPR's backlog and partly due to a lack of follow-through.

The role of the 'implementer' (i.e., ASEAN Secretariat, IICA, AU-IBAR) may not have been sufficiently thought through. ASEC played a valuable role in the ASEAN projects. The other two organisations played a less prominent role than expected, for a variety of reasons, including the strong project presence of USDA and IR-4. In addition, IICA and AU-IBAR were not in the same 'league' as ASEC, which has a regional standards role, though they are both strong regional organisations with an established role in SPS capacity development. AU-IBAR's main role is in animal health, but it also has a role in food safety in the absence of a regional food safety organisation, and it participates in relevant Codex Committees. Both organisations also had personnel changes, and AU-IBAR encountered unexpected administrative constraints. In the end, the role of 'implementer' became more one of 'administrator' in Africa and Latin America, and the interest and attention to detail seemed to wane accordingly. For the new projects, a different approach is being adopted by USDA/IR-4. See the regional sections below for further details.

6. Has it been flexible enough to be refined to meet evolving needs and requirements?

Yes, the design and, even more, the persistence and commitment of the technical support and national teams provided the flexibility and wherewithal to meet evolving needs and requirements.

7. To what extent have the assumptions, risks, strategies, baselines, indicators and results frameworks proved appropriate in terms of monitoring and achieving the desired results?

The accuracy of the assumptions was mixed (see Theory of Change below). Baseline information was not available to measure the extent of improvement of a number of indicators, although in some cases the baseline was considered to be zero (rightly so for certain capacities and MRLs). For market access, quantified data were missing.

Regarding monitoring, the midterm and end-of-project surveys in Latin America and ASEAN provided a good sense of the improvements and the needs. The activity charts used in monitoring the progress in LA, for example, were useful and easy to understand, though data was inconsistent from one reporting period to the next, and dates were often not inserted. (This indicates that quality assurance was missing in the design of the reporting process.)

8. To what extent did the outcome indicators reflect the stated objectives? Were they realistic?

The outcome indicators and the six main objectives covered below were largely the same, as should be the case. Progress reports updated achievements in these areas every six months or so. In the end, they proved to be fairly realistic in the sense that many of them are likely to be achieved. The timeframe was unrealistic, so it is too soon to be able to measure the exact extent to which the objectives and indicators have been attained.

9. Did the design pay due attention to the ultimate impacts on gender equality and environmental sustainability?

Among other things, the projects were designed to promote the use of newer pesticides with less risk of damaging the environment and more likely to be accepted by JMPR for MRLs. "We sought 'reduced-risk' chemistries that had no known serious human or environmental health issues. Obviously, growers were already using pesticides (sometimes for which no trade standards were in place), and in many cases these were highly toxic (e.g., organo-phosphates or other low-cost but effective products). Our hope was that, through education on the importance of trade standards (to reduce export crop rejections) and better user safety, growers would be willing to pay somewhat

more for an effective/low-risk product." Debra Edwards, ex-Director, Office of Pesticide Programmes, US EPA (led multi-stakeholder seminars/consultations in ASEAN and Latin America, pre-project phase: 2010-2013).

Gender was not mentioned in the application or other documents. The evaluators found that the project teams had good female representation in Latin America and Asia, but less so in Africa. The project teams with women in a prominent position tended to be more visible. In terms of the end-beneficiaries, in the project countries, minor-use crops tended to involve small to medium-sized farms (hence the mediocre interest by pesticide firms). Women tend to share in the farm duties, so whatever benefits accrue (e.g., better protection habits, lower-risk pesticides, higher incomes due to greater demand for their products, etc) farm women and families are likely to benefit.

Theory of Change:

10. Have the underlying assumptions proved relevant and accurate throughout implementation to date?

The assumptions that intensive training and learning-by-doing from start to finish of the project would develop the necessary capacities has proved relevant and largely accurate. However, assumptions were not so accurate on high-level commitment from governments and pesticide companies, field and laboratory readiness and capabilities, and time required to produce high-quality results. Nor was the assumption accurate that one could rely on the pesticide companies to pursue MRL establishment with JMPR if any problems were identified with the submission (this occurred with one ASEAN and one Latin American study, leaving the 'expected' MRLs in limbo). Time will tell if the assumptions on grower willingness to use the new pesticide/crop combinations were correct.

Assumptions Regarding MRL Adoption

Project applications assumed that: "*Target markets accept Codex standards"; "The JMPR must accept the data generated and packaged by the project implementers";"Establishment of additional MRLs is contingent upon the proposed tropical crop grouping scheme being adopted by the Codex Alimentarius Commission*".

Project application documents also assumed that FAO and JMPR guidance would ensure that the submission met JMPR requirements. *"FAO: Yong Zhen Yang, JMPR Secretariat will provide guidance to ensure that field trials are conducted, and data submitted in a manner that is acceptable to the FAO/Codex. FAO will also participate as member of the project Steering Committee. JMPR consultant: Arpad Ambrus, senior member of the JMPR, will provide guidance to ensure that data is consistent with JMPR requirements*." In the end, the Malaysia/Singapore and Costa Rica/Guatemala (both Sumitomo) submissions did not meet the requirements. *Source*: Project application documents

11. To what extent have the expected changes in mindset and behaviour occurred among the main target groups?

The main target groups - field and laboratory researchers - say the project has enhanced their understanding of GAP/GLP requirements and inculcated greater discipline and care in their approach to trials, analyses and documentation. The issue of Quality in particular has resonated. At the same time, they emphasise that this needs to be consolidated through continuing work, including new projects aimed at achieving additional MRLs.

"Looking back," says Dr. Jason Sandahl, "they have made a big leap since 2012, in terms of knowledge and ability to contribute and engage on technical matters. Without this project, we would have had no opportunity to engage with these countries as we did."

12. How have these changes contributed to the achievement of the objectives?

The persistence, patience and commitment demanded by the project on the part of all concerned (national teams, USDA-FAS/IR-4, trainers, mentors, pesticide companies, etc.) have been a major factor in achieving the objectives.

13. Extent to which the beneficiaries and implementers have proved to be effective change agents

In the countries where individual 'champions' emerged to advocate and drive the projects, including the critical QA aspects, changes have been more perceptible. See the ASEAN, Latin American and African sections for examples.

Efficiency of Implementation

14. Were the activities and outputs delivered according to the project document (i.e. on time and within the budget)?

All three regional projects experienced delays due to difficulties in agreeing on pesticide/crop combinations that would balance country trade priorities with pesticide companies' market interests. Trialling and registering pesticides is time-consuming and costly, and even if the project was going to supervise the field and laboratory work, the companies would nevertheless have a fairly intensive involvement, including in preparing submissions for JMPR and in some cases for registration. Other delays occurred due to budget shortfalls, personnel transfers,

natural calamities, plagues, equipment breakdowns, lack of necessary equipment, and problems with materials. As a result, all three projects requested and received a no-cost 12-month extension, as noted above. Disbursement schedules were revised accordingly.

In general, the programmed **capacity-building activities** were delivered on time and within budget - mostly in Year 1 of the STDF-funded part of the exercises and in the previous year (and earlier) under USDA support. (The STDF-funded activities included training, equipment and materials.) The '**MRL-related' activities** included the actual field trials, laboratory analyses and report preparation. In Latin America, for example, in Oct. 2013 - Sept. 2016 inclusive, more than 30 capacity-building and mentoring activities took place in the form of pre-trial training, field trials, lab analyses and reporting.

The **supervised field trials** were undertaken in a systematic fashion, but in some cases budgets and time had been underestimated (calculated on US field trials, rather than on local conditions where labs and personnel were far from field sites). Also preparedness by local teams for field trials (e.g., equipment pre-tested and in good repair, effective separation of trial and normal crops, etc) was not always optimum, leading to delays. A number of field trials had to be repeated, including most of those in Africa (due to deterioration of samples in the labs or in transit).

In Africa, efficacy trials (not in the original plan) were added in five countries (for three registrations to date), because JMPR requires product labels for data submissions.

The **laboratory analysis** phase was the most challenging. Equipment breakdowns (and no budget for repairs), transfer of trained personnel, problems with reagents, need to repeat analyses, etc, caused delays in all three regions. Other delays arose because in many cases, laboratory staff were doing these projects on top of their normal activities (the latter had priority since that was what they were being paid for and assessed on by their superiors).

Report-writing proved to be more time- and resource-intensive than expected. In all three regions, the technical support teams from IR-4 spent more time than planned on advising and mentoring national teams on producing high-quality reports.

15. Was the project a cost-effective contribution to addressing the needs of the beneficiary?

The projects were a cost-effective contribution. The partner organisations could not have done this on their own. In the end, the projects in Asia and Latin America ranked higher in cost-effectiveness than the one in Africa. This said, the cost-effectiveness argument in project applications had flawed assumptions regarding the progress of crop grouping in Codex.

Cost-Effectiveness

"Under the current situation, countries operate individually in generating residue data for the establishment of MRLs or import tolerances. This often results in duplication of efforts and generating either redundant residue data, or generating residue data that is not useful for establishing Codex MRLs due to widely differing use practices. This project seeks to coordinate work, harmonise practices and standards as much as possible, and ultimately conserving valuable resources. Additionally, by strategically selecting representative crops from the Codex crop grouping scheme, a relatively few residue trials need to be performed, and that data can be extrapolated to multiple other crops. Through this coordinated and strategic approach, it is estimated that a savings of over 90% can be achieved as compared to conducting individual field trials for each crop/pesticide combination separately." Source: Latin America/IICA project application

The total estimated value of the ASEAN project at the time of contracting, was US$1 242 000. This included an STDF contribution of up to $637 000. Over the course of the project, $605 148 was transferred to the ASEAN Secretariat. Following cost savings realised through the "efficient execution of resources" (quote from ASEAN Final Report), the final STDF contribution totalled $603 518. USDA-FAS, the ASEAN Secretariat, participating ASEAN Member States, CropLife Asia and pesticide manufacturers supported the project with $605 000 in cash and in-kind contributions. Thus, the project was executed within the contracted budget, with a saving of $1 630, plus the $32 852 that remained in the project account at STDF.

In Latin America, the total cost of the three-year programme (counting the USDA, IDB and STDF inputs in cash and kind) was around US$1million. Of the US$374 166 committed by the STDF, $355 418 was disbursed in six lots, and $314 603 had been spent by 30 September 2016. The remaining $40 815 was returned to the STDF. Combined with the undisbursed $18 751, the total underspent was US$59 566.

In Africa, the US$1m project was plagued with challenges. Of the total US$446 150 committed by STDF, $423 721 were transferred in four disbursements from January 2014 to February 2017. Of this, $391 073 was spent,

leaving an unspent balance of $32 648 at AU-IBAR, plus the undisbursed $22 429 remaining in the project account at the STDF, or a total of $55 077. While the STDF project finished in April 2017, USDA/IR-4 continued work on outstanding activities. IR-4 expects to finish the data package for submission to Dow and JMPR in coming months.

Results and Effectiveness of Implementation

16. To what extent were the projects' specific and overall objectives achieved - or are likely to be achieved?

The main *specific* objective was to **improve technical capacity to generate, review and interpret pesticide residue data** that was of sufficiently high quality to be accepted by JMPR for the issuance of new MRLs for specific minor-use speciality crops. This improvement was achieved to a high degree (in some cases the baseline was 0), but efforts are still needed to consolidate the knowledge, skills and capacity to apply them and pass them on to others. The new USDA-IR4 projects in many of the same countries will help in this respect. A key indicator will be the level of the respective countries' participation in SPS and JMPR/CCPR, Codex and Global Minor Use activities, including pesticide residue priority setting fora.

The second specific objective was to **facilitate new Codex MRLs** (six from ASEAN, four from LA and one from Africa). The results to date are: ASEAN: 4 MRLs in 2018 and 2 expected in 2019; LA: 1 MRL in 2017 and 2 more expected in 2019; Africa: 1 MRL expected in 2020. However, the pyriproxyfen on mango (ASEAN) and banana (LA) are pending possible resubmission by Sumitomo, as they were not accepted by JMPR in 2018 due to labelling and trial issues. (See MRL table in *Section 1: Introduction*.)

The third specific objective was to support **national pesticide registration**. In Latin America, all participants in trials have registered the resulting products (Colombia: spinetoram/avocado, Panamá: pyriproxyfen/pineapple, Costa Rica/Guatemala: pyriproxyfen/banana). In Africa, Tanzania and Uganda reported that they have registered sulfoxafor/mango; Kenya is in the process of doing so. In Asia, all participants in trials have registered the resulting products (Thailand: spinetoram/lychee and mango; Indonesia and Viet Nam: azoxystrobin plus difenoconazole/ dragon fruit; Malaysia and Singapore: pyriproxyfen/mango).

The fourth specific objective was to develop a **replicable model for joint pesticide residue projects**. This has been achieved and is now being improved for a second round of projects in Asia and Latin America.

There were two 'overall objectives': to **facilitate market access** and to **expand lower-risk pesticide options.**

- The first will be measurable only after the MRLs are adopted and awareness among end-users (growers, exporters) and buyers improves.
- The second is a key objective and its achievement will depend on a number of factors. While the projects contribute science-based data and facilitate registration and MRLs, the uptake of the lower-risk products will depend in part on awareness of their existence by producers, exporters, extension services, relevant government agencies, NGOs. The pesticide companies have a role to play in promoting the lower-risk products and ensuring they are competitive (price/effectiveness ratio).

17. What were the major factors influencing the achievement of the project objectives, outcomes and outputs?

- Commitment, persistence and patience by both the USDA/IR-4 teams and the national teams
- National project teams' composition and management (the most successful teams were those in which each team member understood his or her role and the importance of that role in achieving the overall objectives)
- The central coordinating role of USDA-FAS, combined with the close working relationship with IR4
- Solid GLP/GAP training programme in pre-project and early stages of the projects
- Practical, hands-on experience in field and laboratory work and preparing submissions
- Excellent technical assistance (all national teams said this) in the field trials, laboratory analysis and report-writing stages
- Participation in regional and international residue and priority-setting activities
- Emergence of some 'champions', both nationally and regionally, which contributed to the pursuit of quality and results, and sustainability.

18. To what extent did the multi-stakeholder/central coordinator approach contribute to results and effectiveness?

The 'multi-stakeholder' approach occurred on two levels:

1. The **direct project level**: USDA-FAS, IR-4 Rutgers University, national teams, pesticide companies, ASEAN Secretariat, IICA, AU-IBAR, FAO/JMPR)

2. The **broader level** involving a variety of government agencies (e.g., Agriculture, Health, Environment, Commerce) and the private sector.

Project Level:
The very active participation and dedication of USDA-FAS (Dr. Jason Sandahl and colleagues) and IR-4/ Rutgers University (Dr. Michael Braverman and colleagues) during the projects have been a key factor in the successful outcomes of the projects. They were able to draw on their considerable bank of knowledge and experience and extensive contact networks, including international, regional and national public and private organisations working in the pesticides area. The central role played by Dr. Sandahl was crucial. This was the 'big-picture' role, the one that required a constant focus on achieving the objectives and attaining the vision. It was a huge responsibility; he would have had to be very focussed and disciplined not to get overwhelmed by three big projects in challenging countries and on a challenging and relatively unexplored topic. The support provided by the IR-4 teams was equally important, and instrumental in keeping the projects moving forward to the very end, constantly highlighting quality and helping to overcome the innumerable challenges that tend to occur in such projects. The close working relationship between USDA-FAS and IR-4 and their common vision also constituted an important success factor.

Managing multi-stakeholder endeavours requires very good communications, coordination, relationship-building and expectation management. All three projects had weaknesses in each of these areas. As a result, in some cases, the multi-stakeholder approach contributed to results and in others it led to delays and ineffectiveness. Surveys and interviews revealed that roles, responsibilities and mutual expectations should have been more clearly spelled out in project documents, contracts, letters of agreement, etc. See the regional sections after this Overview for details.

Broader Level:
Some of the more successful projects were those where a broader set of national stakeholders was involved and where awareness and better common understanding of MRL-related issues reached different government agencies and private sector organisations. This has the benefit of delivering more coherent and cohesive action on food safety, environmental and trade-related issues.

19. What challenges and risks, if any, occurred during project implementation, and how was the project able to adapt to these changes and manage risks?

- Changes in crop/pesticide combinations in the early stages of the projects due to certain chemical companies' reluctance to participate in what they saw as a low cost-benefit-ratio exercise
- Insufficient support at senior levels of governments and institutions (to ensure appropriate priority for the project activities, sufficient budget, adequate staff, sufficient time, etc)
- Accustoming project officers and technicians to the high degree of documentation and precision required for GLP research and the important role of Quality Assurance oversight
- Inability of some laboratories to analyse the selected product once the field trials were completed
- Transfers or absences of key project personnel which led to delays and lost continuity (and extra training costs)
- Transfers or absences of key regional administrator staff, which affected communications and coordination
- Equipment deficiencies and/or breakdowns
- Reagent problems
- Misunderstandings on terms of transferring payments from AU-IBAR to partner institutions; which led to delays in funding the field trials and laboratory analyses in Africa
- Difficulties in raising money to send samples from Africa to a UK laboratory
- Need to repeat trials and analyses in Africa.
- Need to add efficacy trials in Africa in order to register and get the labels necessary for the JMPR submission.

In most cases, solutions were found, and with considerable persistence, patience and commitment, the projects were completed. Some countries, nonetheless, were unable to complete the project as originally contemplated after the search for solutions was unsuccessful (e.g., Perú, Bolivia, Tanzania).

Many of these things can be avoided in future through **rigorous risk assessment and risk mitigation** planning in the design and implementation phases. Including these experiences in **training activities** can also help to focus attention on common problem areas.

Impact

20. To what extent were horizontal (crosscutting) issues adequately addressed in the project?

The projects facilitated and encouraged the introduction of newer pesticides with reduced risks for both human health and the environment. This was achieved by generating pesticide residue data enabling JMPR to establish Codex MRLs and encouraging pesticide manufacturers to register such pesticides for use in the participating countries. In addition, the capacity-building phase included training in GAP/GLP in the application of pesticides, which should lead to reduced environmental contamination.

21. To what extent did the projects contribute to higher-level objectives of the STDF programme such as a measurable impact on market access; improved domestic and - where applicable - regional SPS situations, and/or poverty reduction, and to relevant SDGs?

Market access: Because the new MRLs were only approved in 2018, and others are expected in 2019 and 2020, it is too early to assess the impact on market access. However, trade in these tropical products is growing. For example, Colombia's Ministry of Commerce and National Planning Department showed that avocado exports shot up from US$1m in 2013 to over $60m in 2018 (maro.com.co). The new Codex MRL is considered very important in efforts to enter new markets and expand existing ones. They hope this will encourage additional cultivation, with a positive impact on rural development and poverty-reduction. However, the EU, Norway and Switzerland reserved their position on the new 2018 Codex spinetoram/avocado MRL, so these promising markets will remain a challenge. EU has adopted a much lower MRL than the Codex MRL – 0.05mg/kg (Limit of Quantification, LOQ) vs Codex: 0.3mg/kg. The US has adopted the Codex MRL.

Domestic and regional SPS situations: The projects have raised awareness and practical expertise in GAP and GLP, which are key to enhancing SPS management and monitoring, for local production and imports, as well as for exports. The projects have also contributed - through joint activities and participation in regional and global events - to stronger 'team spirit' among SPS institutions in the respective regions. This is already having positive repercussions (e.g., the EAC harmonisation efforts and better participation in international priority-setting and other fora). In addition, the training and practical experience - and the confidence this generated - has produced stronger national teams that can provide additional kinds of science-based information to their decision-makers.

SDGs: The three projects have contributed to the following Sustainable Development Goals:

Goal 1	Eliminate poverty.
Goal 2	End hunger, achieve food security, improved nutrition and promote sustainable agriculture.
Goal 3	Ensure healthy lives and promote well-being for all at all ages.
Goal 10	Reduce income inequality within and among countries
Goal 12	Ensure sustainable consumption and production patterns
Goal 15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 17	Strengthen the means of implementation and revitalise the global partnership for sustainable development.

Source: www.undp.org/content/undp/en/home/sustainable-development-goals

22. What real difference (expected and/or unexpected) have the projects made or are likely to make for the final beneficiaries (*producers and traders*)?

The STDF projects have contributed to a variety of outcomes - both expected and unexpected - that could potentially deliver benefits throughout the 'minor use' crop value chain. Examples include the following.

Growing awareness of the lack of MRLs for tropical fruits. The 'STDF Project' was regularly referred to during the CCPR sessions, the Global Minor Use Summits, American Chemical Society, many other events during the course of the project. It was held up as a model for collaboration, capacity building and addressing MRL barriers.

Registration of the lower-risk products will help **replace some of the higher-risk pesticides**. However, this will depend on pesticide companies and growers/exporters working together to put these products to good use (as explained under *Results* above).

Where registration authorities were involved (e.g., Thailand), they gained a **better understanding of the MRL establishment process**, and thus could **better evaluate registration submissions**: Was the residue data generated under GLP? How many trials? Who conducted them? etc. Registration officials who also attended Codex meetings were more actively engaged. "For example", recounts Dr. Jason Sandahl, "and this is a real success – Mr Pisan from Thailand was one of the main drivers within **CCPR to establish minimum trial requirements** for the various crops (as there was never clear guidance on the minimum number, and submitters just had to hope the reviewers accepted what they submitted)".

Using the training to **train extension officers** on calibration and protection (e.g., Thailand, Malaysia, Vietnam, Costa Rica).

Better participation in global priority-setting fora: A large portion of countries responding to the calls for proposals for priorities in 2016/18 were STDF project partners, according to USDA/IR-4. "These are now in the global priorities database, with lots of tropical fruits for the first time."

The STDF projects contributed directly to the establishment in 2018 of the **Minor Use Foundation (MUF) -** an outcome that is already making a difference for the beneficiaries. (See *Introduction*.)

Improved understanding of how MRLs are established has helped partner countries to become involved in other international efforts to support trade and deal with MRLs, e.g., the APEC initiatives on MRL import tolerances and MRL compliance flexibility.

ASEAN harmonisation
Following the completion of the ASEAN project, CropLife Asia has initiated and funded a project to train national authorities from 10 ASEAN member countries on pesticide registration according to FAO guidance on pesticide management. The project started in 2018 and is slated to end in 2020, with the ultimate aim of seeing FAO guidance adopted into the national pesticide registration regimes (the FAO guidelines can be accessed via www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/code/list-guide-new/en/).

Latin American harmonisation. Dr. Jason Sandahl said USDA-FAS is planning "a lot of harmonisation work in Latin America in 2019". As a direct outcome of the STDF project, Costa Rica and Colombia are taking the lead in designing a workshop programme to address harmonisation issues, starting in Argentina in late March. "They are really the champions behind this effort," said Dr. Sandahl.

EAC harmonisation: The EAC Working Group on Agrochemicals had been interested in regional harmonisation issues for some time. In 2016 "the STDF project gave us a basis for a common work programme," said one of the three EAC members who participated in the project (Kenya, Tanzania and Uganda). With the support of USDA-FAS (Dr. Jason Sandahl), FAO and others, in 2016-2018, the Working Group was able to develop common protocols for procedures for residue data generation, regional efficacy trials, and registration data requirements. Those who participated in the STDF project said the experience and confidence gained in the project (e.g., on how to conduct GLP supervised residue trials and make Codex submissions) helped them in particular to develop the residue data generation procedures. In late January 2019, the EAC Council of Ministers signed the protocols. "We are now working with the EAC to put these documents into practice through a pilot project," said Dr. Sandahl.

23. What was the role of the projects, if any, in raising awareness on SPS challenges and/or mobilising additional resources for SPS capacity?

During the project, the participants acquired new knowledge and practical skills in SPS-related areas where they had little previous experience, e.g., low-risk pesticides, Codex MRL establishment processes, GAP and GLP. This has enabled a number of them to play a more active role in national, regional and international discussions on pesticide residue issues, such as prioritisation of Codex MRL development, crop grouping, regional and international harmonisation of MRLs, pesticide registration processes, etc., in CCPR and other fora. The FAO/JMPR secretariat and others have confirmed that the countries that participated in the projects have been significantly more active in CCPR in recent years, and this is in large part due to their participation in the project.

The project has also helped a number of countries to mobilise resources, both national and from development partners (especially USAID and the EU).

Sustainability

24. What were the major factors that influenced sustainability of the projects?

The project activities were calibrated and sequenced in a programmed, yet pragmatic, fashion, bearing in mind the beneficiaries' ability to absorb and 'own' the knowledge and techniques.

The composition of the project teams has been a determining factor in sustaining the benefits of the projects. "Sustainability has worked where there were good teams," commented Dr. Jason Sandahl. Responses to the survey and interviews validated this, highlighting that the project team composition was a key factor in achieving the objectives and carrying on after the projects *per se* had finished. Indeed, a number of champions have emerged

from the STDF national project teams, and they are proving to be instrumental in taking forward pesticide residue issues in their regions (see *Impact* above).

As mentioned above, the close working relationship between the USDA-FAS and IR-4 teams also contributed to sustainability, in terms of new projects in all three regions.

25. To what extent did the benefits of the projects continue after the end of STDF funding?

Most of the participants reported that the benefits of the capacity development (training, equipment, practical experience in field trials and laboratory analyses, QA) are continuing. A number mentioned they are applying various aspects of GLP in their daily work and paying more attention to the need for careful documentation. Colombia said they were adopting the project's successful team approach in their lab work in general. All said they still needed support to consolidate the knowledge and skills they acquired during the projects.

26. What follow-up activities, if any, are planned and/or are required to sustain these results over time?

A number of the countries that participated in the STDF project have participated in the Minor Use Summit and Global Priority-Setting workshops. Building on the priority-setting activities, USDA/IR-4 are starting a second round of pesticide residue projects involving national teams from the STDF project and additional countries in Latin America, Asia and Africa.

An article in an IR-4 journal in 2017 explained the next steps after the STDF project: "The Global Minor Use Workshops have illustrated the continued need for such work, and the Global Minor Use Fund has provided more opportunities for cooperative work. For example, in Latin America projects are being initiated to address several of the tropical priorities from both Global Minor Use Workshops. These include: spinetoram on banana, papaya and pineapple to control fruit fly and some lepidopteran insects; trifloxystrobin plus fluopyram on papaya to control anthracnose; and oxathiapiprolin on cacao bean (cocoa) to control pod rot. The countries contributing to this work include Bolivia, Colombia, Costa Rica, Ecuador, Panamá and Perú." (Source: *Concluding the STDF Capacity-Building Work, Success, Lessons Learned and Going Forward,* ir4project.org, pg. 9 Vol 49 No 3, 2017.)

In **Asia** several new projects are ongoing or planned with the support from USDA-FAS & IR-4 (in Indonesia fluopyram on dragon fruit; in Malaysia +Thailand fluopyram and trifloxystrobin on papaya; in Thailand picarbutrazox on basil; in Vietnam spinetoram and fluopyram on dragon fruit) In addition, studies are planned in Indonesia on carbosulfan in palm oil and in Thailand on pyridaben and difenoconazole on oranges with support from other sources. Singapore and Philippines have also said that they are interested in participating in further studies.

New projects are also contemplated for **Africa**. In East Africa, one new project is related to the EAC harmonisation pilot (see *Impact* section above); this may lead to new regional opportunities that will permit the country teams to consolidate the good practices they have acquired. In West Africa, IR-4 has been exploring the use of biopesticides to reduce residue problems. "We are starting to see how we can work cooperatively so that some data is generated in the US in combination with other countries, and we all benefit from having a new MRL on speciality crops", explained Michael Braverman.

Follow-on activities to sustain results over time should also include: communications strategies to disseminate results and related information, on-call mentoring, support to participate in national and global pesticide residue fora, including priority-setting activities, support to link into SPS- and trade-related donor programmes, etc.

27. To what extent did the multi-stakeholder approach promote greater coherence across agriculture, health and environmental portfolios/communities?

In countries like Colombia where a variety of stakeholders was involved, the project helped to consolidate a more coordinated SPS approach across government. Colombia highlighted the inclusion in the National Development Plan, for the first time, a chapter on sanitary and food safety issues with indicators and goals focused on national benefits. In addition, a national residue sampling plan was developed. Ghana reports that the project improved the communications and cooperation among the Ghana Standards Authority; Food and Drugs Authority; Crop Science Department, University of Ghana; Environment Protection Agency; and the Plant Protection and Regulatory Service Directorate of the Ministry of Food and Agriculture. The ASEAN countries reported that participation in the project had improved communication and cooperation among different organisations (both public and private) within the country and, in some cases, within the region and internationally. For example, Malaysia reported a "stronger working relationship with other government agencies and networking with international counterparts on project collaboration. In addition, the project has enhanced communication between the private sector involved in

the project and also other stakeholders in the project". In countries where stakeholders were mainly involved on a 'need to know' basis (e.g., regulators), coherence opportunities have been scarce.

28. Do the recipients of the projects have the necessary capacity to sustain the results?

In ASEAN and Latin America, the beneficiaries have attained a good foundation. In Africa, the foundations still need work. All parties will need to strengthen their bases by consolidating their knowledge, skills and experience through continued work on similar assignments; transferring skills and good practices; conducting joint research; participating in regional and international events/activities, etc.

All the countries still need to address weaknesses relating to priorities, budgets, equipment, personnel, materials, high-level support, communications, involving the private sector and universities, etc.

3.3 ASEAN

This section provides further information on certain issues related to the ASEAN project, over and above that already presented in the *Introduction* and Section 3.2.

Summary

Although there were some delays in completing it, this was a very successful project, which generated high quality pesticide residue data, enabling JMPR to recommend Codex MRLs for a number of pesticide/fruit combinations. These risk-reduced pesticides have now been registered in the participating countries, which should facilitate market access for ASEAN tropical fruits and improve pesticide application and pesticide residue control. By accelerating the introduction of newer, safer pesticides, it should contribute to reducing risks to field workers, consumers and the environment. The project has increased communication and cooperation on pesticide issues, both within and between countries in the region and globally and between the public and the private sectors. The participating countries are now in a much better position to carry out further studies on pesticide residues and such studies are being planned. The model used in planning and implementing the project was sound and takes into account the differences in infrastructure, facilities and other resources in different countries.

Relevance and design

As shown in the *Introduction* and Section 3.2, the needs were well documented and the rationale was strong. The objective was in line with the ASEAN Economic Community Blueprint (AEC-PP) to increase agricultural production and its competitiveness to enhance ASEAN trade. The project should help to enhance market access for ASEAN tropical fruits. In addition to the risks discussed in the ASEAN Project Grant Application, two others should be mentioned. Firstly, in tropical countries there is a risk that fruit samples will be spoiled during transport from the field to the laboratory carrying out the residue analysis, especially if the samples have to be transported from one country to another and go through border controls. This was a potential risk when samples collected in Malaysia were sent to Singapore for analysis. Secondly, there is a risk (perhaps difficult to imagine!) - that a pesticide manufacturer could submit a data package to JMPR in which the preharvest interval (PHI) on the authorised label was shorter than the PHI in the field studies carried out. This could result in JMPR not recommending an MRL, even though it considered the pesticide residue data to be adequate.

Efficiency of implementation

The planned activities and outputs were all delivered, but with some delays. The project was supposed to end on 30 November 2015. However, following delays in starting some trials, as well as the effect of natural calamities at some sites (there was an eruption of Mount Merapi in Central Java), upon the request by ASEAN, the STDF Working Group approved a no-cost 12-month extension and the project officially ended on 30 November 2016, i.e. one year later than originally planned. This indicates that the assumptions made in the planning phase, and based largely on experience from projects carried out in the U.S.A., were too optimistic. As shown in Section 3.2, **the ASEAN project was executed within budget,** with a total saving of US$ 34 482 of the STDF contribution.

Results and effectiveness of implementation

The **technical capacity building activities** comprised a series of trainings, workshops and consultations on the conduct of field trials, sample preparation and analysis, SOP reviews and identification of core management teams, facility inspections and protocol development. The information contained in Annex 3 in the Final Report of the Project and views we collected from the participating countries show that there was **overall great satisfaction with the content and quality of the training activities**. One participant said "...this is one of the best organized and delivered international projects we have ever participated in." There were many requests for training in additional

areas, further training in the subjects covered by the courses and for training opportunities for more participants. One area where there was evidently a need for either further training or mentoring, or both, was in the preparation of the data packages for submission to JMPR. The fact that the pesticide residue data generated fulfilled the strict JMPR requirements is a clear indication of the success of the training programme.

Concerning **pesticide residue data generation and MRLs**, the project partners agreed initially to focus on the following risk-reduced pesticides – azoxystrobin (Syngenta), pyriproxyfen (Sumitomo), spinetoram (Dow) and chlorantraniliprole (Dupont). Following further discussions, it was decided to remove chlorantraniliprole from the list. (A small error in Annex 1 of the ASEAN Final Report gives "chlorantraniliprole in pineapple" as the pesticide/crop combination studied in the Philippines. It has now been corrected to read "pyriproxyfen on papaya".)

Initially, residue studies were planned for five countries (Indonesia, Malaysia-Singapore, Philippines, Thailand), with five "observer" countries (Brunei Darussalam, Cambodia, Lao PDR, Myanmar, Viet Nam), which would result in the establishment of five new Codex MRLs. However, after successfully completing the training, Brunei Darussalam and Viet Nam were considered qualified to participate in the residue studies (another indication of the effectiveness of the training provided) and they joined the participating countries. In addition, Thailand volunteered to undertake an additional study, bringing the total number of studies to six.

The pesticide residue data produced in the ASEAN project not only met the planned targets, but exceeded them. Residue data for six pesticide/crop combinations were submitted to JMPR, with the results shown in the *Status of the MRL* table in the *Introduction*. JMPR accepted and reviewed the data package on pyriproxyfen on mango submitted from the Malaysia/Singapore study, but no MRL was recommended due to "labelling issues". The data package submitted by Sumitomo included an authorised label giving one day as the Pre-Harvest Interval (PHI), whereas the PHI in the field trials in Malaysia was 14 days. Sumitomo's reasons for this discrepancy are given briefly in Annex 4. According to USDA/IR-4, the problem could possibly be solved if Sumitomo changed the PHI on the label to 14 days, and if JMPR was prepared to consider a resubmitted application. The JMPR Secretariat indicated that JMPR would consider a resubmitted dossier, but it would have to get onto the CCPR priority list again.

In the seven ASEAN countries that completed the residue studies, **registrations of these reduced-risk pesticides were successfully completed.** During 2017-2018, USDA and IR-4 provided follow-up to expand registrations of these project pesticides to other ASEAN Member States.

During the project, many of the participants acquired a lot of new knowledge and experience in areas where they had little previously, for example, low-risk pesticides, GAP, GLP and the process by which Codex MRLs are established and adopted. This has enabled several of them (e.g. Mr. Pisan Pongsapitch from Thailand and Dr. Ngan Chai Keong from Malaysia) to play a very active role in discussions on pesticide residue issues in CCPR and other international fora. The FAO/JMPR Secretariat and others have confirmed that **the participating countries have been much more active in CCPR in recent years and this is in large part due to their participation in the project**. The national Study Teams coordinated the project work with their Codex Contact Points and their lead delegates to CCPR in order to have their project pesticides placed on the CCPR review schedule.

The project gave the governments in the ASEAN Member States an opportunity to collaborate with each other to address their pest control needs and the development of new Codex MRLs. It also provided an opportunity for government agencies within each country to collaborate, communicate, and build relationships which did not exist previously. Finally, this project promoted dialogue between government researchers, the pesticide industry, and grower/exporter stakeholders to identify and prioritize crop protection needs.

The project was initiated by USDA in collaboration with ASEC, which was the lead agency in implementing the project. USDA-FAS played the role of Technical Coordinator, ensuring linkages and synergies with the other two STDF-supported regional MRL projects to coordinate technical aspect of the project. ASEC and the Technical Coordinator reported the progress of the Project to the Expert Working Group on Harmonisation of MRLs of Pesticides among ASEAN Countries (EWG-MRLs), which acted as the Project Steering Committee (PSC). (EWG-MRLs was established in 1996 as a subsidiary body of the Senior Officials Meeting for ASEAN Ministers of Agriculture and Forestry with the objective of facilitating trade in agricultural commodities in the ASEAN region. Its main function is to adopt relevant Codex MRLs as ASEAN harmonised MRLs and to establish harmonised MRLs from residue data generated regionally. It also prioritizes the development of MRLs in the ASEAN region.

Training was organised and delivered by the Study Director and experts from the IR-4 network and the International Atomic Energy Agency (IAEA). The FAO/JMPR Secretariat provided technical advisory support on the implementation of the Project and participated in the PSC.

The answers to our Survey Questionnaire show that there was, **in general, good communication and cooperation between the different stakeholders and** that **the composition of the Project Teams was appropriate**. However, some pesticide manufacturers experienced delays in receiving timely responses from some Project Team members.

Impact

Growers in the participating ASEAN countries can now use these reduced-risk pesticides, which will have new Codex MRLs established in 2018-2019. This should bring benefits in the form of **reduced risks to field workers, consumers and the environment, improved access to export markets and ensured food security**. The project has also **helped JMPR's work** on some new issues, e.g., discussions on the new crop grouping system; combining data sets from several countries in a joint submission; and the level of GLP compliance required to accept data.

Sustainability

The capacity building provided in the project means that the participants are now in a much better position to take part in new projects on pesticide residue data generation and MRL setting and several ASEAN countries are already planning such studies or have expressed an interest in doing so (see Section 3.2.26). Some ASEAN countries already have the necessary resources (e.g., well-equipped laboratories with analysts experienced in modern analytical methods) and can carry out such studies themselves, providing they are convinced of the need for such work and can reach agreement with pesticide manufacturers to commit resources and seek registration. Other countries will be able to undertake further studies only if they can obtain external resources, especially for capacity building and perhaps also to cover some other costs. One way of enabling further countries to participate in future studies is by sharing the work, so that one country carries out the field studies and another analyses the samples, as was done in the ASEAN project, where Malaysia and Singapore and Brunei Darussalam and Malaysia cooperated on studies.

This project has laid the technical foundation and logistical mechanisms for the establishment of the Minor Use Foundation (~~G~~MUF) (see Section 3.2). The MUF is also looking to create partnerships with grower/exporter associations to provide the fields/trees for the research. USDA-FAS and IR-4 have begun discussions with Malaysia, Thailand, and Viet Nam (and Colombia, Costa Rica, and Panama) for a next round of joint residue projects. IR-4, via the MUF, has established either formal Memoranda of Understanding, or informal cooperative agreements, with the involved ministries of these six countries to partner on future joint projects. The MUF will provide coordination, training, and guidance for the joint work, with the pesticide manufactures providing registration support and materials/methods for field and lab studies, and the country teams providing support of their staff, equipment, and facilities to conduct the work. **Discussions are under way on a second round of pesticide residue data generation projects** involving countries in the ASEAN region and other parts of the world. The table below gives some details of new pesticide residue data generation projects in ASEAN countries.

New (ongoing or planned) pesticide residue projects in ASEAN countries

Country	Pesticide/crop	Support
Viet Nam	Spinetoram/dragon fruit Fluopyram/dragon fruit	USDA-FAS, IR-4 USDA-FAS, IR-4
Indonesia	Carbosulfan/palm oil Fluopyram/dragon fruit	Private company USDA-FAS, IR-4
Thailand	Pyridaben, Difenoconazole/orange Picarbutrazox/Basil	Dept of Agriculture USDA-FAS, IR-4
Malaysia + Thailand	Fluopyram+ trifloxystrobin/papaya	IR-4

3.4 Latin America

This section summarises the relevance, efficiency, results/effectiveness, impact and sustainability of the Latin America Pesticide Residue Data Generation Project STDF/PG/436 (1 October 2013-30 September 2015, extended to 30 September 2016). It complements the information already provided, particularly in the *Introduction* and Section 3.2: *Overall Response to Evaluation Questions* (EQs). In an effort to avoid duplication, this section does not repeat the findings and examples provided in 3.2, so it is recommended to read 3.2 first. Where relevant, reference is made to specific EQs.

Summary: This project has achieved most of its objectives. Technical capacity to generate, review and interpret pesticide residue data was improved in five countries. (The project started out with six participants: Bolivia, Colombia, Costa Rica, Guatemala, Panamá and Perú, but Perú dropped out in 2015.) Three studies were completed and data packages were submitted to JMPR via the chemical companies (Dow and Sumitomo). One MRL was approved in 2018, one is expected in 2019, and another is pending possible resubmission of data to JMPR by Sumitomo. Registrations have taken place in all four countries that participated in the studies. (*Please see the Project Summaries and the MRL table in the Introduction chapter.*)

New projects involving USDA-FAS/IR-4 and these and additional countries are underway, with Colombia and Costa Rica taking leadership roles. These projects will help to consolidate knowledge and skills among the STDF project participants and develop the capacity of the new members. Ultimately, this should have a positive impact on regional harmonisation efforts and on the countries' ability to participate in international priority-setting and other SPS fora. Thus, the main objectives have been, or are likely to be, achieved.

Relevance and Design

The project was highly relevant and addressed well-documented SPS-related needs, as explained in the *Introduction* chapter and EQs 1-4. All the countries were experiencing residue-related problems with exports (and imports) of tropical produce and were keen to develop the capacity to generate and analyse the data so that they could monitor pesticide use and food safety better, and ensure that export produce met Codex or other MRL standards. The STDF project offered them an opportunity to develop such capacity.

While the model proved to be well based in general, the design had a number of weaknesses. These are discussed in EQs 5-9. They mainly related to risk assessment, needs and capabilities assessment, communications and relationships (e.g., with higher levels of government and pesticide companies), and the need for clear shared understanding of roles, responsibilities and mutual expectations. The *Recommendations* and *Lessons* chapters address these issues, which tended to be common to all three projects, in many but not all aspects.

Efficiency of Implementation

Overall, given the outcomes and the continuing work, the project was good value for money.

The Latin America three-year programme cost around US$1 million (including the USDA, IDB and STDF inputs in cash and kind). Of the US$374 166 committed by STDF, $355 418 were disbursed in six lots, and $314 603 were spent by 30 September 2016 (end of project). The STDF funding was mainly used for capacity building (training, workshops, some equipment and materials). In February 2017, IICA returned the unspent $40 815 to the STDF. Combined with the undisbursed $18 751 in the project account, the unspent total was US$59 566.

This project, like the others, was divided into four phases:

1. preliminary capacity building (mostly in 2010-2013 before the project started; more occurred in 2014-15)
2. field trials
3. laboratory analyses
4. report-writing/submission to pesticide manufacturer for registration and submission of data to JMPR.

As explained in EQ 14, the project requested a one-year no-cost extension because delays in selecting the final pesticide/crop combinations led to delays in the field trials. The training was delivered largely as programmed. The field trials experienced further delays due to under-budgeting and lack of preparation of teams at certain sites. The laboratory analyses experienced at times long delays due to electricity failures, equipment breakdowns, personnel transfers, quality problems with reagents, etc. And the report-writing phase required additional support that had not been programmed. (*See Challenges below*.)

Nonetheless, the project was completed within the overall budget (partly because Perú dropped out and Bolivia's study did not continue after the trial phase, although Bolivia continued to receive training support). It was also completed more or less on time. All the data packages and labels had been submitted to the chemical companies by the time the Final Report was written in January 2017: Colombia's spinetoram/avocado report to Dow in October 2016, Panamá's pyriproxyfen/pineapple data to Sumitomo in November 2016, and Costa Rica/Guatemala's pyriproxyfen/banana to Sumitomo in January 2017. Dow submitted the data package to JMPR in late 2016, along with the ASEAN sister project's spinetoram/lychee and spinetoram/mango data. JMPR was overbooked in 2017, so the submission was reviewed in 2018, and MRLs approved by September 2018. The pyriproxyfen review was rescheduled to 2018; Sumitomo submitted the banana and pineapple data packages and labels to JMPR in late 2017. (*Please see the MRL table in the Introduction for the current status.)*

Results and Effectiveness of Implementation

Overall, the Latin American projects have attained - or are likely to attain - the key aims and objectives. The boxes below contain the Project's Logical Framework (logframe) and, in bold italics, the achievements against the various aims and indicators.

Latin America Logframe Indicators (from Project Framework)

Capacity building: Aim: Scientists and regulators have acquired knowledge and skills to organise and implement field trials and to collect, prepare and analyse high-quality data for submission to JMPR. ***This has been achieved and is being consolidated through the new projects.***

Indicators:

i. At least 95% of the total invited scientists from participating Latin American countries trained during the project period (2012-2016) ***Neither Progress Reports nor the Final Report addressed this indicator. However, the STDF Secretariat, USDA and the country focal points developed a detailed chart of 44 participants in capacity-building activities from Bolivia, Colombia, Costa Rica, Guatemala, Panamá and Perú in 2013-2016. We were not able to ascertain how many were invited (to determine if 95% attended). Interviews of participants indicated that the (mostly hands-on) training activities were effective and appreciated.***

ii. A number of additional scientists trained in future years (during & beyond the Project period) via the 'train the trainer' model. ***Reports did not mention this indicator, nor did they refer to how many 'train the trainer' events took place since 2012 or how many of these trainers have trained others? Interviews indicated that the activities mentioned under 'i' above served a 'train the trainer' purpose. And a number of those trained have indeed passed on their skills to others. For example, Colombia organised (on its own initiative) a regional Quality Assurance workshop and members of the project team conducted training***.

iii. Five residue studies completed during the project period and submitted to JMPR for review. ***Partially achieved. Three residue studies were completed and submitted to JMPR. See MRL table in Introduction for a full list.***

MRL establishment/registration: **Aim**: The availability on the market of new, approved chemicals for minor use crops. ***Comment: The set of indicators (below) does not mention 'New MLRs for the pesticide/crop combinations submitted'. This was definitely a key goal.***

Indicators:

i. New residue data is generated for low-toxicity chemicals on at least three tropical fruit varieties during the project period. ***Achieved. New data was generated for spinetoram/avocado, pyriproxyfen/pineapple and pyriproxyfen/banana, and submitted to JMPR in 2016-2017.***

ii. New chemicals are registered for use in three countries by the end of the project. ***Achieved. According to the project reports, the pesticide/crop combinations were registered in the four that produced the studies (Colombia, Costa Rica, Guatemala, Panamá).***

Achievement of the Six Main Objectives of the Project

1. Facilitate market access	It is ***too early*** to measure market access gains yet, with just one MRL approved in 2018 and two more pending JMPR action in 2019.
2. Expand lower-risk pesticide options	***Ongoing***. The project contributed science-based data and thus facilitated registration in the four countries that contributed studies. Growers and exporters need to be aware that the new options are available. And the new options should be competitive in price/effectiveness with other chemicals on the market.
3. Improve technical capacity to generate, review and interpret pesticide residue data	***Achieved. This was considered the most important achievement by the project teams.*** Need to focus on sustainability and continuity by involving lab and field teams in new projects, train the trainer activities, mentoring, etc. The USDA/IR-4 new round of projects facilitates this.
4. National pesticide registration	***Achieved.*** Spinetoram/avocado registered in Colombia; pyriproxyfen/pineapple registered in Panamá; pyriproxyfen/banana registered in Costa Rica and Guatemala.
5. Facilitate new Codex MRLs	***Partially achieved.*** One MRL (spinetoram/avocado) was approved in 2018 (Colombia). The pyriproxyfen/pineapple MRL is expected in 2019 (Panamá). The final expected MRL (pyriproxyfen/ banana: Costa Rica/Guatemala) is pending possible resubmission of data to JMPR by Sumitomo (JMPR rejected the data set due to trial-related issues).
6. Develop **replicable model** for joint pesticide residue projects	***Achieved.*** The model is now being improved for the second round of projects.

Major factors influencing the achievement of the project objectives, outcomes and outputs included: a good model with flexibility built in; solid IR-4 training programmes; persistence, patience and commitment of all the

teams (including USDA/IR4) and individual team members; strong team spirit. "Each team member understood his/her role and the importance of that role in achieving the overall objectives", responded several teams to the survey and in interviews.

The main factors driving change were local 'champions', who went beyond the call of duty to promote the project and solve problems. In addition, in some countries growing awareness of the issues in government and private sector circles helped to create more support. This awareness was due to a number of simultaneous factors: the project, better documentation of the problems faced by exporters, relevant issues arising in international fora (eg, SPS Committee, Global Minor Use Summit, WTO Ministerial Conference in Buenos Aires), etc.

Best Team of the Year

In Colombia, the project team's ability to overcome obstacles, maintain solidarity and stay focused on achieving the result won them the 'Best Team' 2016-2017 prize at the Instituto Colombiano Agrícola (ICA). They also won the 'Best Poster' award for the project poster displayed at the 2017 LA Pesticide Residue Workshop in Costa Rica (Annex 5).



Part of the team at a focus session for this evaluation, at the laboratory where the analyses took place. *(Click to enlarge)*

The main target groups - field and laboratory researchers - say the project has changed the way they engage and act, by enhancing their understanding of GAP/GLP requirements and inculcating greater discipline and care in their approach to trials, analyses, documentation and quality assurance. These changes are likely to be consolidated by continuing work on residue matters, including new projects aimed at achieving additional MRLs.

Challenges and risks and how they were managed

- Staff transfers provoked delays in many of the national projects. In Perú, so many of the trained people were transferred that Peru no longer had the capacity to continue with the project. So it was terminated in early 2015 after two trials.
- Bolivia's project was cut short (after the field phase) because its partner in the spinetoram/banana study - Uganda - changed to sulfoxaflor/mango along with the rest of the African participants after Dow was unable to support the spinetoram work there. The search for a new partner was unsuccessful. Bolivia's project had already undergone a revision when it was found that the laboratory did not have the capacity to do the analysis. It was to ship its samples to a laboratory in a neighbouring country (as was the case with Guatemala). In the end, however, this proved too complex.
- In Guatemala, a banana plague caused the six field trials to be reduced to one.
- Breakdowns of laboratory equipment and electrical facilities caused several long delays in analyses. In some cases, project funding was able to help with repairs or replacement of equipment parts, materials, etc.
- In Colombia, when the Study Director (Dr. Edwin Barbosa) was transferred to a new institution, instead of replacing him, the team used the opportunity to include the new institution and keep the same Study Director.

Sustainability and Impact

Utilising the skills and knowledge and passing them on to others is imperative if the projects are to reap the desired longer-term impacts of improved market access and greater use of lower-risk pesticides.

One of the goals of the project was to enhance participants' ability to **engage constructively in international SPS and pesticide residue fora** that address trade-related matters. This appears to be happening: JMPR reports that they are seeing a 'significant' increase in the active CCPR participation of the countries involved in the projects. In priority-setting, they have also been successful in getting a number of tropical crops on the priority list from the Global Minor Use Workshops. This is leading to additional projects that may result in new MRLs.

The project is also leading to **greater regional cooperation**. A good example is a joint collaboration between Colombia and Bolivia. Dr Edwin Barbosa (the Colombia Study Director under the STDF project) is now the Study Director of the joint project, taking on the communications and coordination role with the other partners. Similarly, Colombia took the initiative to host a regional Quality Assurance workshop for QA technicians.

Another goal was to enhance the technical capacity and common approach necessary to underpin **regional harmonisation** of pesticide registrations. The STDF and the new projects are likely to contribute to the achievement of this goal, through eventual *de fact*o, if not *de jure*, harmonisation in both the Andean region and Central America. This would be a very positive outcome indeed. (See the *Introduction* chapter and EQ 22.) The Comunidad Andina (Bolivia, Colombia, Ecuador, Perú) issued in September 2018 (with FAO support) the *Manual Técnico Andino para el Registro y Control de Plaguicidas Químicos de Uso Agrícola*, which gives all four members a common basis for registration and control of pesticides for agricultural use. (www.comunidadandina.org) The STDF project and the continuing USDA/IR-4 activities will help create capacity in the four countries to implement these registration and monitoring guidelines. In addition, Colombia and Costa Rican participants in the STDF project are cooperating with USDA-FAS to create a mechanism and a Latin American regional technical working group to address harmonisation issues. The first set of regional meetings will take place in Argentina in late March 2019.

Putting the skills and knowledge acquired to good use in new projects is a key sustainability tool. USDA-FAS and IR-4 are implementing a new round of projects in Latin America, following up on priorities that were identified at the Global Minor Use Workshops in 2016 and 2018. The new residue studies involve Bolivia, Colombia, Costa Rica, Ecuador, Panamá and Perú and focus on the following pesticide/crop combinations:

1. Spinetoram on banana, papaya and pineapple to control fruit fly and some lepidopterous insects.
2. Trifloxystrobin+ Fluopyram on papaya to control Anthracnose.
3. Oxathiapiprolin on cacao bean (coco) to control pod rot.

Second-Round Projects in Latin America: Status as of end-February 2019

Spinetoram/ Banana: 4 field trials (2 Colombia, 2 Ecuador); Colombia to analyse all samples. Colombia will start field trials in Sept. 2019. Ecuador's trials will start after personnel changes are sorted out.

1. Spinetoram/ Pineapple: 10 field trials (4 Colombia, 4 Panamá, 2 Bolivia); Colombia to analyse its and Bolivia's samples. Panamá will analyse its samples. Panama expected to start trials in June 2019, and Columbia in September/October. Bolivia to confirm dates for trials later in 2019. Trials to continue in 2020.
3. Spinetoram/ Papaya: 4 field trials in Panamá and Costa Rica. Each to analyse its own samples. (Costa Rica is on a different grant.)
4. Trifloxystrobin+ Fluopyram on Papaya: 1 field trial in Perú, 1 in Costa Rica, which will analyse all samples. Costa Rica made final application and collected samples in late February 2019. Peru will make applications in early March. Analysis of the samples will follow shortly.
5. Oxathiapiprolin on cacao bean: 8 field trials in Colombia, which will analyse all samples. Study to start in coming months.

Source: IR-4

3.5 Africa

This section summarises the relevance, efficiency, results/effectiveness, impact and sustainability of the Africa Pesticide Residue Data Generation Project STDF/PG/359 (1 May 2013-30 April 2016, extended to 30 April 2017). It complements the information already provided, particularly in the *Introduction* and Section 3.2: *Overall Response to Evaluation Questions* (EQs). In an effort to avoid duplication, this section does not repeat findings and examples provided in 3.2, so it is recommended to read 3.2 first. Where relevant, reference is made to specific EQs.

Summary: The STDF project started in May 2013, involving five countries spanning eastern and western Africa: Ghana, Kenya, Senegal, Tanzania and Uganda, and one pesticide/crop combination (spinetoram/mango). The STDF project officially finished in April 2017. However, due to a series of unexpected problems (*see Africa Project box below*), the project did not complete its activities within the STDF project timeframe of 2013-2017.

All sources interviewed agree that the STDF project improved technical capacity to generate, review and interpret pesticide residue data in all five countries. Registrations have occurred or are underway in three countries: Uganda, Tanzania and Kenya. Three sets of data (possibly four) are close to delivering the study and data package for submission to JMPR via the chemical company (Dow). If all goes well, JMPR would consider the data and approve an MRL in 2020. (*Please see the Project Summaries and the MRL Table in the Introduction chapter.*)

New projects involving USDA-FAS/IR-4 and some of these and other countries are under consideration (*Impact/Sustainability below*). These projects will help to consolidate knowledge and skills among the STDF project participants and develop the capacity of the new members. Ultimately, this should have a positive impact on regional harmonisation efforts and on the countries' ability to participate in international priority-setting and other SPS fora.

Relevance and Design

The project was highly relevant and addressed well-documented SPS-related needs, as explained in the *Introduction* chapter and EQs 1-4. All the countries were experiencing residue-related problems with exports (and imports) of tropical produce and were keen to develop the capacity to generate and analyse the data so that they could monitor pesticide use and food safety better, and ensure that export produce met Codex or other MRL standards. The STDF project offered them an opportunity to develop such capacity.

While the model was good in general, the design had a number of weaknesses which are discussed in EQs 5-9. In this case, they mainly related to risk assessment, needs and capabilities assessment, communications and relationships (e.g., with pesticide companies and AU-IBAR), and the need for clear understanding of mutual expectations.

Due to these and other weaknesses, implementation proved to be a major challenge. Unexpected setbacks throughout the project meant that it did not achieve all the objectives in the timeframe allocated. Many lessons were learned, especially about the importance of thorough pre-project assessments, strategic planning, risk assessment and risk management.

There were related lessons to be learned about assumptions as well. For example, the project document stated, "It is anticipated that only small equipment purchases will be made to support the project. Project partners are expected to use existing national resources to implement the project." Other assumptions were that funding would be transferred by AU-IBAR to beneficiaries as needed (as set out in the project document); that national laboratory equipment sufficed and would generally work as expected; that budgets would cover 'troubleshooting'; that reliable refrigerated transport would be available, etc.

Sustainability was lightly touched upon in the project document, mainly referring to dissemination of results and lessons learned at the end of the project. It remains to be seen how and when this will be implemented. Future project documents should consider sustainability more thoroughly, with an eye on long-term continuity.

Efficiency of Implementation

The US$1m project in Africa (at April 2017) was plagued with challenges. Of the total US$446 150 committed by STDF, $423 721 were received by AU-IBAR (the administrator) in four disbursements from January 2014 to February 2017. Of this, $391 073 was spent, leaving an unspent balance of $32 648, which AU-IBAR returned to the STDF in February 2018. This plus the undisbursed $22 429 added up to an unspent total of $55 077. In terms of efficiency, timeliness and cost-effectiveness, the project did not meet expectations. USDA/IR-4 have probably spent a lot more than their expected cash and in-kind contribution of just over US$600 000.

The early training activities and field trials were carried out largely as projected. From then on, problems and delays cascaded, to the extent that the project was almost abandoned.

The Africa Project: An Example of Persistence and Commitment

"I don't think the original plan was wrong in Africa", relates Jason Sandahl of USDA-FAS. "For the original chemicals (azoxystrobin and difenoconazol - Sygenta), all the labs had some capability of doing the work. But, when we had to switch chemicals (to sulfoxaflor - Dow), only the Kenya and Ghana labs were capable of doing the analyses, with some support. The problem was that we ran out of time since: 1) Syngenta lost market interest for these products and we needed to find a new company to join the project; and 2) AU-IBAR was not able to transfer the funds to the countries to do the work due to unexpected bidding requirements. After six months of searching for a solution, AU-IBAR was able to transfer the money (US$261 000) to IR-4/Rutgers University to manage the transfers. That took another 5-6 months, because IR-4 had to transfer it to another regional entity, African Agricultural Technology Foundation (AATF), for disbursement."

"The crop seasons were winding down (or we would have had to wait another year for the next opportunity), and the STDF grant and the agreement with AU/IR4 was ending. We only had a couple of months left and that was not enough time to get the labs up to the level that they could actually run the samples. Even after we conducted some training…they weren't quite ready, and we didn't have more trainers available at that time either."

"So, we decided that the only option was to send the samples to a lab that could do the analysis asap. This lab in the UK (CEMAS) is used by Dow for other work, and Dow offered to pay half the cost of the analysis. So, it made sense. In the end, IR-4 reduced their own service fees to cover the shortfall, since the countries couldn't pay all the (very dear) shipping costs."

"But, the Tanzanian samples didn't finish the journey frozen. And the freezers in Kenya and Ghana broke just days before the shipment dates and their samples were lost. Only Uganda's and Senegal's samples arrived in good shape, although Uganda's

label was unclear. With all that, we were discouraged and ready to call it quits."

"But, the countries rallied. All said they would use their own resources to redo their trials (USDA found some USAID funds to help Senegal and Ghana in the end). USDA also found funds to send an IR-4 chemist, Wayne Jiang, to work with the labs in Kenya and Ghana to prepare them for the analyses. Kenya and Ghana competed their analyses, and we are still trying to get Senegal samples to Ghana (the first shipment thawed during air transport delays), or wait a bit longer and help them borrow a university instrument in Senegal to do the analyses. In the meantime, the Senegal/Uganda results from the UK laboratory are being reviewed by IR-4's Joe de Francesco and Wayne Jiang in the US, along with the Ghana and Kenya data – and they indicate that the data are good enough to use."

"Corteva (Dow) has listed the JMPR review for 2020, so we have until November 2019 to get all the data packages ready to submit. The final combined study (mango/sulfoxaflor) will include data from Ghana (2 trials), Kenya (2 trials), Uganda (1 trial) and Senegal (1 trial) – for a total of 6 total trials from the African countries. We are now in discussions with them for a possible follow-up programme."

State of play at end-February 2019: sulfoxaflor/mango project (Source: IR-4 team working on the data package**)**

- Received Kenya's final analytical data: Feb. 2019.
- Still awaiting field data notebooks and QA reports from Kenya.
- Received Ghana's analytical data; formatting the data, QA statement and report.
- Still awaiting QA reports from Ghana field trials.
- Senegal and Uganda 2016/2017 trials data received from UK CEMAS lab in Sept. 2018; now under review.
- Have field data notebooks from Uganda and Senegal.

Results and Effectiveness of Implementation

Overall, the African project is likely to attain most of the key objectives, albeit rather later than originally planned. Following are the Project's Logical Framework and, in bold italics, the achievements against the expected results and indicators.

Results to Date as per Africa Logframe Indicators (from Project Framework)

Expected results:

1. Training of skilled scientists and regulators in the process of study design, field trial implementation, sample collection, preparation and analysis to produce high-quality residue data to be considered by the JMPR for chemical evaluation and MRL establishment. ***Partially achieved. The training is completed and mentoring (QA) continues.*** *The training and mentoring provided by USDA/IR-4 enabled laboratories in two of the countries (Kenya and Ghana) to eventually conduct the analysis of the samples (after the STDF project had formally closed).* ***New projects in some of the countries will help to consolidate skills.***
2. Project chemical is registered for use in three countries. ***Likely to be achieved***. ***It has reportedly been registered in Uganda and Tanzania, and Kenya is in the process***.
3. Important residue data is generated for low-toxicity chemicals on three (possibly four) tropical fruit varieties. ***Not achieved***. ***Residue data was generated for one variety: mango.***

Indicators:

i. An estimated 20 scientists from participating AU member states will be trained at six technical capacity building workshops. ***Achieved. More than 20 scientists were trained during the life of the project (including 2018).***

ii. At least one set of residue data generated and submitted to the JMPR to support at least one Codex MRL. ***Pending. Data set expected to be submitted to JMPR in late 2019 for MRL consideration in 2020.***

Achievement of the Six Main Objectives of the Project

7. **Facilitate market access**	It is too early to measure market access gains since no MRL has been approved yet.
8. **Expand lower-risk pesticide options**	The project contributed science-based data that will facilitate registration in all countries participating in the studies. Once registered, growers and exporters need to be made aware that new options are available. And these new options should be competitive in price/effectiveness with other chemicals on the market.
9. **Improve technical capacity to generate, review and interpret pesticide residue data**	*Achieved. But further improvements needed*, with a focus on sustainability and continuity (involve lab and field teams in new projects, train-the-trainer activities, mentoring, etc). A second round of USDA/IR-4 projects would facilitate this.
10. National pesticide registration	*Registration is underway, pending confirmation in three countries: Tanzania and Uganda said they were awaiting labels; Kenya is completing the data submission.*
11. **Facilitate new Codex MRL**s	*Not yet achieved*, but possible in 2020.
12. Develop **replicable model** for joint pesticide residue projects	The model is now being refined for the second round of projects. The basic learning-by-doing approach remains at the core.

Major factors in achieving the objectives, outcomes and outputs

According to the stakeholders, the following were important contributors to achievements:

- Commitment, persistence and patience of USDA/IR-4 teams and the national teams in the face of constant challenges
- A good model with enough flexibility and knowhow to deal with challenges and adversities
- Solid IR-4 hands-on training programmes provided by high-quality trainers
- Regional team spirit among the five countries (and among EAC members Kenya, Tanzania and Uganda in the harmonisation work)
- Financial assistance from Dow at a critical point (for CEMAS laboratory to analyse Uganda and Senegal samples in the UK)
- EU funding for KEPHIS lab to buy a new LC-MS/MS machine, allowing Kenya to analyse its retrial samples.

KEPHIS Lab Head with new LC-MS/MS machine

KEPHIS STDF Project Team with freezer & new monitor

Major Factors in Delays

• Multiple changes in crop/pesticide combination • Inability of laboratories to analyse the selected product once the field trials were completed • Challenges in raising money to send samples to a UK laboratory • Misunderstandings on terms of transferring payments from AU-IBAR to partner institutions	• Freezer breakdowns due to electrical outages and equipment problems • Reagent problems • Personnel transfers or absences • Need to repeat the trials and analyses • Need to add efficiency trials to the project in order to register and get the labels necessary for the JMPR submission.

Impact and Sustainability

Utilising the skills and knowledge acquired and passing them on to others are imperative if the projects are to reap the desired longer-term impacts of improved market access and greater use of lower-risk pesticides. This often requires adopting new approaches and changing longstanding ways of doing things.

Respondents to surveys and interviews said the GLP training and supervised hands-on practice was leading to a **more disciplined approach to field and laboratory work.** "The field training enhanced our capacity in designing and implementing field trial protocols. Laboratory training helped in method development and validation to ensure the results generated are accurate and reliable. GLP training has influenced the way we conduct document and record keeping. We are in the process of adopting the standard reference material and instrumentation procedures."

One of the overall goals of the project was to enhance participants' ability to **engage constructively in international SPS and pesticide residue fora**. As mentioned earlier in the report, a JMPR representative familiar with the project noted a 'significant' increase in project members' active participation in CCPR meetings. Other sources also mentioned a "stronger African voice at CCPR, WTO-SPS and other fora, with "elevated confidence and technical knowledge of issues raised and contributions to discussions and decisions".

Another goal was to enhance the technical capacity and common approach necessary to underpin **regional harmonisation** of pesticide registrations. The STDF project played a role in fast-tracking the development of common **East African Community** (EAC) protocols for procedures for residue data generation, regional efficacy trials, and registration data requirements (especially residue data requirements and standards establishment). This should give chemical companies an incentive to register more new lower-risk products in the EAC region, and may serve as a model for other regions, as well. *(See the box below, as well as* the *Introduction* chapter and EQ 22.*)*

An important impact, mentioned by several people interviewed in the region, was the **improvement in the countries' ability to address emergency pest outbreaks**, such as Fall Army Worm. "With the experience of the STDF project, country teams are now contributing to developing solutions to exotic pest outbreaks - bridging residue studies/MRLs with identifying new pesticides, collaborating with pesticide companies, and considering efficacy needs and residue needs while finding solutions."

EAC Harmonisation of Pesticide Registration Requirements: Added Value of the STDF Project

Frustration with efficacy requirements for each country individually was a key motivation to work towards the mutual recognition of efficacy data in the East Africa region, where these are a prerequisite for registration. The very beginning of this effort stemmed from a meeting between the Africans and the chemical companies hosted by USDA-FAS on the margins of the 2016 global priority setting conference - after Sygenta had pulled out of the STDF-funded project. The country representatives asked what was the problem and what they could do to get the chemical firms to register new products in Africa. The response was "You need to harmonise data packages, get mutual recognition of efficacy data, and deal with confidentiality issues".

The EAC Working Group on Agrochemicals had been interested in regional harmonisation for some time. "The STDF project gave us a basis for a common work programme on registration," said Lucy Namu, the Kenya Study Director. (Three EAC members were in the STDF project: Kenya, Tanzania and Uganda). With the support of Jason Sandahl, FAO and others, in 2016-2018, the WG was able to develop common protocols for procedures for residue data generation, regional efficacy trials, and registration data requirements. Jason related, "*Mike Odong from Uganda, a key person in the STDF project and EAC harmonisation effort, was to join me at the WTO-SPS Committee meeting in October 2016 to present on the success of the EAC work. Sadly, Mike passed away en route to Geneva."*

Participants said that the experience and confidence gained in the STDF project (eg, on how to conduct GLP supervised residue trials and make Codex submissions) helped them in particular to develop the residue data generation procedures. In late January 2019, the EAC Council of Ministers signed the protocols. The Working Group is still addressing confidentiality.

"We are now working with EAC to put these documents into practice through a pilot project," said Jason Sandahl. "Five chemical companies are volunteering to move their products through this new mechanism. The EAC technical group will meet 18-21March 2019 in Arusha to put in place guidance documents and roadmaps to get efficacy trials underway. We are going to link this to the Fall Army Worm efforts, as we can then leverage additional funding resources, and this puts some urgency behind moving the project forward quickly."

New projects: Consolidating skills and knowledge through new projects is very important for sustainability. USDA-FAS/IR-4 are in the planning stages for a number of new projects involving some of the countries that participated in the STDF programme. In **East Africa**, one new project is related to the EAC harmonisation pilot mentioned above. This may lead to new regional opportunities that will permit the country teams to strengthen the good practices they have acquired. In **West Africa**, IR-4 has been exploring the use of biopesticides to reduce residue problems. "We are starting to see how we can work cooperatively so that some data is generated in the US in combination with other countries, and we all benefit from having a new MRL on speciality crops," explained Michael Braverman of IR-4. Work should start in the next few months on residue mitigation studies to reduce export problems with dimethoate and chlorpyrifos in eggplant and okra in Ghana, and with lamda cyhalothrin and deltamethrin in mango in Senegal.

4. Conclusions

1. Altogether, the three projects have **successfully generated quality pesticide residue data** contributing to the establishment of five new Codex MRLs (four from ASEAN and one from Latin America). JMPR evaluations have been completed for a further two, and MRLs are expected in 2019 (one ASEAN and one LA). Another two (also one ASEAN and one LA) did not pass JMPR evaluation. It remains to be seen if the chemical company, Sumitomo, is prepared to revise and resubmit the two dossiers to JMPR. (Rec. 14) Regarding the African study, IR-4 is working on the data package and awaiting the remaining documentation from the participants. The chemical company (Dow) must submit the dossier to JMPR by November 2019 if it is to be evaluated as scheduled in 2020.

2. **Technical capacity has improved visibly.** All respondents to surveys and interviews said they needed further support to consolidate the knowledge and skills acquired and to strengthen their capacity to apply them and pass them on to others. (Recs. 5, 9, 10, 11, 12)

3. To date, all of the ASEAN countries that participated in the trials have **registered the reduced-risk pesticide** for the crop they tested, as have Colombia, Panamá, Costa Rica and Guatemala in Latin America, and Uganda and Tanzania in Africa. Kenya is in the process.

4. Participants in the STDF projects have demonstrated a 'significant improvement' in their ability to **engage constructively in international SPS and pesticide residue fora**, and to **contribute to regional harmonisation efforts**.

5. The **model used** in the three projects **was sound**, but needs to be adapted to the infrastructure, conditions and resources available in the participating countries. The composition of the national Study Teams used in the projects appeared to work well and should be replicated as far as possible. (Rec. 1)

6. The projects proved that **cooperation and collaboration was possible** among a broad range of national stakeholders, including registrants, research institutes, labs, other government agencies, and in some cases universities, producers, exporters, their associations, and extension services. Some who were not initially involved (e.g., in the last five groups) became important partners for sustainability in some projects. In future, their possible role should be given consideration early in the planning phase. A key message from surveys and interviews was that the **private sector in particular should be involved much more proactively**. (Recs. 1, 4)

7. **High-level commitment** from governments, key ministries and chemical companies was a challenge highlighted in all three projects. A number of interviews indicated that a stronger form of agreement should be sought, with mutual expectations, roles, responsibilities and communication matters spelled out and signed off by all parties. (Rec. 2)

8. Managing **multi-stakeholder endeavours** requires very good communications, coordination, relationship-building and expectation management. All three projects had weaknesses in each of these areas. As a result, in some cases, the multi-stakeholder approach contributed to results and in others it led to delays. **Efficiency and effectiveness** may well have been higher (i.e., many delays avoided) if roles, responsibilities and mutual expectations had been agreed and spelled out clearly in the project and contractual documents. This applies for all parties - administrators, implementers, pesticide companies, national testing facilities, etc. (Rec. 2)

9. There is a need for **better communication** among the pesticide manufacturers, the JMPR Secretariat and the Technical Director of the projects to ensure that information about JMPR data requirements for MRL establishment is up to date and that the results of JMPR's evaluations are explained, so that any deficiencies can be rectified. (Rec. 3, 14)

10. Some of the more successful projects were those where a broader set of national stakeholders was involved and where awareness and better common understanding of MRL-related issues reached different government agencies and private sector organisations. This has the benefit of delivering more **coherent and cohesive action** on food safety, environmental and trade-related issues. Projects where a narrower set of stakeholders was involved on a 'need to know' basis led to little improvement in coherence nationally. (Rec. 4)

11. Both the design and implementation stages required more thorough and ongoing needs and capabilities assessments, risk assessments, contingency planning, communications mechanisms, and strategies to manage relationships and expectations. (Recs. 5, 8)

12. **Sustainability** aspects need to be better incorporated into the project at the planning stage and updated regularly in order to ensure post-project continuity and consolidation of results. (Rec. 5)

13. **Identifying and prioritising project pesticide/crop combinations** to study is extremely difficult, as there are many interests at play and it is important that representatives of all relevant stakeholders be involved. (Rec. 6)

14. Serious problems may arise if **crop samples** have to be transported long distances from the field study sites to the analytical laboratories, or if they have to be stored in deep freezers for a long period of time. Risk mitigation in such cases may have budget implications. (Rec. 6)

15. **Project team composition** was a key factor in achieving the objectives and carrying on after the projects had finished. Successful projects had teams in which each person understood his/her role and importance in achieving the specific and overall objectives. Indeed, a number of champions have emerged from the STDF

national project teams, and they are proving to be instrumental in taking forward pesticide residue issues in their regions. (Rec. 7)

16. The **capacity building phase of the projects was very successful.** Participants particularly appreciated the 'learning-by-doing' approach and the strong support of the IR-4 technical teams from start to finish. All highlighted the need for continued training opportunities and on-the-job learning in order to consolidate the knowledge and skills they acquired in the STDF project, especially those related to producing data for submission to JMPR. (Recs. 9, 10, 11, 13)

17. Project teams also suggested that an **end-of-project review**, with a facilitator, would be a good sustainability tool, since it would give them the chance to discuss achievements, challenges and lessons learned that could be applied both generally in ongoing work and specifically in new projects. (Rec. 12)

18. A very large number of tropical fruits exists, and it is unrealistic to think that pesticide residue data will ever be generated to enable JMPR to propose Codex MRLs for all of them. Hence the importance of the ongoing discussions in JMPR and CCPR on the **extrapolation of Codex MRLs** adopted for a few key representative crops to other crops within the same Codex subgroup of tropical fruits. (Rec. 16)

19. Being able to comply with Codex MRLs is, unfortunately, not always enough to gain access to some markets, since stricter MRLs are applied by some countries and/or commercial food business operators (e.g. Global Gap), and these are more difficult and expensive to comply with. (Rec. 20)

20. Following national registration, growers in many of the participating countries can now use the reduced-risk pesticides studied in the projects. This should bring benefits in the form of **reduced risks to field workers, consumers and the environment, improved access to export markets, and better food security**.

5. Recommendations

The Final Reports of the three projects contain a number of specific and broader recommendations, including those on areas that would benefit from additional support and capacity building in the future; these recommendations should be taken into account when planning capacity-building activities in future projects of this kind.

For project designers, managers and partners:

The Model

1. Future projects on generation of pesticide residue data should be based on the model piloted in the three projects evaluated, taking into account the lessons learned and adapting the model to the infrastructure, conditions and resources of the participating countries. The composition of the national Study Teams used in the projects appeared to work well and should be replicated as possible (i.e., National Focal Point/Testing Facility Manager, Study Director, Quality Assurance, Field Research Director and Laboratory Research Director). The Focal Point should be a senior person with sufficient authority to make the necessary decisions and at the same time be able to devote adequate time to the project. Dedicated staff and equipment should be encouraged where possible.

Relationships and communications

2. The letters of agreement with the agencies and pesticide companies concerned should clearly spell out the mutual expectations, roles, responsibilities and communication matters, and be signed off by both parties. High-level commitment should be sought from governments to provide the necessary policy, personnel and budgetary support. Similar high-level support should be obtained from the chemical companies. In all cases, such commitment should be communicated and followed up vertically so that all relevant levels and offices in government and in the companies are aware of the project and their specific roles in it.

3. Technical coordinators of pesticide residue data generation projects and **the pesticide manufacturers** involved should maintain regular and close contact with the JMPR Secretariat in order **to remain current on JMPR's requirements** regarding the nature, quality, quantity and presentation of the data to be submitted for setting Codex standards. Early feedback from the JMPR reviewer, enabling the applicant to provide additional information, clarifications, etc, would help to avoid unnecessary delays in the evaluation. JMPR should establish a better mechanism to inform the applicant, the project coordinator and the relevant country(ies) on the outcomes of its evaluations.

4. At the country level, the project should identify key national decision-makers and stakeholders, determine the role they are to play in the project (who, when, how), and develop strategies to get and keep them onboard at critical points before, during and after the project. They include, for example:
   - 'Lead agency'
   - Ministry of Agriculture and related services (e.g., research entities, extension services, etc)
   - Laboratories
   - Growers, Exporters, Importers and their Associations
   - Companies (food businesses, importers and exporters)
   - Ministry of Commerce and export promotion agency
   - Universities and research institutes

Planning

5. Future projects would benefit from more thorough planning, including rigorous needs assessments, risk assessments, contingency planning, and regular review of assumptions. 'Sustainability' should be built into the design from the beginning, determining how best to consolidate learning and results both during and after the project. The timeframe should be calculated to include contingency plans and follow-up action. (Many development assistance programmes use a x+1- or x+2-year model, with a mid-term review to assess progress and suggest improvements in approach.) Annex 7 gives some key questions to pose before starting a project.

6. The initial planning discussions, including the choice of pesticide/crop combinations to be studied, the site(s) for the field studies and the laboratories to carry out the analyses, should include representatives of the growers and exporters, pesticide companies, relevant government authorities, laboratories, pesticide registration entities, agricultural extension services, research institutes and universities as appropriate. If field studies are to be carried out far from the analytical laboratories, logistics and transport of samples to laboratories should be incorporated in the planning and budgeting.

7. In choosing the broad research teams, the roles and responsibilities of each team member should be carefully and clearly defined (see Annex 6 for a model reflecting experience in these projects). The STDF projects have shown that it is useful to seek the input and participation of (Agriculture) ministry crop research sections, as well as extension services and university crop researchers. At this stage it is also important to identify back-ups for each key person, and determine how to involve them in the project so as to permit seamless continuity in case someone leaves.

8. During the pre-implementation needs and capacity assessment phase, and during risk assessment, all issues related to facilities, equipment and materials should be identified and resolved. Project planning should incorporate sufficient contingency plans, backup equipment, and funds to deal with 'small' breakdowns and repairs. For laboratory equipment supplied by donors, good practice indicates that the purchase terms should include after-sales contracts covering yearly training and maintenance/repair for five years following delivery (in the interest of sustainability).

For project designers, managers, trainers, partner country institutions:

Capacity development and perpetuating knowledge and skills

9. Capacity building should continue to follow the 'on-the-job' and 'train-the-trainer' principles, with the aim of eventually having a core group of people in each country who have fully acquired the necessary expertise and can pass it on to new staff. The training should enable candidates who already have good basic knowledge of field work or advanced analytical methods (e.g., LC-MS/MS) to improve it in specific areas so that they can carry out field studies and laboratory analyses according to GAP and GLP. Participation in training courses (and study teams) should be contingent on sufficient technical knowledge and language skills to be able to fully benefit from the experience. Since staff turnover is common in most organisations, it is important that the people trained pass on their knowledge to colleagues. Trainers can facilitate this by providing course materials, etc., on USB memory sticks. In addition, including in **training activities** case studies on the issues that caused delays can also help to focus attention on common problem areas.

10. USDA-FAS and IR-4 are encouraged to develop mentoring programmes, as both a capacity-building and sustainability tool. These could include 'on-call' mentoring (e.g., by Skype or WhatsApp) during critical stages of the project and in the post-project period where researchers are putting to use the skills and knowledge they have acquired.

11. To consolidate knowledge, skills and capacity, the 'second round' of MRL projects should address areas in which laboratories still need to improve in order to generate high-quality data. Reports and interviews highlighted ongoing needs relating to SOPs, methods development, performing QA audits, log-filling and report writing. This will also help to ensure sufficient laboratory preparation before training visits and may underpin stronger commitment from those involved to meet deadlines and achieve goals.

12. Upon completion of each project, follow-up meetings should be held at both the national and regional level, involving all participants and other interested parties, to communicate the results obtained, discuss lessons learned and develop recommendations to improve the planning and implementation of future projects.

For international organisations and developing countries:

13. In order to disseminate information and advice from successful pesticide residue data generation projects and related issues, STDF, WTO, FAO, Codex and other international and regional organisations should continue to invite relevant people to make presentations at events they organise. The EAC, for example, might share its experience in regional harmonisation of registration, etc, with the other AU Regional Economic Communities.

14. In order to enable JMPR to establish Codex MRLs for pyriproxyfen on mango and banana, and thus meet a key objective of two projects in which a large investment has been made, **Valent/Sumitomo** should revise and /or complete their dossiers so that they fulfil JMPR requirements, and resubmit them to JMPR. (JMPR has confirmed to the evaluation team and the parties that this is the correct way to proceed.)

15. In order to expedite the development and adoption of Codex standards on pesticide residues, FAO and WHO should consider increasing the resources available to JMPR to enable it to eliminate the backlog of dossiers awaiting evaluation. In addition, if there is a considerable backlog, consideration could be given to prioritising dossiers from developing countries where the potential impact on trade would be high.

16. The countries that participated in the three projects should continue to play an active role in the work of CCPR and encourage other tropical fruit-producing countries to do so as well. In collaboration with other countries, they should endeavour to expedite JMPR and CCPR work on extrapolating Codex MRLs from key representative crops to other crops in the same Codex crop subgroup.

17. In order to expedite the standard-setting work of Codex, STDF should consider further support to developing countries wishing to carry out pesticide residue data generation projects by inviting them to seek Project Preparation Grants.

18. USDA/IR4 and partner country institutions should approach donors involved in SPS and trade issues to see how these projects and others in national SPS/MRL plans could fit into ongoing or planned capacity-building programmes. The relevant government donor coordination focal point should be involved.

19. FAO, WHO and WTO should make stronger efforts to encourage their Members to incorporate Codex MRLs for pesticide residues into their national legislation, to facilitate international trade.

20. Exporting countries whose tropical produce is denied access to markets due to the application of MRLs that are stricter than Codex MRLs should raise the issue at the SPS Committee and other international fora and request justification for the stricter limits.

6. Lessons Learned

This chapter shares the key lessons learned and practical suggestions that are applicable to wider use and future programme development. (We are aware that the 'practical suggestions' are akin to recommendations.)

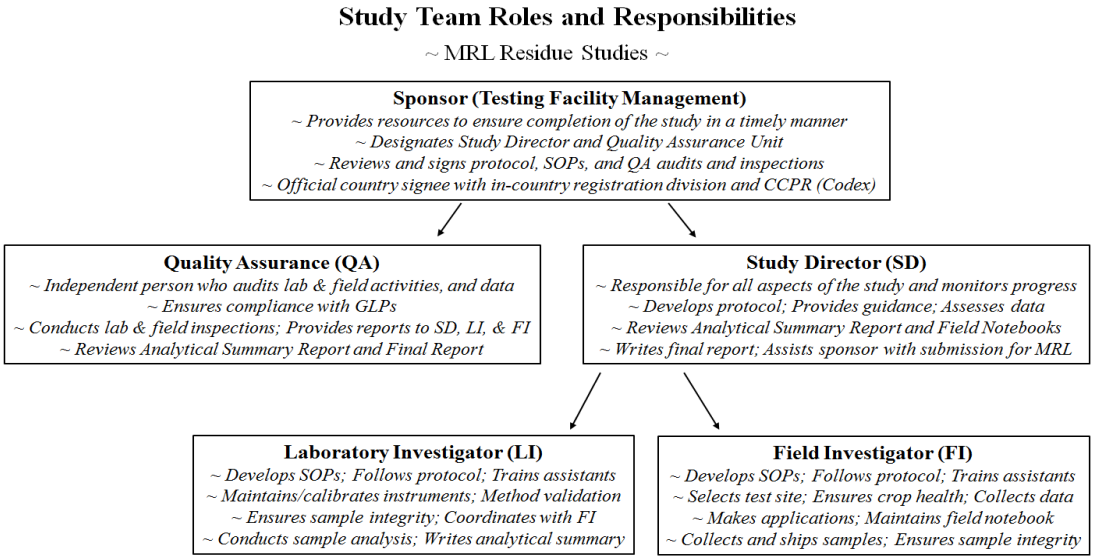
Identifying and prioritising project pesticide/crop combinations to study is extremely difficult, as there are many interests at play. Firstly, there must be a real pest control problem to be tackled in the country. Secondly, there are the commercial interests of the pesticide industry to be considered and, thirdly, it is meaningless to generate residue data for Codex MRLs if there is no opportunity for the pesticide to be placed upon the JMPR review schedule. Thus, there is a need to balance these three key considerations in discussions with relevant stakeholders involved. The lesson learned in this project was that **the process can be quite slow and future**

projects should allow more options, allocate more time for achieving consensus, and include more fallback options in case primary options fail.

The most important **lesson learned about the budget** was the high cost of travel to conduct the research. Most study sites were far from the researchers, and in some cases required air travel and lodging for field investigators. Future projects need to include larger budgets for site travel. In addition, it is critical to identify several alternative field study sites in case problems develop at the initially planned site.

Project team composition is a key to success. One lesson learned was not to rely too much on government officials; they tend to rotate too often, despite undertakings to not transfer staff during the project. Another lesson was that roles and responsibilities must be clearly defined and even more clearly understood - particularly in terms of how each role and person contributes to the overall results.

Based on the STDF project experience, the IR-4 technical team and Dr. Jason Sandahl prepared a set of Study Team roles and responsibilities (see Annex 6); the main points are in the chart below prepared by Dr. Kunkel.



An important lesson is that Study Teams **should be adapted to the conditions and resources in each country** – one size does not fit all! It is important to select members from organisations with the ability to dedicate time, replace members if needed, and coordinate with other institutions involved in the work. Each Study Team should have a strong in-country Study Director or contact person who can communicate with all other members of the team, IR-4, and other stakeholders. (Our Survey responses indicated that most **participating countries considered the composition of their Study Teams to be adequate.)**

Another lesson learned is that to ensure seamless continuity, **back-up or replacement equipment and materials** should be identified in the early stage and **back-up personnel** should be appointed from the beginning of the project to 'shadow' the key team members (e.g., Study Director, etc) and stand in for them in case of need. They should participate in training and other activities to the extent possible. The 'lead' back-up person should participate fully, in order to be able to step in and take responsibility for the outcome should the need arise. A 'vertical approach' to reach all the technical staff should be implemented.

Universities and research institutes proved to be useful partners in the few projects where they were involved (Asia). Interviews in other regions indicated strong support for involving academia more in future. "Experienced university researchers can 'second' or replace lab/field staff where these do not exist or are not capable of conducting the studies," commented Jason Sandahl. "In Round 2, we are including universities in Peru, Ecuador, Senegal, and Ghana - maybe more as we get underway."

Involvement of **agricultural extension services** could support sustainability, as they could carry on helping growers after the end of the project (in terms of pesticides, sprayers, calibration, protection, etc). This did not happen very often in the STDF projects (mainly in ASEAN). In interviews, a number of people noted that extension services, *per se*, either did not exist in their country or were a local phenomenon and therefore not

centrally accessible. They concurred that involving extension services would be a good idea, and if government extension people weren't available, then perhaps the fruit and vegetable associations could take on that role, though obviously budgeting would be an issue.

Another lesson contributed by several participants is that **personnel must fully understand the procedures** to follow, so that the data generated is not wasted, trial crops are not picked without permission, etc. It is important to include such contingencies in the risk mitigation plan.

The technical trainers and pesticide company representatives provided the following suggestions based on lessons they learned during the projects:

- More **focused attention to the choice of personnel** conducting the studies. Each researcher must have **current experience for the role they will fill**. Field researchers should have expertise in conducting crop research. Quality assurance officers should have quality control experience in crop production or laboratory analysis.
- **Dedicated personnel or at least dedicated time** to ensure the completion of the research, data collection and report writing
- **Dedicated critical equipment,** or a**t least better control over the use and maintenance of shared critical equipment**, especially s**prayers and analytical equipment.**
- **Good maintenance contracts for essential laboratory equipment,** and/or a plan for **back-up equipment.**
- **Storing and shipping samples**: Install an alarm system to alert if freezer or electricity fail. Have a back-up gas generator for the freezer in the event of an electricity failure. Have a plan to move samples from a failed freezer to a functioning freezer. Use a reliable shipping company that is willing to replenish dry ice in route, if needed.
- Use **Skype or other videoconferencing to provide additional training.** Towards the end of the project the technical team started using Skype to provide training for the analytical summary report and final report writing. This worked well, as long as the participants had access to good internet connections.
- **Incentives** to ministries/study teams to ensure the timely completion of each phase of the study.

Regarding the last issue: **incentives and motivation** to complete tasks in a timely fashion, several team members responded: "Obtain a firm commitment from higher levels that the necessary budget will be made available and that the professionals and technicians will stay in their jobs/roles during the whole project unless they are not performing." In other words, provide a **stable environment** in which to carry out the studies.

Regarding **private sector involvement and sustainability**, surveys and interviews suggested the following:

- Involve the relevant agriculture and export trade and industry associations, and explore how they can contribute to project outcomes by taking responsibility for communicating to their members information on the progress, the results, the lessons learned and the opportunities.
- Involve the Ministry of Commerce, export promotion agencies and other relevant agencies, and encourage them to work with the associations to help farmers and food exporters take advantage of the new opportunities arising from the new MRLs and the lower-risk pesticides that have been trialled and registered.

Blank page

Annex 1: People Consulted

STDF
Ms Marlynne Hopper
Ms Nora Dei-Anang

USDA-Foreign Agricultural Service
Dr. Jason Sandahl (Project Technical Coordinator)

IR-4/Rutgers University
Dr. Michael Braverman (Project Study Director)
Joe De Francesco, IR-4 expert, Oregon State University, Integrated Plant Protection Centre

FAO/JMPR Secretariat
Ms Yong Zhen Yang (Technical Advisory Support)

US EPA
Ms Debra Edwards (Regulatory Consultant, former ex-Director, EPA Office of Pesticide Programmes)
Mr Luis Sugiyama, retired Manager of the EPA Office of Pesticide Programmes

CEMAS (Analytical laboratory in the UK)
Dr Neal Rawe
Dr Lisa Jutsum

CHEMICAL COMPANIES
DOW CHEMICAL COMPANY
Ms Carmen Tiu, Global MRL & IT Leader, CORTEVA Agriscience, Agriculture Division of DowDuPont

SYNGENTA AG
Ms Heidi Irrig, North American MRL and Senior Regulatory Manager

SUMITOMO/VALENT
Ms Mary Jean Medina, Registration &Regulatory Affairs Manager, AgroSolutions, Sumitomo Chemical Asia
Mr Yoshihiro Nishimoto

CROPLIFE INTERNATIONAL (an agrochemical company trade association based in Brussels**)**
Dr Vasant Patil, Director – Science & Regulatory Affairs, CropLife Asia
Javier Fernández, Director, Legal and Regulatory Affairs, CropLife Latin America
Ms Stella Simiya Wafukho, Director, Regulatory Affairs & Stakeholder Relations, CropLife Africa-Middle East

ASEAN PROJECT

ASEAN SECRETARIAT
Ms Sri Dyah Kusumawardhani, STDF Project Administrator

BRUNEI DARUSSALAM
Mr Noor Azri bin Haji Mohamad Noor (Field Research Director)

INDONESIA
Prof. Dr. Sri Noegrohati (Study Director)

MALAYSIA
Mr. Mohammad Nazrul Fahmi bin Abdul Rahim (National Focal Point), Mr. Ngan Chai Keong (Study Director, EWG-MRLs Chairperson), Ms Nurhayati binti Kamyon (Malaysian Secretariat for MRL setting), Ms Nor Hasimah Haron (Laboratory Service Division, Department of Agriculture). Mr Noorsham Ramly , International DivisionFederal Agricultural Marketing Authority (FAMA).

PHILIPPINES
Dr. Amelia Tejada (Laboratory Research Director)

SINGAPORE
Dr. Wu Yuan Sheng (National Focal Point), Ms Helen Phang (Laboratory Research Director), Dr. Foo Chin Lui, Mr Joachim Chua (Field Research Director), Ms Luk Seow Cheng (Quality Assurance)

THAILAND
Dr. Prachathipat Pongpinyo (Laboratory Research Director)

VIET NAM
Mr Giang Vuong Truong (National Focal Point and Study Director)
Mr Tran Thanh Tung (Field Trial Director)

CAMBODIA
Mr Kang Sareth (National Focal Point and Field Research Director)

LATIN AMERICA

LATIN AMERICA IR-4 TECHNICAL TEAM
Ms Edith Lurvey, Technical Coordinator (IR-4 Project, Cornell University)
Dra. Amy Wang, Field Trial trainer (Universidad de Costa Rica)
Dra. Milena Ramírez, GLP trainer (Universidad de las Américas, México)

BOLIVIA
David Ramos, Study Director under STDF Project (Responsable, Vigilancia y Programas Inocuidad Alimentaria, Servicio Nacional de Sanidad Agropecuaria e Inocuidad Alimentaria, SENASAG-CBBA
Alejandro Mattos, Jefe Nacional De Inocuidad Alimentaria -SENASAG

COSTA RICA
Magda González, Executive Director (Servicio Fitosanitario del Estado, Ministerio de Agricultura y Ganadería)

PANAMA
Federico Abrego, Sponsor/Coordinator of STDF Project (Dirección Nacional de Sanidad Vegetal, MIDA)
Eric Candanedo, Study Director (Instituto de Investigación Agropecuaria e Panamá)
José Luis Causadías, Field Director (Instituto de Investigación Agropecuaria e Panamá)

COLOMBIA (Field Visit)
Project Team (all involved in new USDA/IR-4 MRL project; Colombia will play a leading regional role):
Dra. Adriana Castañeda (Coordinator of the STDF Project; now a lead consultant of the new regional project)
Dr. Edwin Barbosa (Project Study Director), Agrosavia
Dr. René Castro, Project Quality Control Coordinator ; Head of the Laboratory, ICA

Asohofrucol (fruit producers association)
Ms Niny Arango

Instituto Colombiano Agrícola (ICA) Team (current)**:**
Dra. Anamaría García, Subgerencia de Análisis y Diagnóstica, ICA
Oscar Dix, Subgerencia de Análisis y Diagnóstica, ICA
Javier Soriano, Manager of STDF Project Field Trials, ICA

Laboratory Analysis Team:
Dr. René Castro, Project Quality Control Coordinator ; Head of the Laboratory, ICA
Marta Patricia Vela, Senior Laboratory Analyst
David Esquivel, Laboratory Analyst (ex National University researcher)
Carlos Ocampo and Sandra x , Laboratory analysts

Government:
Giovanni Sambrano, Ministry of Commerce
Natalia Acosta, National Planning Department (Secretaría Técnica de la Comisión Intersectorial de Medidas Sanitarias y Fitosanitarias)
Juan Fernando Cifuentes, National Planning Department (Secretaría Técnica de la Comisión Intersectorial de Medidas Sanitarias y Fitosanitarias)

INSTITUTO INTERAMERICANO DE COOPERACION PARA LA AGRICULTURA (IICA)
Costa Rica HQ
Robert Ahern, PhD, main contact person for the STDF Project (Líder, Sanidad Agropecuaria e Inocuidad y Calidad de Alimentos)
Pilar Agudelo (administered STDF funding, with Lourdes Fonalleras) (Especialistas en Gestión de Sanidad e Inocuidad)
Bogotá IICA office:
Humberto Oliveira, Director
Andrea Carolina Borda, Assistant to Director
Administrative Manager, IICA

AFRICA

AFRICAN UNION - INTERAFRICAN BUREAU FOR ANIMAL RESOURCES
Prof. Ahmed El-Sawalhy, Director-General
John Oppong-Otoo, head of the Standards and Trade Secretariat. Officer responsible for the Project after replacing Raphael Coly of Senegal in the late stages.
Charles Lodiaga, Accounts Officer

EAST AFRICAN COMMUNITY (EAC)
David K. Wafula (harmonisation of pesticide registration processes)

KENYA
Kenya Plant Health Inspection Service (KEPHIS)
Lucy Namu, STDF Project Study Director; Chief Analytical Chemist, KEPHIS
Onesmus Mwaniki, Head Analytical Chemistry lab & Food Safety
Peter Mwangangi/Kamuti, Deputy. Lab Analyst.
Robert Koigi, Field Manager and Chief Analytical Chemist during Project. Deputy for Lucy in Project.
Dr. Esther Kimani, Director-General of KEPHIS

Kenya Private Sector:
Japheth Mbandi, Technical Manager, Keitt Fruit and Vegetable Export Company, a large fruit export company

GHANA
Paul Osei-Fosu, STDF Study Team Director, Head, Pesticide Residue Laboratory, Ghana Standards Board
John Ofosu Anim, Field Expert, University of Ghana
John A. Pwamang, Acting Executive Director, Environmental Protection Agency

SENEGAL
Amadou Diouf, STDF Project Facility Management; Director of the Anti-Poison Centre, Ministry of Health
Nar Diene, STDF Project Study Director; Coordinator, Local Codex Technical Committee

Raphael Coly, Administrator of STDF Project at AU-IBAR for much of the time

TANZANIA
Dr Bakari Salim Kiondo Kaoneka, STDF Study Team Director, Principle Research Scientist, Tropical Pesticides Research Institute, Ministry of Agriculture

UGANDA
Geoffrey Onen, STDF Study Team Director, Principal Government Analyst, Government Analytical Laboratory

Annex 2: Evaluation Matrix

(*Please note*: The ToR questions have been edited to reflect the fact that the evaluation will cover three projects. Priority questions are in bold.

Evaluation Questions	Evidence/Indicators	Sources and Methods
Relevance (from ToR)		
1. **Were the projects the right answer to the SPS-related needs of the beneficiaries?** 2. What was the value added of these projects, compared to other support programmes? 3. Were local contexts, ownership, processes and stakeholders adequately taken into account in the design and implementation of the project? 4. **Was sustainability (including follow-up activities, scaling up and dissemination of results) adequately considered at the project design phase and throughout the project?**	• Needs assessments (change in needs over time) • Coverage of other donor programmes • Gaps filled by the STDF projects • Multi-stakeholder approach: links to other projects/programmes of governments, donors, international organisations, academia; cooperation and collaboration across government agencies in and among countries/regions, and with the private sector • Synergies between STDF and other donor projects/programmes • Value added of the STDF contribution • Donors' willingness to fund STDF activities/Trust Fund • Synergies with STDF's Medium-Term Strategy 2015-2019 • Synergies with MDGs and SDGs • Stakeholders'/beneficiaries' ability to drive change	• Donors' and partners' country and regional strategies and country programmes • International priorities (e.g. MDGs, SDGs) • Analytical reports on SPS and related issues • Needs assessments and other baseline information: original and revised facts, figures, statistics and other evidence • STDF Project documentation (**henceforth this term means *all project documentation***, including STDF Medium-Term Strategy, project applications, results frameworks, plans, reports, correspondence, outputs, M&E, feedback from training, case studies, etc) • Interviews with STDF Secretariat, project partner and implementing organisations • Interviews with other relevant donors, international organisations, regional organisations, technical experts • Interviews with beneficiaries (government, private sector, civil society, etc, as required)
Quality of the Programme Design and Logical Framework *(additional questions, etc, to guide analysis)*		
Additional questions on design, logframe, indicators 5. Has the implementation design proved to be realistic in terms of delivering the desired results, meeting expectations and managing risks? 6. Has it been flexible enough to be refined to meet evolving needs and requirements? **7. To what extent have the assumptions, risks, strategies, baselines, indicators and results frameworks proved appropriate in terms of monitoring and achieving the desired results?** 8. To what extent did the outcome indicators reflect the stated objectives? Were they realistic? 9. Are the indicators and claims valid measures? 10. Did the design pay due attention to the ultimate impacts on gender equality and environmental sustainability?	• Baselines established to underpin the results frameworks • Expectations: original and evolving • Risks: original and evolving • Extent to which the design targeted the right people and tailored the services/outputs appropriately • Extent to which the programme design (e.g., concept, assumptions and strategies) addressed the identified and evolving needs, expectations and situations (e.g., flexibility to respond to evolving requirements) • Suitability/measurability of results indicators and verification sources • Extent to which 'crosscutting issues' such as gender equality and environmental sustainability are reflected in the design, desired results and implementation plans	
Sample questions on Theory of Change: 11. Have the underlying assumptions proved relevant and accurate throughout implementation to date? 12. To what extent have the expected changes in mindset and behaviour occurred among the main target groups? 13. How have these changes contributed to the achievement of the objectives?	• Assumptions and underlying reasoning, evidence • Extent to and direction in which mindset and behaviour have changed so far • Extent to which the Beneficiaries and Implementers have proved to be effective change agents	

Efficiency of Implementation (from ToR)		
14. **Were the activities and outputs delivered according to the project document (i.e. on time and within the budget)?** 15. Was the project a cost-effective contribution to addressing the needs of the beneficiary?	• Timeliness of funding disbursements • How funding was used • Extent to which activities, outputs, services were delivered on time, as per Plan • Extent to which activities, outputs, services were delivered within budget, as per Plan • Efficiencies gained from coordination with and among donors/ partners (eg, IR-4/Rutgers/Cornell; Global Minor Use Foundation) • Transparency	• Evaluations • Programme documentation, including annual budgets, plans and narrative and financial reports, any audits • Interviews with Secretariat, partner organisations, beneficiaries, external experts
Results and Effectiveness of Implementation (from ToR)		
16. **To what extent were the projects' objectives achieved - or are likely to be achieved - based on the indicators for expected outputs and outcomes identified in the logframes?** 17. **What were the major factors influencing the achievement or non-achievement of the project objectives, outcomes and outputs? What factors were most effective in driving change?** 18. **To what extent did the multi-stakeholder/central coordinator approach contribute to results and effectiveness?*** 19. **What changes and risks, if any, occurred during project implementation, and how was the project able to adapt to these changes and manage risks**? 20. To what extent were horizontal (crosscutting) issues (particularly related to gender and environment) adequately addressed in the project?	• Changes in the capacity of SPS institutions, the SPS situation, market access, needs and other relevant indicators over the baselines at the beginning of the projects • Extent to which the overall objective has been achieved • Results achieved vs 'desired results' • Outputs/services delivered vs annual action plans • Quality of outputs and services • Effectiveness of multi-stakeholder approach in delivering results • Follow-up and responsiveness to evolving customer needs • Customer satisfaction with outputs, services, implementation • Extent to which outputs led to desired results and outcomes • Effectiveness of risk management strategies and actions vs actual risks encountered • Effectiveness as viewed by other stakeholders • Effectiveness of resource mobilisation • Timeliness and ease of comprehension of reporting • Transparency and accountability of the implementers	• STDF programme documentation • Targeted interviews with stakeholders and STDF, including M&E officers • Analyses of stakeholders' information/ documentation/data (e.g. partner organisations' reports, analyses, evaluations) • Feedback (surveys, post-training evaluation forms, interviews, etc) • WTO SPS documents, any relevant TPRs • UN and other relevant analyses
Impact (from ToR)		
21. To what extent did the projects contribute to higher-level objectives of the STDF programme such as a measurable impact on market access; improved domestic and - where applicable - regional SPS situations, and/or poverty reduction, and to relevant SDGs? 22. **What real difference (expected and/or unexpected) have the projects made or are likely to make on the final beneficiaries (*producers and traders*)?** 23. What was the role of the projects, if any, in raising awareness on SPS challenges and/or mobilising	• Changes in the capacity of SPS institutions, the SPS situation, market access, needs and other relevant indicators over the 2012 baseline • Unexpected or unforeseen changes, positive or negative • Evolution of key stakeholders' SPS and related AfT priorities since 2012	• Interviews • Programme documents • Other evaluation reports and baseline data • Relevant reports and analyses • Key stakeholders' SPS and AfT policies and priorities, country and regional programmes • Evolving needs assessments

additional resources for SPS capacity?		
Sustainability (from ToR)		
24. **To what extent did the benefits of the projects continue after the end of STDF funding?** 25. **To what extent did the multi-stakeholder approach promote greater coherence across agriculture, health and environmental portfolios/communities?** 26. **Did the recipients of the project have the necessary capacity to sustain the results?** 27. **What follow-up activities, if any, have been planned and/or required to sustain these results over time?** 28. **What were the major factors that influenced sustainability of the projects?**	• Extent of beneficiaries' commitment, ownership, willingness and ability to maintain and build on the outputs and outcomes of the Programme • Effects of coordination and cooperation across government agencies in different countries/regions, and with the private sector • Extent to which the activities were calibrated and sequenced to beneficiaries' ability to absorb, 'own' and sustain the outputs • Impact of challenges experienced during the programme period • Extent to which gains can be attributed to the programme (if sufficient information is available)	• Evaluations • Programme documentation • Feedback from stakeholders (interviews, surveys, post-training evaluation forms, etc) • Needs assessments
Lessons Learned and Next Steps (from ToR)		
29. **What lessons can be learned from the projects regarding the process of project design and implementation?** 30. What lessons can be learned that may be of importance to the broader donor community and which should be disseminated more widely? 31. What actions have been taken by the beneficiary, STDF partners or others to disseminate, learn and follow-up on the outcomes of the project? 32. How could STDF increase the sharing of good practices on SPS capacity-building coming out of this project? *Additional question for Next Steps*: 33. **What practical improvements or changes in approach (eg, organisation, strategy, delivery, etc) should be considered in future project design and planning?**	• Sustainability issues above • Human, financial, institutional capacity and mandates • Needs • Priorities	• Interviews with partners, donors, other stakeholders • Other relevant evaluation reports and analyses • STDF Strategy and other programme documentation • WTO SPS Committee and other relevant organisations'

Annex 3: Global Minor Use Fund (Foundation)

Global Minor Use Fund
Joint Residue Work for Specialty Crop MRLs

IR-4 Project, Rutgers, the State University of New Jersey;
United States Department of Agriculture, Foreign Agriculture Service

The Specialty (Minor) Crop Problem

- Specialty crops are high-valued, internationally traded commodities, but new pesticide products (often more targeted and lower-risk) are not widely available to farmers.
- Pesticide manufacturers often do not have economic incentive to generate residue/efficacy data necessary for registrations or MRLs.
- Some governments have created "minor use" programs to generate this data in order to obtain new products for their farmers – this mechanism is very important when needing to quickly address emergency pest/disease outbreaks.
- Generating data is expensive – no country can work on this alone.
- If data from one country is used to establish international MRLs (Codex), the MRLs may not be relevant to grower needs/use patterns in another country.

Partnerships are Essential

- Generating data in several countries, at the same time, together, helps farmers gain new products quickly.
- Joint work saves money, as costs are shared between several countries.
- A wider distribution of data ensures that Codex MRLs are more relevant to all farmers across the world.
- If coordinated with IR-4 projects, joint work will ensure that U.S. MRLs are also established.
- Provides regulators with more robust data.

Vision

- A network of partners across the world will work together to generate residue data necessary for local registrations and establishing MRLs (Codex, U.S., other national).
- Annually, partners and stakeholders will discuss farmer priorities for new pest control products and MRLs needs, while sharing new or potential pest threats that need to be addressed quickly.
- Partners will then develop plans to distribute and share work assignments; location of trials, number of trials, timing of trials, resources available.
- Data generated under cooperative work will be publically available and used both for national registration and international standard (MRL) setting needs.

Mechanism

- For each collaborative study, partners will each need to conduct and analyse between 1-6 trials, depending on the crop and number of partners involved.
- The Global Minor Use Fund (GMUF), via IR-4 and other supporting institutions, will provide coordination to identify and prioritize work among partners.
- GMUF will offer technical assistance to partners on training and guidance for conducting supervised residue trials (both field and laboratory).
- As a work-sharing effort, GMUF, IR-4, research partners, pesticide registrants, grower/exporter associations, and other stakeholders will need to develop a funding plan which will need to be tailored for each study, according to each countries' unique situation for each project.
- Sources of funding for each project will generally include the following:

➢ Project Coordination (GMUF)
➢ Field Access/Crop Purchase (Grower/Exporter Association)
➢ Labor Field Applications(Partner's own staff)
➢ Labor Laboratory Analysis (Partner's own staff)
➢ Labor Quality Assurance(Partner's own staff)
➢ Equipment/Supplies (Partner, GMUF, others, as needed)
➢ Registration Fees/Support (Pesticide Registrant)
➢ Efficacy Requirements (Pesticide Registrant or Partner staff)

Process

1. Form National Study Team

- GMUF can assist partners is forming national study teams to conduct residue work. The teams will be comprised of:
  - ➢ Facility Management (overall responsibility of study)
  - ➢ National Study Director (technical coordinator of study)
  - ➢ Field Investigator (leads field work)
  - ➢ Laboratory Investigator (leads analytical work)
  - ➢ Quality Assurance (ensures study follows protocol)

2. Identify Projects

- GMUF can assist partners in identifying joint projects, either at local meetings or at global coordination workshops.

GMUF Global Priorities Workshop

Study Team with Support Staff

3. Training and Guidance for Conducting Residue Work

- GMUF can provide training and guidance to partner teams on how to conduct studies to generate residue data, of high quality, to establish Codex MRLs.

Setting up Trial Plots

Calibrating Equipment

Application Practice

4. Conducting Actual Field Trials and Analysis

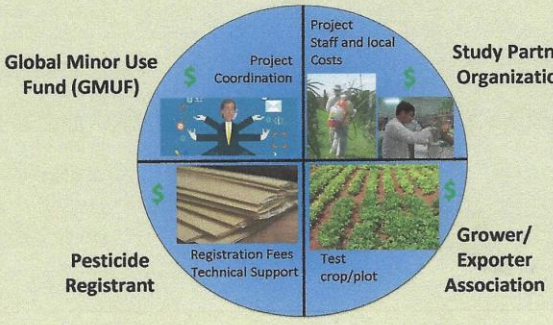
- GMUF can assist the partner teams in conducting actual studies, to ensure that protocols are understood and methods are followed.
- GMUF will then assist in preparing the data package for Codex submission.

Applying Study Pesticide

Analyzing Samples

Data Package Preparation

Example of Cost-Sharing ($) / Resources



Annex 4: Sumitomo's explanation

Information from Sumitomo Chemical Co., Ltd. on the Malaysian study on pyriproxyfen on mango
(supplied in an e-mail to Stuart Slorach from Ms. Mary Jean Medina on behalf of Sumitomo Chemical on 14 February 2019, 02.03)

"*There were 6 residue trials at harvest (14 days PHI) and 1 decline study (PHI=0, 3, 7, 14 and 21 days) on mango in Malaysia. The results in the* ***residue studies at harvest*** *showed residue levels of <0.02 mg/kg (below the limit of quantification of 0.02 mg/kg). The results in the* ***decline study*** *also showed residue levels of <0.02 mg/kg at all sampling dates. All data on mango for all studies showed levels < 0.02 mg/kg. In this particular case, a PHI of either 0 or greater than 0 day does not make any difference, so a PHI of either 0, 1, 3, 14, etc. days should have been considered acceptable to support a proposed MRL.*

In the case of papaya, there were 7 residue trials submitted (Philippines-3 trials, Malaysia-3 trials and Brunei-1 trial). The Philippine label with a PHI of 1 day was used to support the use pattern in papaya. The results showed levels of greater or lower than the LOQs.

During the preparation of the JMPR submission, preliminary consultation with JMPR indicated that a MRL on mango with a PHI of 1 day could be supported extrapolating data from papaya, too as both fruits can be considered medium-sized tropical fruit.

However, in the final JMPR report, JMPR indicated that it considered data on mango insufficient to estimate an MRL. It seems that JMPR considered the Malaysian trials to be only one supervised field trial supporting mango while it considered supervised field trials conducted in Brunei, Malaysia and the Philippines to be distinct trials supporting papaya with an MRL of 0.3 mg/kg and an STMR of 0.07 mg/kg.

Sumitomo Chemical did not resubmit the dossier.

At the moment, Sumitomo Chemical has no plan to make a resubmission, which we consider difficult as this is not a regular JMPR procedure."

Annex 5: Latin America 'Best Poster' Displayed at LAPRW, Costa Rica, 2017

ANALYTICAL METHODOLOGY FOR THE ESTABLISHMENT OF MAXIMUM RESIDUE LIMITS (MRLs) FOR SPINETORAM IN AVOCADO (*PERSEA AMERICANA*)

Nancy Velandia[1], Hugo Rodríguez[1], Jacqueline Guevara[1], Adriana Castañeda[1], Rene Castro[1], Javier Soriano[1] Edwin Barbosa[2]
[1]Instituto Colombiano Agropecuario ICA; [2]Corporación Colombiana de Investigación Agropecuaria CORPOICA
Email: nancy.velandia@ica.gov.co

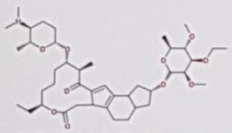
Avocado (*Persea americana*) is an exotic fruit of economic importance on the global market and has become a major part of the diet in many countries. In Colombia, Avocado fruit is an alternative for the small growers because of its export potential. Currently, Spinetoram, one of the insecticides registered in Colombia for *Thrips* spp. control in avocado, does not have maximum residue limit (MRL) in this commodity and is making it difficult to gain access to the international market because of safety regulations. Colombia developed technical studies to determine maximum residue limits (MRLs) for Spinetoram in avocado through a STDF supported project and with assistance from the USDA and IR-4 minor use project.

FIELD SAMPLES

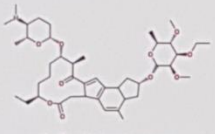
Untreated samples of three diferent varieties of avocado (Hass, Reed and Papelillo), with known production histories were provided from six farms in the three main avocado production regions of Colombia: Antioquia, Risaralda and Cauca. The farms were certified in Good Agricultural Practices (GAP) and field trials were developed under OECD-GLP standards.

ANALYTICAL PROCEDURE

Spinetoram is a broad-spectrum insecticide used to control crop-damaging insects; is a mixture of chemically modified spinosyns J and L. The chemical structures are shown below.



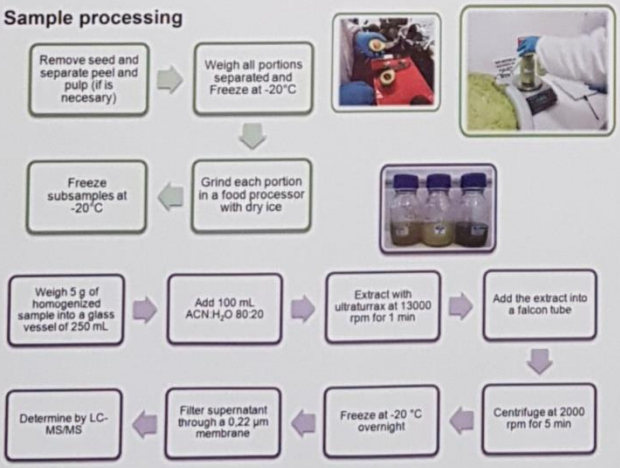
3'-O-ethyl-5,6-dihydro spinosyn J
SPINETORAM J



3'-O-ethyl spinosyn L
SPINETORAM L

Major considerations for the analytical method performance include accuracy, precision, sensitivity and selectivity. The residue definition includes Spinetoram (Spinetoram-J and Spinetoram-L) and also its metabolites (N-Demethyl-Spinetoram-J and N-Formyl-Spinetoram-J). The methodology was validated for the four compounds in peel, pulp and whole fruit of avocado

Sample processing



INSTRUMENTAL CONDITIONS

For LC-MS/MS analysis, the UPLC system was an Acquity UPLC® (Waters®, Milford, USA) with the MassLynx software. The column was an ACQUITY C_{18} (1.7 µm, 2.1 × 100 mm) maintained at 25 °C. The mobile phase consisted of a combination of phase A (ACN/MeOH (1:1) with amonium acetate 2 mM) and phase B (Amonium acetate 2 mM). The conditions of chromatography were as follows: phase A was initiated at 66% increased linearly to 100% at 2.2 min, hold until 3.5 min and then back to 66% at 4 min until the end of the run (5 min), flow rate of 0.35 ml/min. The MS/MS analysis conditions are shown below in the table 1.

Table 1. MRM. transitions and retention times of analytes

Analyte	Retention time (min)	Precursor ion(m/z)	Quantitation ion (m/z)	Confirmation ion (m/z)	CV (V)	CE (eV)
Spinetoram J	3.30	748.5	142.11	98.04	46	32
Spinetoram L	3.34	760.53	142.11	98.04	44	28
N-Demethyl Spinetoram J	2.66	734.53	128.01	84.06	34	24
N-Formyl Spinetoram J	2.91	762.4	156.15	203.08	26	20
Spinetoram J IS	3.25	757.55	146.08	102.00	42	32
Spinetoram L IS	3.40	769.55	146.14	102.07	44	32
N-Demethyl Spinetoram J IS	2.64	739.49	128.07	84.06	40	32

RESULTS

For the recoveries, untreated samples were fortified whit a fixed volume of a mixture of Spinetoram and its metabolites at 0.003, 0.01, 0.20 and 2.0 mg/kg. The quantitation was done using matrix matched calibration curves and deuterated standards due to the presence of matrix effects.

Figure 1 shows the calibration curves obtained for pulp, peel and whole fruit. The difference between the sensitivity in the three matrices can be noted, given the presence of more coextracted fat substances in the pulp and the greater amount of pigments coextracted from the peel.

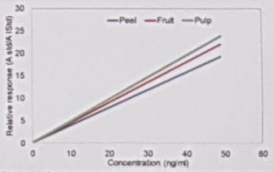


Figure 1. Calibration curves for Spinetoram J in Pulp,Peel and Whole fruit.

Table 2. Average recoveries and CV

Compound	Matrix	% Rec	CV
Spinetoram J	Fruit	107	6
	Peel	101	13
	Pulp	110	5
Spinetoram L	Fruit	108	9
	Peel	102	12
	Pulp	109	7
N-Demethyl Spinetoram J	Fruit	111	4
	Peel	103	10
	Pulp	103	11
N-Formyl Spinetoram J	Fruit	106	10
	Peel	101	19
	Pulp	109	7

Table 2 shows the average recoveries for Spinetoram and its metabolites in the three different matrices. The experiment was developed at 0.003, 0.01, 0.20 and 2.0 mg/kg. All the recoveries were in the range 70-120% and CV below 20%. Quantitation and detection limits (LOQ and LOD) were calculated for Spinetoram and its metabolites using the SD from the 0.01 mg/kg recovery experiments in pulp, whole fruit and peel.

The calculated LOQ were below to 0.01 mg/kg for all compounds and matrices. A representative chromatogram for the MRM of the quantitation transition for matrix matched calibration standard at 0.01mg/kg is shown in the figure 2.

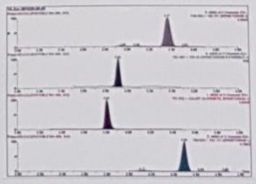


Figure 2. MRM quantitation transition for Spinetoram and its metabolites. Peel 0,01 mg/kg

CONCLUSION

The results from this study show this methodology can be adopted for the analysis of samples to establish maximum residue limit (MRL) for Spinetoram in avocado.

ACKNOWLEDGMENTS

The authors want to express their thanks to the Instituto Colombiano Agropecuario head directors: Rosana Brochado, Carlos Maldonado, Roberto Galindo and Julián Ayala, also to the Corporación Colombiana de Investigación Agropecuaria and as well to Dow AgroSciences, IR-4 Project, USDA, Edith Lurvey, Milena Ramírez, Amy Wang and Luz Marina Arango for the support in the development of the study.

REFERENCES

Hastings, M. Dow AgroSciences Methods GRM 05.03 and GRM 015.04. 2005. Unpublished report of Dow AgroSciences LLC

Annex 6: Study Team Roles

Description of GLP-Required Personnel and Their Responsibilities

(IR-4 Technical Team, 2017)

A large commitment of personnel, time and materials is necessary in order to successfully complete a Good Laboratory Practices (GLP) study. Much of GLP is about having full documentation and being able to recreate a study on paper, making it legally defendable. Many regulatory agencies around the world require data to be generated using GLPs.

A GLP residue study generally takes three to four years from writing the protocol, conducting the field trials and laboratory analysis, and writing and submitting the final report. Additional time is needed for other preliminary steps such as writing and/or reviewing Standard Operating Procedures (SOP), finding field trial sites, and acquiring all the equipment and materials needed for the entire project.

There must be a strong commitment to the project from the government. It is important that the decision makers within the institution/organisation understand what is involved and are committed to the doing what is necessary to generate GLP residue data in support of establishment of Maximum Residue Levels (MRLs). These key decision makers must have the authority to assign the personnel, facilities, and provide support for the duration of the project. Ideally, this commitment will be to the long-term goal of developing a specialised team dedicated to doing GLP residue work. Dedicated personnel are essential, as learning to complete residue studies under GLP is a sharp learning curve, generally at least two years of constant practice. Adequate infrastructure and support are also essential as there must be adequate space to conduct the work in compliance with US EPA GLP or OECD Guidelines. Inadequate personnel, resources or time reduce the quality of the work and may result in the loss of a study.

It is essential to have a **technical committee** to oversee the project, liaise with members within the organisation, consult on technical matters, help acquire equipment/materials, and ensure that the resources, including personnel, are adequate to do the work.

Personnel are perhaps the most important part of conducting GLP studies. They must be adequately trained in GLP, be committed to the project, understand the why's and how's of the protocol, GLPs, etc., and have the time necessary to fulfill their responsibilities. Personnel assigned to conduct these studies should receive a reduction in their normal duties.

GLP studies require five unique and specific positions. They are presented below with their specific responsibilities and rough estimates of the time needed to do them.

1. **Sponsor (Tesing Facility Management):**
   a. One person who represents the organisation at a level where he/she can assume responsibility for ensuring that the study is completed in an adequate and timely manner. Specific responsibilities include:
      i. Provide resources to ensure proper personnel are trained and able to conduct the research and perform their duties.
         1. Designate a study director for the study, and be able to replace the study director promptly if it becomes necessary.
         2. Designate a quality assurance unit (QA), and be able to replace the quality assurance personnel promptly if it becomes necessary.
      ii. Read and sign the Standard Operating Procedures (SOPs) for the other members of the team.
      iii. Read and sign the protocol.
      iv. Review and sign Quality Assurance (QA) inspection and data audit reports.
   b. Direct involvement in the project helps the functioning of the field and laboratory.
   c. Time commitments will vary depending the activities and their participation in the project. The obligations will be high during the initiation of a GPL residue program, as the research team must be identified, SOPs and protocols developed , reviewed and signed, etc. During the conduct of a study the Sponsor needs to be available to answer questions, resolve problems, and review and sign QA documents and the final report.

2. **Study Director**:
   a. The Study Director is the individual responsible for the overall conduct of a study.
   b. This one person serves as the single main point of contact for the study. That means he/she is the *ONLY PERSON* who can make decisions about the study and make changes to the protocol.
      i. The SD is a scientist or other professional of appropriate education, training, and experience, or combination thereof, to be able to provide oversite of the entire residue project.
   c. This is a time-consuming position. The study director needs to dedicate approximately 50% of his/her time to the project during the active writing and research phases. More time is needed if he/she is responsible for multiple studies. Study Director responsibilities include:
      i. Develop and write the protocol.
      ii. Work with the other researchers and quality assurance personnel on SOPs for each phase of study.
      iii. Be available for decisions and protocol changes during conduct of the study.

iv. Assess the field and laboratory data as it is generated.
v. Read and respond to QA inspections and raw data audits for lab and field.
vi. Review Field Data Books (FDB) and work with the Field Investigator for accuracy and completeness, and summarize the data for the final report.
vii. Review the Analytical Summary Report.
viii. Write the Final Report and work with QA officer to ensure accuracy and GLP compliance.
ix. Communicate study needs to Testing Facility Management (Sponsor).

3. **Field Investigator**:
   a. More than one person can act as a Field Investigator within a study, but only one field investigator can be assigned to a single field trial at any one time. Conducting field trials is a full-time job during application of the test substance and field sample harvest. This is especially true if the researcher must travel to the trial sites. It is essential that the researcher have enough time to record the required data **at the time of the activity**, not a couple days/weeks/months later (*data entry MUST be done at the time the activity occurs)*. Field investigator responsibilities include:
      i. Write/review SOPs
      ii. Select high quality test site locations where a healthy crop is grown and maintained under good agricultural practices, and is typical of local farming practices, and meets protocol requirements; such as being able to collect test site history and weather data from the farm.
      iii. Select and train other personnel who will be assisting the field investigator.
      iv. Keep data and test substance in secure locations.
      v. Ensure that necessary equipment is in good working order and the required calibrations/verifications have been completed and recorded.
      vi. Apply the test substance and record the data in the FDB.
      vii. Collect samples and ship/deliver to the analytical laboratory.
      viii. Coordinate timing of sample shipment/delivery with laboratory personnel
      ix. Work with QA officer to ensure that required inspections and audits are conducted and respond to findings as soon as possible.
      x. Submit accurate and complete FDB to the Study Director and work with SD and QA to address questions/issues.
   b. It is essential that the field investigator be detail-oriented and understand GLPs, Good Agricultural Practices, pesticide application techniques.

4. **Laboratory Investigator**:
   a. One person serves as Laboratory Investigator. He/she acts as the team leader, and should have strong management skills and a strong technical background. The laboratory must have enough space and equipment to be able to complete activities (sample storage, grinding, extraction and analysis), without cross contamination, and to conduct the analysis in a timely manner. Lab inspector responsibilities include:
      i. Write/review SOPs
      ii. Assign and train support personnel for: sample receipt, preparation, extraction, and analysis.
      iii. Develop analytical working method from reference method and verify recoveries.
      iv. Coordinate sample receipt with field personnel.
      v. Ensure that analysis is in compliance with protocol, SOPs and GLPs.
      vi. Troubleshoot chemistry issues
      vii. Work with QA officer to ensure that required inspections and audits are conducted and respond to findings as soon as possible.
      viii. Assess data as it is generated.
      ix. Write Analytical Summary Report; submit to QA; address all issues, then submit to Study Director.
   b. GLP sample handling and analysis is a full-time job during those activities. It is helpful if the sample grinding, extraction and analysis are conducted at a different time or in a different space from other samples. Maintaining sample integrity is essential.

5. **Quality Assurance Officer (QA):**
   a. QA can be more than one person, although one person must take the leadership role and be responsible for, and sign, the protocol and final report. This is one of the most difficult and time consuming positions. The lead QA must understand all aspects of the study, field and laboratory. Quite often there are at least two QAs, one for the field and one for the laboratory. In-Life inspections can take more than a day if travel is involved. Data audits of each FDB take anwhere from a few hours to a couple of days, depending on the quality of the field investigator's work. The audits of the laboratory raw data and Analytical Summary Report may take more than a week, depending on the size of the study. The Final Report can also take several days to complete. QA responsibilities include:
      i. Liaison with, and report directly to, Testing Facility Management (Sponsor).
      ii. Assist study director, field investigator, lab investigator and other personnel in development of SOPs. It is not the responsibility of the QA to write the SOPs, but rather to review for completeness and adherence to GLPs, and provide guidance.
      iii. Review the protocol for GLP compliance and make suggestions.
      iv. Work with the study director, field investigator, lab investigator to ensure that required inspections and audits are conducted, and track audit responses.

v. Conduct facility inspections of the field test sites and analytical laboratory.
vi. Conduct In-Life inspections on critical phases of each study (eg, test substance application; residue sample harvest/shipping; sample receipt/storage; sample grinding; extraction; and sample analysis).
vii. Perform audits of all the raw data generated for the each Field Data Books, the laboratory sample receipt and handling logs, analytical standard receipt and handling logs, chromatograms, etc.
viii. Review the Analytical Summary Report for accuracy and compliance with GLPs.
ix. Review the Final Report of accuracy and compliance with GLPs
x. Provide reports to Sponsor, as well as study personnel.

b. The QAs are not to be directly involved in the conduct of GLP studies. They can make suggestions, but cannot do any of the work or tell the researcher what to do.
c. The people assigned QA responsibility must be detail oriented, have a complete understanding of GLPs, and have a good technical understanding of what they are reviewing. Personnel with a strong background in quality control generally make good QAs.

For further information about GLP, please visit:
The Organisation for Economic Cooperation and Development's Principles on GLP:
http://www.oecd.org/chemicalsafety/testing/oecdseriesonprinciplesofgoodlaboratorypracticeglpandcompliancemonitoring.htm
The USA/Environmental Protection Agency's Volume 40 Code of (US) Federal Regulations Part 160:
https://www.gpo.gov/fdsys/pkg/CFR-1999-title40-vol16/pdf/CFR-1999-title40-vol16-part160.pdf

Additional Important Definitions:
- Study Initiation Date: the date the protocol is signed by the study director.
- Study Completion Date: the date the final report is signed by the study director.
- Experimental Start Date: the first date the test substance is applied to the test system.
- Experimental Termination (End) Date: the last date on which data are collected directly from the study.
- Test Substance: the pesticide substance or mixture administered or added to a test system in a study.
- Reference Substance: is any chemical substance or mixture, or analytical standard, or material other than a test substance, feed, or water, that is administered to or used in analysing the test system in the course of a study for the purpose of establishing a basis for comparison with the test substance for known chemical or biological measurements.
- Quality Assurance Unit: any person or organisational element, except the Study Director, designated by Testing Facility management, to perform the duties relating to quality assurance of the studies.

Annex 7: Key Questions to Pose for New and Future Projects

Checklist for Future Pesticide Residue Data Generation Projects

(Source: Edith Lurvey, Technical Coordinator for Latin America STDF Project PG-436)

1. Does everyone understand the considerable time and resource commitment for conducting research and Quality Assurance for a GLP Study?

2. What funds can the ministry/organisation provide to cover the routine parts of the project?

3. Who will help manage the normal responsibilities of each researcher (lab, field and QA) to ensure he/she has sufficient time to dedicate to the new project?

4. How will changes in personnel be handled? Are any transfers or retirements foreseen for critical personnel?

5. How to ensure continuity? How will staff be trained and retrained? How will staff trained by the project pass on their knowledge and skills to the rest of the personnel so that there is always a core team of specialists?

6. How can researchers from universities and various sections within the ministry(ies) be integrated into the study to ensure that the best people are involved and can spread the knowledge to a wider audience?

7. Are the field facilities and personnel adequate to conduct GLP/OECD studies? Do the field researchers have GLP and ISO training? Do they know how to prepare the necessary notebooks/reports to a high standard?

8. Is sufficient funding available/allocated for field travel: vehicles, other transport, food, lodging, etc?

9. Are there plans for crop maintenance during the course of the study?

10. Is the laboratory ISO 17025 accredited? Is it compliant with OECD Good Laboratory Practice (GLP) Principles? (ISO 17025 sets the requirements that testing and calibration laboratories must meet to demonstrate that they operate a quality system, are technically competent, and are able to generate technically valid results. GLP principles assure the quality and integrity of the data submitted.

11. Are trained and certified Quality Assurance officers available to inspect and audit the study? Do they have GLP OECD and ISO training?

12. Are the appropriate (eg, high-quality) analytical reagents and solvents in stock or otherwise available?

13. Is regular equipment maintenance and/or replacement included in the budget? Are there any planned equipment redundancies or any plans to repair or back-up critical analytical equipment? Do contingency plans and funding exist for unexpected events and emergency repairs?

14. What incentives might expedite the completion of the various phases of the study and the timely submission of the reports (ie, what can motivate people)?

OECD Good Laboratory Practice (GLP) Principles*	
1. Organisation and Personnel o Management Responsibilities o Sponsor Responsibilities o Study Director Responsibilities o Principal Investigator Responsibilities o Study Personnel Responsibilities 2. Quality Assurance Programme o Quality Assurance Personnel 3. Facilities o Test System Facilities o Facilities for Test and Reference Items 4. Equipment, Reagents and Materials	5. Test Systems o Physical/Chemical o Biological 6. Test & Reference Items 7. Standard Operating pProcedures 8. Performance of Study o Study Plan o Conduct of Study 9. Reporting of Results 10. Archival - Storage of Records and Reports

*Following Decision C(97),186/Final of the OECD Council, *data generated in the testing of chemicals in one OECD Member Country, in accordance with OECD Test Guidelines and the Principles of GLP are accepted in all other OECD Member Countries.* OECD: ENV/MC/CHEM(98)17 part two. Good Laboratory Practices (GLP) is a quality system concerned with the organisational process and conditions under which studies are planned, performed, monitored, recorded, archived and reported. *"OECD Principles of Good Laboratory Practice (as revised in 1997)". OECD Environmental Health and Safety Publications. OECD. **1**. 1998*

Annex 8: Documents Reviewed

In addition to the three STDF Project Grant Applications, the Final Reports of the three projects and the responses to our survey questionnaires, the following are the most important sources of information.

GENERAL

STDF documents (meta evaluation 2017, strategy documents, annual reports, etc)
STDF Briefing: *Facilitating safe trade: protecting health, reducing SPS trade costs*, 2013
STDF Fact Sheets on the three projects
WTO SPS Agreement and SPS Committee documents and reports
WTO 10th Ministerial Meeting, Buenos Aires, Ministerial Statement of support for STDF MRL projects
Global Minor Use Summit agendas and reports
Global Minor Use Foundation (now *Minor Use Foundatio*n) background, projects, etc
STDF/Coord/588/Concept Note (Revised: 6 March 2018): Good regulatory practice to support the development and implementation of SPS measures
OECD Principles of Good Laboratory Practices

FAO/WHO/JMPR/Codex

CAC, 2018. Report of the 41st Session of the Codex Alimentarius Commission, Rome, Italy, 2-6 July 2018.
CCPR, 2018. Report of the 50th Session of the Codex Committee on Pesticide Residues. Haikou, P.R. China, 9-14 April 2018.
FAO/WHO International Code of Conduct on Pesticide Management & Technical Guidelines for Implementation
Principles and guidance on the selection of representative commodities for the extrapolation of maximum residue limits for pesticides to commodity groups. Codex doc. CAC/GL 84-2012. Adopted in 2012. Amended in 2017.
Joint FAO/WHO Meeting on Pesticide Residues. 2019 Extraordinary meeting. 7-17 May 2019, Ottawa, Canada. List of substances scheduled for follow up evaluation or new uses and request for data. Issued May 2018.
Joint FAO/WHO Meeting on Pesticide Residues 2019 meeting, Geneva, 17-26 September 2019. List of substances scheduled for evaluation and request for data. Issued October 2018.
Joint FAO/WHO Meeting on Pesticide Residues. Berlin, 18-27 September 2018. Summary report, October 2018.

ASEAN

Matrix Effect Evaluation and Method Validation of Azoxystrobin and Difenoconazole Residues in Red Flesh Dragon Fruit (*Hylocereus polyrhizus*) Matrices Using QuEChERS Sample Preparation Methods Followed by LC–MS/MS Determination, Bulletin of Environmental Contamination and Toxicology, 2018.
Harmonisation of maximum residue limits (MRLs) of pesticides among ASEAN countries. Ngan Chai Keong. Presentation at the 256th ACS National Meeting: Joint Reviews for New Pesticides: Success Stories, Challenges and Future Prospects. August 21, 2018. Boston, USA.

LATIN AMERICA

LA project concept paper/application, 2013
Letters of support for application from prospective partner countries, 2013
WTO-IICA STDF/PG/436 contract, 2013
STDF-IICA correspondence 2012-2017
Steering Committee reports
Mission Reports of trainers and project coordinators
Workshop programmes and participant lists, 2013-2016
STDF-IICA payment requests and disbursement memos #1-6, 2014-2016
IICA Progress Reports and Financial Reports #1-5, 2014-2016
Latin America STDF/PG/436 Final Report, 2017
Project closure memos, 2017
Midterm and end-of-project surveys
End-of-project assessment, and country readiness for next steps, Edith Lurvey and David Soderlund (IR4-Cornell University), 2017
LA project poster and PPTs, LAPRW, 2015
STDF LA website updates, 2018
LA Pesticide Residue Workshop and side session on regional collaboration, May 2017
Participants list, Coloquio Codex, Quito, 2016
Principios de Analysis de Riesgo de Codex: Residues de Plaguicidas, 2015
Presentations by partner countries at various fora, during and after the projects

Comunidad Andina, 2018, *Proyecto de Resolución para la Adopción del Manual Técnico Andino para el Registro y Control de Plaguicidas Químicos de Uso Agrícola*
Coordinación y orientación en la ejecución de la política de sanidad agropecuaria e inocuidad, Comisión de Medidas Sanitarias y Fitosanitarias, Grupo Técnico de Trabajo de Residuos en Alimentos, Departamento Nacional de Planeación, Colombia, 2018
Plan de Admisibilidad Sanitaria, Dirección de Desarrollo Rural Sostenible, DNP, Colombia, 2018

AFRICA
Africa project concept paper/application, 2012
Letters of support for application from prospective partner countries 2012
COLEACP-PIP letter of intent to cooperate with STDF-AU project, 2012
WTO-AU-IBAR contract, 2013
STDF-AU-IBAR-USDA-IR4 project correspondence 2012-2018
IR-4/USDA correspondence with pesticide manufacturers and CEMAS laboratory
Mission Reports of trainers, 2014-2017
Workshop programmes and participant lists, 2014, 2016, 2017
Steering Committee reports
WTO expenditure statements, disbursements, etc, for Africa project
AU-IBAR Extension request and approval documents
AU-IBAR Progress Reports and Financial Reports #1-6 to STDF, 2013-2017
AU-IBAR Rutgers University Special Services Agreement and payment memos, 2015
Rutgers Uni reports to AU-IBAR
Africa STDF/PG/359 Final Report, 2018
Project closure memos, 2017-18
STDF project website updates, 2018
East Africa Community documents on regional harmonisation of pesticide registration processes, 2017-2019
Draft East Africa Community Guidelines for Conduct of Supervised Pesticide Residue Field Trials on Crops, 2018

Annex 9: Joint FAO/WHO Meeting on Pesticide Residues (JMPR) and Codex Committee on Pesticide Residues (CCPR)

The "**Joint Meeting on Pesticide Residues**" (**JMPR**) is an expert ad hoc body administered jointly by FAO and WHO in the purpose of harmonizing the requirement and the risk assessment on the pesticide residues.

The JMPR has met annually since 1963 to conduct scientific evaluations of pesticide residues in food. It provides advice on the acceptable levels of pesticide residues in food moving in international trade. The JMPR consists of experts who attend as independent internationally-recognized specialists who act in a personal capacity and not as representatives of national governments.

The current JMPR comprises the WHO Core Assessment Group and the FAO Panel of Experts on Pesticide Residues in Food and the Environment. The WHO Core Assessment Group is responsible for reviewing pesticide toxicological data and estimating Acceptable Daily Intakes (ADI), acute reference doses (ARfDs) and characterizes other toxicological criteria.

The FAO Panel is responsible for reviewing pesticide data residue and for estimating maximum residue levels, supervised trials median residue values (STMRs) and highest residues (HRs) in food and feed. The maximum residue levels are recommended to the Codex Committee on Pesticide Residues (CCPR) for consideration to be adopted by the Codex Alimentarius Commission (CAC) as CXLs.

The output of JMPR not only constitutes the essential basis for Codex MRLs for food and agricultural commodities circulating in international trade, its health-based guidance for pesticides (i.e. ADIs and ARfDs) and recommends maximum residue levels also benefit to the governments of the member countries and regions.

Codex Committee on Pesticide Residues (CCPR)
The CCPR, a subsidiary body of the Codex Alimentarius Commission (CAC), is an intergovernmental meeting whose prime objective is to reach agreement between governments on maximum residue limits (MRLs) for pesticides residues in food and feed commodities moving in international trade. The MRL proposals made by JMPR are considered by the CCPR as part of eight-step procedure which provides opportunity for discussion and comment by national governments and other interested organizations. The MRLs recommended by CCPR are provided to the CAC, for adoption as Codex maximum residue limits (CXLs).

The Terms of Reference of the CCPR are:
(a) to establish maximum limits for pesticide residues in specific food items or in groups of food;
(b) to establish maximum limits for pesticide residues in certain animal feeding stuffs moving in international trade where this is justified for reasons of protection of human health;
(c) to prepare priority lists of pesticides for evaluation by the Joint FAO/WHO Meeting on Pesticide Residues (JMPR);
(d) to consider methods of sampling and analysis for the determination of pesticide residues in food and feed;
(e) to consider other matters in relation to the safety of food and feed containing pesticide residues; and,
(f) to establish maximum limits for environmental and industrial contaminants showing chemical or other similarity to pesticides, in specific food items or groups of food.

Further information can be obtained via the Codex website: www.fao.org/fao-who-codexalimentarius/en/

Annex 10: Examples of Representative Commodities for the Extrapolation of Maximum Residue Limits for Pesticides to Commodity Groups

Codex document CXG 84-2012. Adopted in 2012. Amended in 2017.

Codex Group / Subgroup	Examples of Representative Commodities[1]	Extrapolation to the following commodities
Group 006 Assorted tropical and sub-tropical fruits – inedible peel	Litchi (lychee) or Longans or Spanish Lime; Avocado; Pomegranate or Mango; Banana and Papaya; Atemoya; Pineapple; Dragonfruit; Prickly pear; Kiwifruit or Passionfruit and Muriti or Palmyra Palm	Assorted tropical and sub-tropical fruits – inedible peel (FI 0030): Abiu; Aisen; Akee apple; Atemoya; Avocado; Bacuri; Bael fruit; Banana; Binjai; Biriba; Breadfruit; Burmese grape; Cacao (pulp); Canistel; Capuacú; Champedak; Cherimoya; Coconut, young; Custard apple; Durian; Elephant apple; Etambe; Feijoa; Granadilla; Granadilla, Giant; Guriri; Ilama; Ingá; Jackfruit; Jatobá; Kei apple; Kiwifruit; Kokam; Langsat; Lanjut; Longan; Lucuma; Litchi (lychee); Mabolo; Madras-thorn; Mammy apple; Manduro; Mango; Mango, horse; Mango, Saipan; Mangosteen; Marang; Marmalade-box; Matisia; Mesquite; Mongongo; Monkey-bread tree; Monstera; Muriti; Naranjilla; Paho; Palmyra palm; Papaya; Passionflower, Winged-stem; Passion fruit; Passion fruit, banana; Pawpaw; Pawpaw, small flower; Pelipisan; Pequi; Persimmon, American; Pineapple; Pitaya; Pomegranate; Poshte; Prickly pear, Pulasan; Quandong; Rambutan; Saguaro; Salak; Sapodilla; Sapote, black; Sapote, green; Sapote, Mammey; Sapote, white; Sataw; Satinleaf; Screwpine; Sierra Leone-tamarind; Soncoya; Soursop; Spanish lime; Star apple; Sugar apple; Sun sapote; Tamarillo; Tamarind (sweet varieties); Tamarind-of-the-Indies; Velvet tamarind; Wampi; White star apple; Wild loquat.
Subgroup 006A, Assorted tropical and sub-tropical, Inedible Peel, Small	Litchi (lychee) or Longans or Spanish Lime	Inedible Peel - Small (FI 2021): Aisen; Bael fruit; Burmese grape; Ingá; Litchi; Longan: Madras- thorn; Manduro; Matisia; Mesquite; Mongongo; Pawpaw, small flower; Satinleaf; Sierra Leone- tamarind; Spanish lime; Tamarind (sweet varieties); Velvet tamarind; Wampi; White star apple.
Subgroup 006B, Assorted tropical and sub-tropical, Inedible Smooth Peel - Large	Avocado; Pomegranate or Mango; Banana and Papaya	Inedible Smooth Peel - Large (FI 2022): Abiu; Akee apple; Avocado; Bacuri; Banana; Binjai; Cacao (pulp); Canistel; Capuacú; Etambe; Feijoa; Jatobá; Kei apple; Kokam; Langsat; Lanjut; Lucuma; Mabolo; Mango; Mango, horse; Mango, Saipan; Mangosteen; Naranjilla; Paho; Papaya; Pawpaw; Pelipisan; Pequi; Persimmon, American; Pomegranate; Quandong; Sapote, black; Sapote, green; Sapote, white; Sataw; Star apple;

Annex 11: Evaluation Terms of Reference

Terms of Reference
Ex-POST EVALUATTION OF STDF PROJECTS:
"ASEAN PESTICIDE RESIDUE DATA GENERATION PROJECT" (STDF/PG/337)
"AFRICAN PESTICIDE RESIDUE DATA GENERATION PROJECT"(STDF/PG/359)
"LATIN AMERICAN PESTICIDE DATA GENERATION PROJECT"(STDF/PG/436)

Overview of Projects

1. The STDF funded between 2012 and 2017 three regional projects to support selected countries in ASEAN countries (STDF/PG/337), Africa (STDF/PG/359) and Latin America (STDF/PG/436) to meet pesticide-related export requirements based on international (Codex) standards. These projects were similar in their scope and approach, all aiming to improve technical capacity in the beneficiary countries to generate, review and interpret pesticide residue data for chosen specialty crops (globally minor crops that are nevertheless crucial to the beneficiary countries' local economies). By doing this, the projects aimed to support national pesticide registration processes and to facilitate the establishment of new Codex MRLs for improved market access. The focus, in all three projects, was on tropical fruits and reduced risk pesticides.

2. Under these projects, over 160 scientists and government officials in the three regions were trained to generate, review and interpret pesticide residue data. Project partners completed 10 new residue studies, informing national registration of reduced-risk pesticides and the establishment of Codex standards. Data from these studies has been submitted to the FAO/WHO Joint Meeting on Pesticide Residues (JMPR) for consideration for new Codex MRLs for minor-use crops such as dragon fruit, mango and papaya. It is expected that this will result in at least 10 new MRLs established in 2018-19. If crop grouping, i.e. extrapolating residue data on one commodity to others within a specified group is allowed, up to 80-100 MRLs could be established for sub-group 006B, tropical fruit.

3. The projects were implemented based on a collaborative approach involving cooperation and partnerships across different government agencies (agriculture, environment, trade), the private sector (Crop Life International, as well as global pesticide manufacturers), international organizations and technical partners. Public-private collaboration plugged data gaps and improved results. Pooling data led to more robust data sets, reflecting geographic and climatic diversity. Government officials gained the know-how to design regulatory frameworks for pesticides that meet public health and environmental objectives. Thanks to the project, the private sector registered new reduced-risk pesticides in 18 countries, expanding access to environmentally-friendly tools, alongside the new Codex standards coming in 2018-19.

4. In 2015, project partners set up the Global Minor Use Foundation, supported by the USDA and the private sector. The Foundation builds on the projects' results and has mobilized over US$550,000 to expand low-risk pesticide options for tropical produce. A sustainable model for joint residue projects was launched in over 13 developing countries, with governments funding research, the private sector giving technical support and financing, and the Foundation supporting capacity building. The projects' role in catalysing global public-private sector collaboration was recognized in a high-level statement signed by 17 governments at the 11th WTO Ministerial Conference in 2017.

ASEAN PESTICIDE RESIDUE DATA GENERATION PROJECT (STDF/PG/337)

5. The STDF Working Group approved project application STDF/PG/337 in October 2011. The project beneficiaries were ASEAN member countries.[4] The total project value was US$1,242,000, with an approved STDF contribution of US$637,000. The project ran from 1 December 2012 to 30 November 2016.[5]

6. The ASEAN Secretariat (ASEC) was contracted to implement the project pursuant to a contract concluded with the WTO in October 2012. Other entities involved were government agencies and institutions from the beneficiary countries, the ASEAN Expert Working Group on Harmonization of MRLs of Pesticides, the US Department of Agriculture Foreign Agricultural Service (USDA-FAS), the US Environmental Protection Agency (EPA), the FAO/WHO JMPR, and pesticide manufacturers (Dow, Syngenta, and Valent/Sumitomo). The Rutgers University/IR-4 project supported project implementation through a Special Services Agreement, concluded between ASEC and the university in March 2013.

[4] Residue studies were carried out in Brunei Darussalam, Indonesia, Malaysia-Singapore, Philippines, Thailand, and Viet Nam. Cambodia, Lao PDR and Myanmar participated as "observer" countries.

[5] The project was officially commenced on 1 December 2012 and was supposed to end on 30 November 2015. However, following delays in the commencement of some trials, which needed to follow harvesting seasons of the commodity, as well as the effect of natural calamities on some sites, upon the request by ASEAN, the STDF Working Group at its Meeting in March 2015 approved a no-cost 12-month extension. The project officially ended on 30 November 2016.

7. The project resulted in six residue studies (one for lychee, one for papaya, two for dragon fruit, and two for mango) for submission to the FAO/WHO JMPR in view of establishing Codex MRLs. Delays in submitting studies were due to the JMPR's overbooked work schedule in 2017.

AFRICAN PESTICIDE RESIDUE DATA GENERATION PROJECT (STDF/PG/359)

8. The STDF Working Group approved project application STDF/PG/359 in October 2012. This project application was developed through an STDF Project Preparation Grant (STDF/PPG/359), which was approved in October 2011 and implemented by the African Union Inter-African Bureau for Animal Resources (AU-IBAR).

9. The project beneficiaries were Ghana, Kenya, Senegal, Tanzania, and Uganda. The total project value was US$1,064,450, with an approved STDF contribution of US$446,150. The project ran from 1 May 2013 to 30 April 2017.[6]

10. AU-IBAR was responsible for implementation of the project pursuant to a contract concluded with the WTO in April 2013. Other entities involved in the project were government agencies and institutions from the five partner countries, USDA-FAS, FAO, COLEACP (Europe-Africa-Caribbean-Pacific Liaison Committee), and pesticide manufacturer Dow. The Rutgers University/ IR-4 project supported project implementation through a Special Services Agreement, concluded between AU-IBAR and the university in March 2015.

11. The project resulted in the implementation of residue field trials in the five participating countries for sulfoxaflor on mango. Efficacy trials in three countries will be completed in 2018 to enable national registrations of the compound. The aim is to nominate sulfoxaflor to be reviewed by JMPR in 2018.

LATIN AMERICAN PESTICIDE DATA GENERATION PROJECT (STDF/PG/436)

12. The STDF Working Group approved project application STDF/PG/436 in March 2013. The project beneficiaries were Bolivia, Colombia, Costa Rica, Guatemala, and Panama. The total project value was US$1,195,416, with an approved STDF contribution of US$374,116. The project ran from 1 October 2013 to 30 September 2016.[7] The project resulted in four residue studies (one for pineapple, two for banana and one for avocado) for submission to the JMPR.

13. The Inter-American Institute for Cooperation on Agriculture (IICA) was responsible for implementing the project pursuant to a contract concluded with the WTO in October 2013. Other entities involved in the project were government agencies and institutions from the beneficiary countries, USDA-FAS, US EPA, FAO/WHO JMPR, pesticide manufacturers Dow and Valent/Sumitomo, IR-4/Rutgers University, and Cornell University.

Description of tasks

14. In October 2017, the STDF Working Group selected these three regional projects (STDF/PG/337, 359 and 426) for an independent ex post evaluation. It was decided to group the three projects in one single evaluation, to enable comparisons across the three projects and enhance synergies and lessons learned. Subsequently, the Working Group selected Stuart Slorach and Andrea Spear to perform the evaluation as a team. This document sets out the Terms of Reference for the International Contractors for this evaluation.

15. The evaluation will be carried out under the overall supervision of the STDF Secretariat, and in cooperation with the implementing agencies (ASEC, AU-IBAR, IICA), as well as other stakeholders involved in the projects. The evaluation will be based on the STDF Project Evaluation Guidelines (Appendix 1).

16. The Lead Contractor (Stuart Slorach) will be responsible for delivering the final evaluation report. He will be supported in the evaluation work by M&E Expert Andrea Spear. The breakdown of tasks and budget is set out in Table 1 (below).

17. *Specifically, the Contractors shall:*

Obtain and Review relevant information and documents

i. Review all available information and documents related to the projects, which will be provided by the STDF Secretariat together with a list of key stakeholders involved in the three projects and their contact details.

ii. Contact stakeholders involved in project implementation to obtain any other relevant information or documents, as appropriate.

[6] The project was expected to run from 1 May 2013 to 30 April 2016. In October 2015, at the request of AU-IBAR, the STDF Working Group approved a one year, no-cost extension request for the project. This extension postponed the project's end date to 30 April 2017. The extension was requested to: i) respond to delays in implementation linked to challenges to agree on the pesticide / crop combinations for the residue trials with the private sector; and ii) include efficacy studies to enable the registration of the pesticide in three of the beneficiary countries. Efficacy trials had not originally been included as an activity in the project, however, considering that provision of product labels was a prerequisite for data submission to JMPR, it was considered important to expand the scope of the project to conduct efficacy trials.

[7] Due to the delays in obtaining final commitments from the pesticide manufactures to agree upon crop/pesticide assignments and their marketing interests, field trials could not be initiated on time. Upon the request by IICA, the STDF Working Group approved a no-cost one-year extension. The project officially ended on 30 September 2016.

Develop an Evaluation Framework

iii. Develop an evaluation framework, which should be discussed with the STDF Secretariat prior to its finalization and use. This framework should, at a minimum:
   - clearly elaborate the questions to be asked to different stakeholders during the evaluation, based on the OECD/DAC evaluation criteria (i.e. relevance, effectiveness, efficiency, impact, sustainability), as well as the indicators identified in each of the project documents' logical frameworks;
   - identify and elaborate the methods and tools (e.g. survey questionnaires, key questions for face-to-face/Skype interviews etc.) to be used to conduct the evaluation;
   - identify key individuals to be consulted during the evaluation, including representatives of: (i) the project implementing organizations (ASEC, AU-IBAR, IICA); (ii) participants/beneficiaries of project activities including relevant government agencies/departments, and (iii) any other key stakeholders relevant to and/or involved in the project (including Rutgers/Cornell Universities, IR-4, relevant development partners, pesticide manufacturers, and relevant industry associations, etc.); and
   - outline a timeframe to conduct the evaluation and to finalize the evaluation report.

Conduct the Evaluation

iv. Contact representatives of project stakeholders and beneficiaries (using methods identified in the evaluation framework) to obtain their views and feedback about the project, addressing key questions related to the project's relevance, effectiveness, efficiency, impact, sustainability and main lessons learned. This should include a detailed assessment of the effectiveness, efficiency, impact, and sustainability related to key project activities (covering both field trials and laboratory analysis for each of the projects), including:
   - In relation to capacity building: Trainings, workshops, consultations on the conduct of field trials, sample preparation and analysis, SOP reviews and identification of core management teams, facility inspections, SOP refinement, protocol development etc.; and
   - In relation to MRL establishment/registration: Field trial applications and harvest, analytical validation and analysis, data packaging and submission, analytical summary report preparation, final report development etc.

v. When formulating and posing evaluation questions, the Contractors should consider the multi-stakeholder context in which the projects were developed and implemented, linkages to other related projects/programmes, the projects' possible environmental or other spillover effects, opportunities created by the projects and/or any challenges faced, as well as any follow-up actions (including JMPR/Codex work towards establishing new MRLs), outstanding needs, etc.

vi. The Contractors should give due consideration to the wider IR-4 framework in which the projects took place, as well as project sustainability, including the creation of the US-supported IR-4/Global Minor Use Foundation.

vii. The evaluation should take account of the partnerships that underpinned the three projects (public-public between government authorities, and public-private with multinational pesticide manufacturers, industry associations etc.), as well as as dialogue and collaboration facilitated by the three projects within and across the three regions (e.g. South-South cooperation, cooperation on lab analysis, etc.).

viii. The Contractors should evaluate how project risks were managed and mitigated, and how the projects' outcomes and results influenced change nationally, regionally and globally.

Write an Evaluation Report

ix. On the basis of all the information collected and feedback received from the various stakeholders consulted, draft one evaluation report covering the results and performance of all three regional projects.

x. This report may contain three separate chapters for each regional project, with detailed analysis of the overall performance and results of each project, as well as a chapter with more general cross-cutting observations, experiences, lessons learned, conclusions and recommendations related to the three projects as a whole, permitting comparisons and an evaluation of synergies and coherence across the three projects. This cross-cutting chapter should not compile and repeat recommendations made under each project, but rather analyse the project-specific findings and seek to extract wider reaching lessons learned from these.

xi. The report should make recommendations specific to the activities conducted under the three projects, as well as more general recommendations that may be useful to improve the design and delivery of future projects that address similar subjects.

xii. The evaluation report should be drafted in accordance with the agreed format (see Appendix 1 – note that the suggested length of sections needs to be adjusted to cover three projects). A draft report should be submitted to the STDF Secretariat by 15 February 2019. The Contrators should revise the report, taking into consideration the Secretariat's comments and suggestions. The deadline for finalising the report is 29 March 2019.

Other information

xiii. On the basis of the final evaluation report, the Contractors shall provide updated content on the key findings and recommendations of the project to be used by the STDF Secretariat to update the project pages on the STDF website.

xiv. The Contractors shall provide to the STDF Secretariat electronic copies of documents relevant to the evaluation for inclusion in the STDF Virtual Library.

Qualifications

18. The Contractors should meet the following minimum requirements:

- Experience in project monitoring and evaluation, including data collection (through survey questionnaires, consultations and interviews involving multiple organizations and participants); Familiarity and experience with results-based project management, the theory of change and OECD/DAC evaluation criteria is an asset;
- Experience with relevant multi-partner/beneficiary initiatives, including understanding of the political and diplomatic dimensions, and managing a review process in that context;
- Experience and knowledge of problems faced by developing countries in the implementation of international food safety standards to gain and maintain market access. Familiarity with projects related to pesticide MRLs is an asset;
- Excellent analytical, drafting and communications skills in English. Knowledge of Spanish and French is an asset.