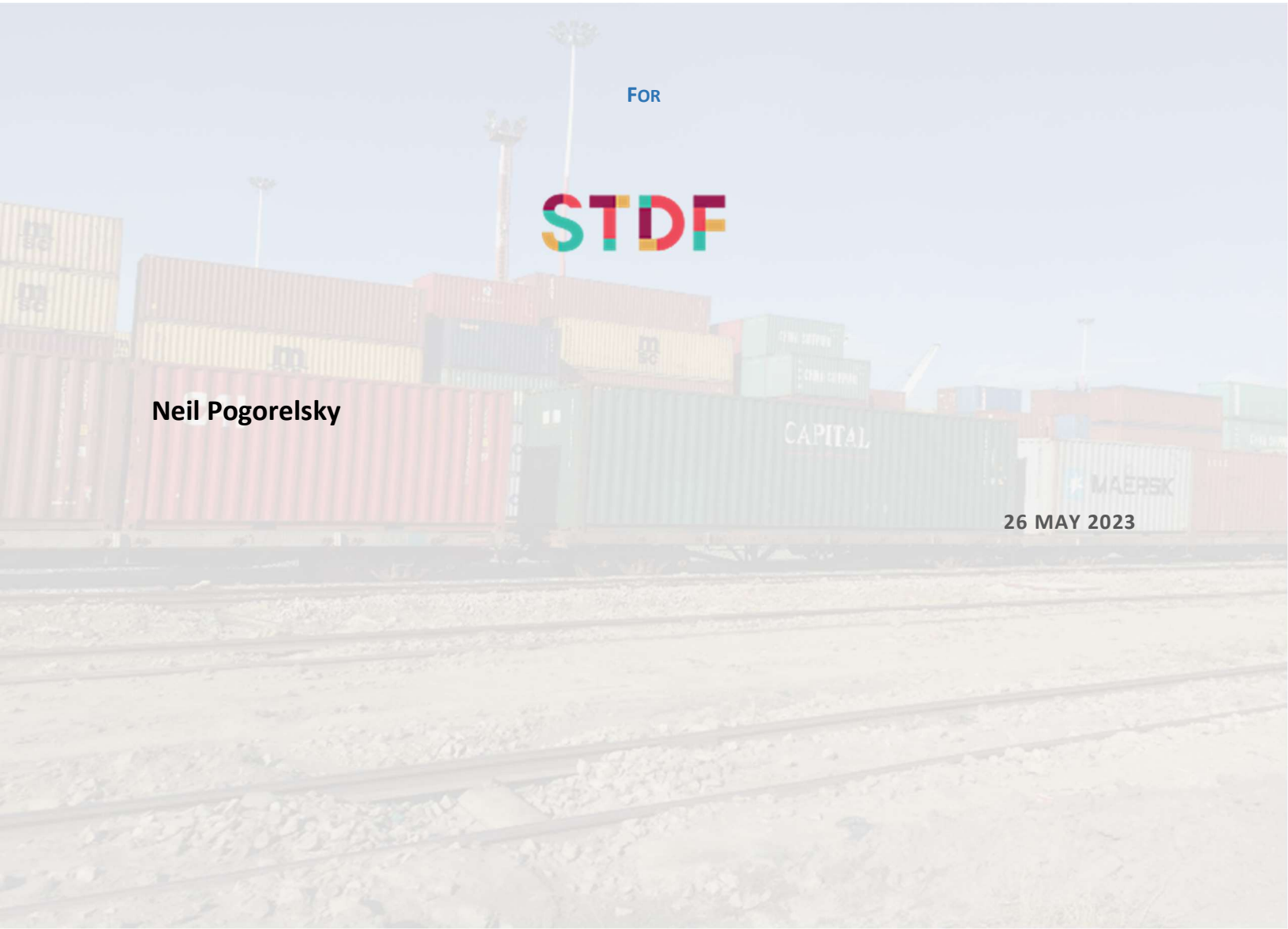
EX POST EVALUATION OF EPHYTO SOLUTION: ENHANCING SAFE TRADE IN PLANTS AND PLANT PRODUCTS (STDF/PG/504)

FINAL REPORT



FOR

STDF

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Independence of evaluation and conflict of interest statement

This report was produced by Neil Pogorelsky, an independent consultant. It was commissioned as an independent evaluation by STDF but the opinions and recommendations expressed within are the author's own. The author was vetted to be, and continues to be, free from conflicts of interest with regards to this study.

Acronyms & Abbreviations

API	Application programming interface
ASCYER	a phytosanitary component of UNCTAD's customs automation program, ASYCUDA
ASYCUDA	Automated System for Customs Data
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Codex	Codex Alimentarius
DAC	Development Assistant Committee (of the OECD)
ePhyto	Electronic Phytosanitary Certificate
EBRD	European Bank for Reconstruction and Development
ECAC	Electronic Certification Advisory Committee
ESG	ePhyto Steering Group
EQ	Evaluation Question
eVet	Electronic Veterinary Certificate
FAO	Food and Agriculture Organization of the United Nations
GATF	Global Alliance for Trade Facilitation
GeNS	Generic ePhyto National System
IAG	Industry Advisory Group
IPPC	International Plant Protection Convention
ISPM	International Standard for Phytosanitary Measures
KII	Key Informant Interview
LDC	Least Developed Countries
NPPO	National Plant Protection Organization
OECD	Organisation for Economic Co-operation and Development
OIE	Office International des Epizooties (now WOAH)
PAC	Project Advisory Committee
Phyto	Phytosanitary Certificate
PTC	Project Technical Committee
RPPO	Regional Plant Protection Organization
SEQ	Sub-Evaluation Question
SPS	Sanitary and Phytosanitary
STDF	Standards and Trade Development Facility
TFSP	Trade Facilitation Support Programme
TOC	Theory of Change
TRACES	EU Trade Control and Expert System

UN/CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
UNCTAD	United Nations Conference on Trade and Development
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNICC	United Nations International Computing Centre
WCO	World Customs Organization
WOAH	World Organization for Animal Health (formerly OIE)
WTO	World Trade Organization
XML	Extensible Markup Language

EXECUTIVE SUMMARY

The ePhyto Solution, primarily funded by STDF and implemented by IPPC with the development and hosting support of UNICC, resulted in a global exchange system for electronic phytosanitary certificates (ePhytos), a generic application that could be used by government regulators in each country to issue, send and receive ePhytos (GeNS), and a pilot implementation in three developing country contexts (Ghana, Samoa, Sri Lanka). The project was successfully completed in 2020 at a cost of about USD 1.7 million, and currently 125 countries are connected to the exchange hub with 76 of those regularly using the system to send, receive, or both send and receive ePhytos. The GeNS application has also been successfully implemented with 25 developing country partners currently using it to exchange phytos and another 22 currently testing.

The objectives of the project included: (1) Finalizing the harmonization of the phytosanitary certificate, (2) Establishing a functioning exchange system, and (3) Ensuring countries of any development status could access and utilize the system. With these three things in the place, the project sponsors anticipated a number of impacts to SPS capacity and trade facilitation. These included improved capacity to detect and combat fraud in plant trade, ease of market access, reduced processing costs, and reduced time for compliance for traders in plants and plant goods. In addition, it was expected that the use of ePhytos would contribute to reduced consumption of paper and overall reduced CO2 emissions associated with plant trade for both developed and developing countries.

To assess the extent to which these objectives were met and resulting in the hoped-for impacts, this evaluation utilized both contextual assessment and contribution analysis frameworks. Over 70 documents were reviewed, over 50 stakeholders were interviewed and two case studies, one in Samoa and the other in Uganda, were developed. The evaluation ran from November 2022 to May 2023 with field work conducted in January and February of 2023. Stakeholders consulted included implementors at the global, regional and national levels, including representatives of both developed and developing economies, international institutions involved in supporting trade facilitation enhancements, national authorities responsible for regulating plant trade, stakeholders that served on various advisory bodies supporting ePhyto implementation, representatives of the three international standard-setting bodies responsible for food safety, animal and plant health, and traders engaged in plant trade. While the findings and recommendations are the author's own, the STDF and IPPC Secretariats were given the opportunity to review and comment on this report to ensure its relevance and usability.

The evaluation determined that the ePhyto solution was successfully implemented and resulted in a number of SPS capacity, trade facilitation, and environmental benefits. Key findings include:

- The project was delivered efficiently at relatively low cost to output and particularly low cost to impact, with a wide and diverse reach across country contexts.
- The ePhyto solution is functional and successfully facilitates bilateral exchange of certificates as expected and with minimal on-going issues.

- The solution has added significant security to the process of plant trade, greatly reducing incidence of fraudulent certificates among countries using ePhyto.
- The ease of movement of ePhytos, relative to traditional paper phytosanitary certificates, has facilitated ease of trade for those countries using them, including those NPPOs in least developed country contexts, and reduced trade transaction costs. It has also reduced the use of paper and need for travel, which has delivered some limited environmental benefits.
- The ePhyto development process and resulting systems appear to be relevant to other potential e-certification efforts, including a potential eVet initiative.
- The relative success of the project, particularly in relation to uptake amongst developing countries, is due in large part to a number of development partners who have mobilized around ePhyto, assisting NPPOs with implementation as a component of trade facilitation assistance. The ePhyto Solution is a good example of the STDF's role in driving catalytic SPS improvements in developing countries.
- The project has largely deferred decisions on financial sustainability, though resolutions are currently being negotiated amongst members. As it stands, however, the system is not self-funding and resolving this issue is an urgent requirement to ensure the longevity of the investment.

The evaluation also resulted in a number of broader lessons of potential interest to organizations involved in SPS standard-setting, capacity development and trade facilitation:

1. Harmonization of certificates is fundamentally crucial to implementing e-certification
2. Relatively minor investments in digitization can have significant catalyzing effects in trade facilitation
3. Developing countries have access and equipment challenges that can inhibit uptake of opportunities to participate in digitization of trade documentation.
4. The private sector is interested, engaged, and willing to contribute to improving trade facilitation in the right circumstances
5. Implementation of e-certification does not need to be all or nothing – a rolling implementation is both possible and effective.

Lastly, the evaluation made five key recommendations to STDF, IPPC, UNICC and the international animal and food trade bodies.

#	Recommendation	Responsibility	Priority
1	Resolve the financial arrangements to support ongoing operation. IPPC has committed to a financial plan for sustained operation in 2023. Adopting this should be the first priority for stakeholders. As no financial plan was agreed upon at the April meeting, advocates for ePhyto, who are concerned with financial sustainability should press for a resolution as soon as possible.	IPPC / ESG	Immediate

#	Recommendation	Responsibility	Priority
2	Continue to improve GeNS to open up realization of full potential benefits: e-payment, traceability, data analysis. UNICC maintains a list of planned improvements to GeNS, as approved and directed by the Steering Committee. Key improvements that should be considered for inclusion are – improved linkage options to on-line e-payment systems (beyond the current ability to attach a pdf payment receipt), improved traceability mapping, and access to (own) data extracts on demand	IPPC / UNICC	Short term
3	Encourage WOAH and/or other relevant regional organizations to consider piloting a regional Veterinary certificate exchange via the hub to (1) serve as proof of concept (2) identify any needed technical adjustments for the Hub to carry additional certificate types (3) provide an example of an approach to harmonizing the certificate amongst a less-than-global group of participants, and (4) work out any technical complexities in adding additional transaction types. The pilot would not explicitly require addition of a Vet module on GeNS, but one may be considered, especially if the pilot is intended as a way to build momentum towards global uptake.	ECAC / WOAH / IICA	Mid term
4	STDF should use its convening power, financial resources and influence amongst the SPS community to encourage veterinary authorities in developing countries, WOAH and other relevant regional organizations to sponsor a pilot program on eVet as described under recommendation 3. Opportunities for influence may include developing a proposed group of participants through regional or multi-bilateral dialogues, offering support through consideration of a grant application, and continuing to advance the cause of e-certification through publication of events and/or papers on the trade facilitation benefits of ePhyto. Given the appeal of fraud reduction as a benefit to NPPOs, the STDF Working Group and/or ECAC may consider carrying out a study on phyto fraud and the effects of ePhyto. Such a study may have appeal to regulatory bodies responsible for animal health and food safety.	STDF Working Group, ECAC and STDF Secretariat	Mid term
5	IPPC/STDF should continue outreach and education efforts to bring more plant trade into ePhyto. Current growth strategies appear to be successful and as such should be maintained. These include the outreach and education efforts to continue to enroll additional NPPOs in ePhyto, relying on RPPOs to help spread the message about ePhyto and encouraging interest among peers.	IPPC / STDF	Mid term

1 PURPOSE OF THE EVALUATION

Based on the STDF MEL Framework[1], the purpose of evaluation (including programme, project and other assessments) is to assess the overall relevance, coherence, efficiency, effectiveness, sustainability or impact of the STDF's work streams to ensure accountability to donors, and support learning and decisions about what to do next. For ex-post evaluations of STDF projects, the focus should be on the impact beyond the immediate project outputs. This should address, for instance, improved market access, reductions in rejections, improvements in the effectiveness and efficiency of regulatory processes, improvements in national food safety, plant or animal health, etc.

The evaluation should draw out key findings, conclusions and recommendations that are relevant for future work on electronic phytosanitary certification. While the evaluation is intended to focus on, and draw lessons out from, the STDF ePhyto project, it is also intended to consider other e-certification projects, including eVet, that may learn from and/or be affected by the ePhyto project.

2 SUMMARY OF THE PROJECT

The ePhyto project aimed to improve the capacity of countries to facilitate safe, secure and efficient trade in plants and plant products through the establishment of a global framework for electronic phytosanitary certification. The project developed the "ePhyto Solution" as an alternative to the practice of exchanging paper phytosanitary certificates (phytos) or achieving electronic certificate exchange via more costly and time-consuming bilateral agreements.

The project aimed to accomplish this through three streams of activity:

1. Finalizing an already in-progress effort to harmonize phytosanitary certificates;
2. Development of an exchange Hub that NPPOs could link to, to enable the international exchange of electronic phyto-sanitary certificates; and
3. Development of a generic technical solution that developing countries could use, at their option, to create a national interface for shippers and brokers to use in submitting certificates and the NPPOs and other relevant authorities could use to send and receive electronic certificates via the hub. This stream of work also included a pilot implementation of the generic system in three countries.

The ePhyto project was approved by the STDF Working Group in October 2015. The project was contracted by the WTO for implementation by the Secretariat of the International Plant Protection Convention (IPPC) from 15 December 2016 to 30 April 2020, in cooperation with other partners. The IPPC sub-contracted the United Nations International Computing Centre (UNICC) to carry out the technical work to build the ePhyto Hub and develop the web-based Generic ePhyto National System (GeNS). Originally approved for a three-year period, the project was extended once, until 30 April, 2020.

[1] https://www.standardsfacility.org/sites/default/files/STDF_MEL_Framework_Final_English.pdf

The total value of the project was US$ 1,728,000, with an approved STDF contribution of US$ 1,120,000, and a budgeted in-kind contribution of US$ 608,000. At the end of the project, US$ 1,095,257 was spent by the STDF under this project.

The Bureau of the Commission on Phytosanitary Measures assigned responsibility for management of the project to the IPPC ePhyto Steering Group (ESG), which also acted as the Project Technical Committee (PTC). The ESG/PTC were comprised of members from the seven FAO regions, UNICC and the IPPC Secretariat, with the occasional participation of a member of the CPM Bureau. An independent Industry Advisory Group (IAG) was established to provide practical guidance and advice to the IPPC Secretariat on the design, development and deployment of an ePhyto Solution for industry groups involved in the trade of plants and plant products. The IAG was led by the International Grain Trade Coalition (IGTC) and the International Seed Federation (ISF) and comprised representatives from several organizations (see the IPPC website for more details on the IAG and its membership[2]). A Project Advisory Committee (PAC)[3] was created to promote dialogue and share information on the project's progress on with other relevant international organizations. The PAC included representatives of the UNICC, UN/CEFACT, UNCTAD, WCO, CITES, OIE (now WOAH), Codex, World Bank, as well as the IAG, STDF donors and the STDF Secretariat.

The ePhyto project comprised two main components[4]: (i) set-up of a central server (referred to as a "Hub") to facilitate the exchange of electronic phytosanitary certificates (ePhytos) between National Plant Protection Organizations (NPPOs); and (ii) development of a simple web application known as a GeNS to produce, send and receive electronic phytosanitary certificates. The project included pilots in three countries (Ghana, Samoa and Sri Lanka) to test the setup, development and use of the GeNS.

The ePhyto Solution became fully operational in July 2019. In 2020, a connection was established between the ePhyto system and the EU Trade Control and Expert System (TRACES), which allows exporting countries to send their phytosanitary certificates to the EU electronically using the ePhyto Solution. By April 2021, 92 countries were connected to the Hub, and of these, 50 were regularly exchanging ePhytos. The GeNS system had been tested in 30 countries and moved into full operation in eight countries. As of May 2023, there were 125 countries connected to the Hub and 49 GeNS users.

According to the final project report, the establishment of the ePhyto Solution improved the security of official communications between countries. The final project report also highlighted how the ePhyto project contributed to improved trade flows by facilitating improved border access for plants and plant products, reduced cost and complexity for countries developing individual systems for electronic data

[2] See: https://www.ippc.int/en/ephyto/ephyto-industry-advisory-group/
[3] See: https://www.ippc.int/en/ephyto/ephyto-project-advisory-cxommittee/
[4] A third stream of work, coordinating harmonization of the phytosanitary certificate, was a crucial step in getting to a workable ePhyto Solution, but was already underway when the program kicked off.

exchange, decreased the use of fraudulent certificates and removed the need for countries to engage in negotiations to establish the necessary exchange protocols on a country-by-country basis.[5]

Organizations worldwide have looked at electronic SPS certification, generally with an emphasis on ePhyto to better understand how to harness new technologies to facilitate trade. For instance, in 2021 the OECD recognized the positive effects of digital SPS technologies, including the use of the ePhyto Solution on trade volumes for vegetables and other plant-based and processed food products. In this study, the OECD estimated that the total value of exports for selected agri-food product groups (except for animal or vegetable fats and oils) could increase over a 2-year period by between 17% and 32% through implementation of SPS e-certificates. The FAO Trade and Markets Division, supported by EBRD, is currently carrying out an economic analysis. The analysis indicates substantial benefits are available to exporters for switching to ePhyto, including significant reduction of external costs, and a reduction of delay-related costs. Preliminary results indicate benefits exceed costs by several orders of magnitude. This finding aligns with the observation that uptake of ePhyto since the completion of the project has been strong. Likewise, the Global Alliance for Trade Facilitation is completing an assessment of the economic effects of implementation of ePhyto in Morocco and preliminary results indicate substantial shipper benefits resulting from reduced frequency of diversion (interception for documentary non-compliance) and improved ease of addressing documentary error.

The results achieved by the ePhyto project have been recognized globally. There has also been recognition globally of the role of the ePhyto project in contributing towards acceptance and implementation of electronic SPS certification more broadly. For instance, in September 2019 the ePhyto Solution won an innovation award at the UNESCAP Asia-Pacific Trade Facilitation Forum as an example of "innovative digital and sustainable trade facilitation implementation".[6] Winners were selected for their achievement in simplifying and streamlining international trade processes, using digital means and channels for effective and efficient trade facilitation measures; and promoting strong linkages to the 2030 Sustainable Development Agenda. In 2019, the G20 Agriculture Ministers Declaration (Annex 1 "For Better Plant Health") encouraged G20 members to participate in harmonized electronic phytosanitary certification (ePhyto) systems developed by the IPPC, in seeking further regional and international collaboration.

Building on the success of the dialogue and collaboration catalyzed through the ePhyto project (including through the Project Advisory Committee), in October 2019 the STDF Working Group agreed to set up set up an Electronic Certification Advisory Committee (ECAC). The ECAC was created to convene and connect stakeholders with an interest in SPS e-Cert to exchange experiences, identify opportunities for collaboration, promote synergies and disseminate good practices to drive catalytic SPS improvements that facilitate safe trade. ECAC comprises representatives of Codex, Convention on

[5] See the project final report: www.standardsfacility.org/sites/default/files/STDF_PG_504_FinalReport_Jun-21.pdf
[6] See: https://unnext.unescap.org/content/aptff-trade-facilitation-innovation-award-2019-2020

International Trade in Endangered Species (CITES), IPPC, UNCTAD, UNECE/UNCEFACT, FAO, UNICC, World Bank, WCO, OIE, WTO and others.[7] ECAC currently operates as an STDF Practitioner Group.

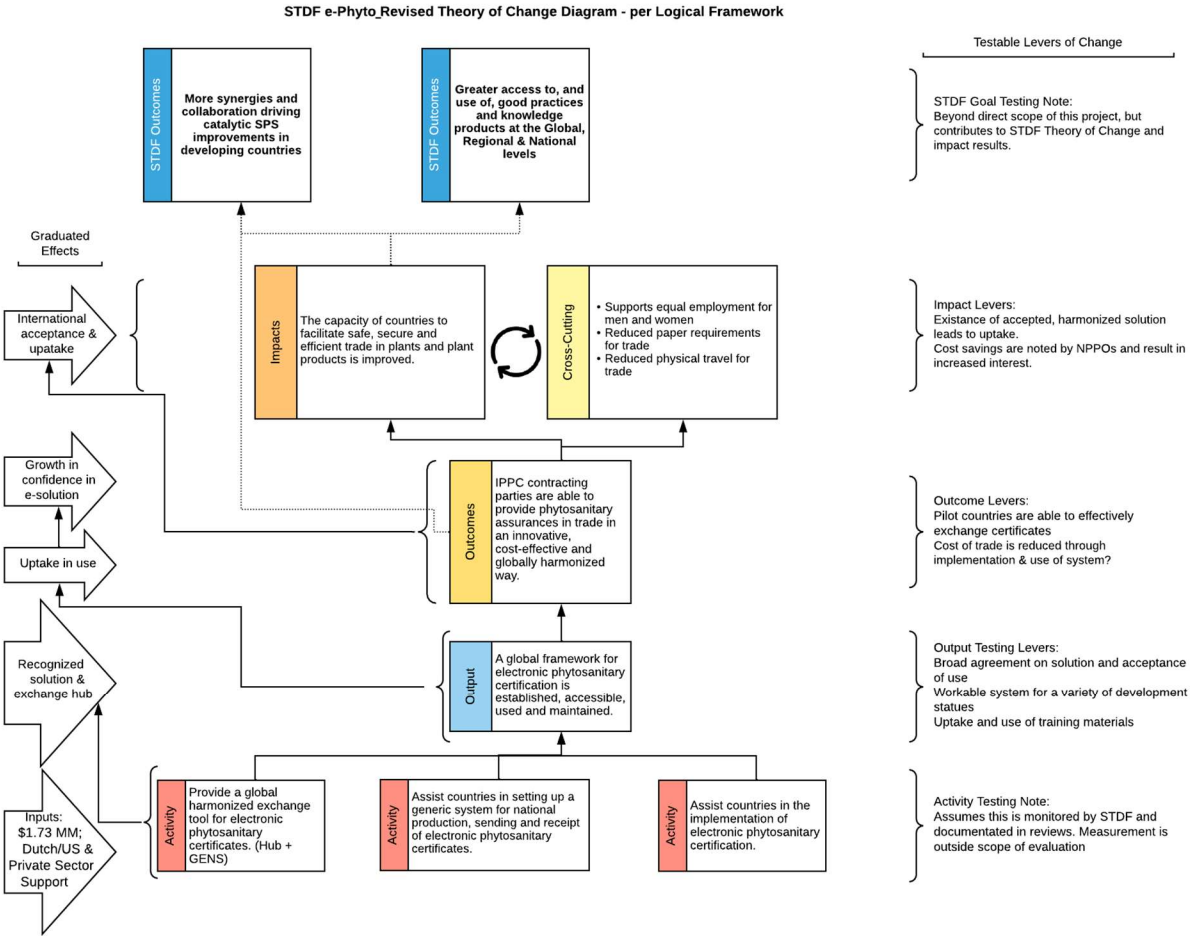
The ePhyto project has catalyzed further support from other partners and donors for replication and scaling up, including the World Bank through the Trade Facilitation Support Programme (TFSP) and the Global Alliance for Trade Facilitation (GATF). In April 2019, the Commission on Phytosanitary Measures approved a five-year strategic plan to continue work on ePhyto, following on from the STDF project. The World Bank Group and the GATF are partnering with the IPPC to scale up the ePhyto Solution in developing countries. The World Bank Group and the GATF have allocated staff time and resources to help developing countries to implement the ePhyto solution, supporting further scaling-up. For instance, the World Bank is supporting implementation of ePhyto in several countries including Côte D'Ivoire, Nepal and Fiji. In 2020, with support from the GATF, Morocco became one of the first African countries to fully integrate and use electronic phytosanitary certificates.[8] Colombia, Ecuador, Jordan, Madagascar, Senegal and Thailand are receiving GATF support to implement the ePhyto solution.[9] Similarly, the ASEAN Secretariat is supporting countries to implement e-phytosanitary certification (Indonesia and Thailand will exchange ePhyto certificates in 2022), and has plans to support new work on e-certification in the food safety and veterinary areas.

As of April, 2023, 109 NPPOs were registered to exchange ePhytos, with 75 actively exchanging phytosanitary certificates via the Hub. Forty-nine NPPOs are using or actively working to use GeNS, with 24 actively using to exchange. At the end of 2021, 107,000 certificates per month were being exchanged via the Hub. As of January 2023, 3 million ePhytos had been exchanged since start-up of the Hub in 2017.[10]

2.1 THEORY OF CHANGE

The original project utilized a logical framework (logframe) to describe the project outputs and effects. In order to devise an approach to evaluation and to clarify the theory of change, this logframe was converted to a pictographic theory of change (TOC) diagram. The TOC was reviewed with and revised by STDF to ensure accuracy and completeness.

[7] For more on ECAC membership, meeting summaries, etc. see: www.standardsfacility.org/sps-ecac
[8] See: www.tradefacilitation.org/project/morocco-optimising-import-export-processes-agri-food-sector/
[9] See: https://www.tradefacilitation.org/projects-modernising-agricultural-trade/
[10] See: https://www.ippc.int/en/news/new-milestone-reached-as-three-million-ippc-ephyto-certificates-exchanged/



Of key importance to the evaluation design is the identification of testable levers of change. As discussed in the evaluation approach – these levers of change are assessed by determining whether or not and to what extent the anticipated changes have taken place, what context strengthened or weakened them, and if they did, indeed, lead to the anticipate result. This assessment is presented in Section 4.

2.2 PROJECT CONTEXT

The ePhyto project was conceived to:

" . . .improve the capacity of developing countries to facilitate safe, secure and efficient trade in plants and plant products through the establishment of a self-sustaining global framework for electronic phytosanitary certification."

The IPPC, which proposed the project to STDF, envisioned that once the system was established and accessible to all Contracting Parties, it would enable them to communicate phytosanitary assurances in a modern, cost effective and globally harmonized way.

The International Plant Protection Convention (IPPC) had, previous to this project, adopted International Standard for Phytosanitary Measures (ISPM) 7, Phytosanitary certification system and ISPM 12, Phytosanitary certificates. These provide harmonized guidance on phytosanitary certification which are used to certify the phytosanitary condition of select traded goods such as wide variety of plant and plant product commodities including food grains, forest products, seeds for planting, ornamental plant material, etc. These standards provide National Plant Protection Organizations (NPPOs) with harmonized guidance in the issuance of phytosanitary certificates by NPPOs of the exporting country.

There were a number of perceived benefits associated with a shift to electronic phytosanitary certificates:

- Reduction of the costs and delays related to the inspection of goods for phytosanitary certification, the payment of fees and the issuance of certificates;
- Improvement of the documentation of the inspection process;
- Reduction of the costs associated with printing and shipping paper certificates;
- Reduction of the costs associated with sorting, distributing, retrieving and archiving paper documents;
- Increased assurances for access of imported consignments by ensuring that documentation is delivered to import authorities in a timely manner and that any issues related to documentation may be addressed prior to arrival of the consignment;
- Expedited communication on specific phytosanitary certificates between exporting and importing NPPOs;
- Decreased fraudulent certificates and increased transparency of certificates that have been issued and received between NPPOs;
- Increased efficiency through removal of manual processing of import documentation;
- Enabling information to be more efficiently stored and accessed (i.e. “in real-time”); and
- Improved reporting and data analysis to make more sound, risk-based decisions.

According to the IPPC’s project application: “In 2012, an appendix to ISPM 12 on electronic phytosanitary certification was approved paving the way for more efficient and effective communication between governments and providing a means for expediting the trade of often perishable commodities. The appendix harmonized the concept of exchange of electronic phytosanitary certificates.”

In 2015-16, when the ePhyto project concept was being developed, several developed countries had made significant advances in developing systems for electronic certification (e-certification) and a handful of developing economies had started to plan and develop their own systems. These included Australia and New Zealand, the United States of America, the Netherlands, Kenya, The Republic of

Korea, The Peoples Republic of China, Argentina, Ethiopia and Chile, among others. These early systems were often highly costly to develop. A 2014 study commissioned by the IPPC (Bryant Christie Inc, 2014), reported that development of national systems to exchange ePhytos had costed some countries about US$ 8-10 million and that negotiations to establish agreements for exchange could cost US$ 50,000 per country. While these costs are bearable for developed economies, they become more problematic in developing country contexts.

Given the expansive benefits that were expected to result from transition to electronic SPS certification alternatives, IPPC believed that funding a harmonized approach would greatly reduce the development burden on developing countries while enabling a relatively low-cost and manageable shift to ePhyto and positive trade impacts internationally. Further, supporting an eased transition would limit market share losses that could potentially accrue as trade partners increasingly shifted to e-certification alternatives. This is particularly true as the profusion of national systems was increasingly making it difficult to develop and integrate electronic systems for producing and receiving certificates, and then to transmit these certificates using a growing number of country-specific transmission protocols.

At the time of project development, in addition to the growth in unique national systems, various international agencies including the WCO, the World Trade Organization (WTO) and others were advancing discussions on strengthening coordination and collaboration amongst border management agencies as part of the, then forthcoming, implementation of WTO's Trade Facilitation Agreement. This included SPS related border controls. A number of single window approaches were being adopted by countries, all of which aimed to develop and implement electronic documentation transfer systems to expedite border procedures and improve security.

Prior to the project, development of, and transition to, e-certification was primarily made on a bilateral basis, particularly between developed countries. This resulted in the adoption of diverse point-to-point systems. To address this, the IPPC actively sought to increase harmonization and simplify methods of electronic data exchange. An IPPC informal steering committee was set up in 2010 to coordinate efforts to simplify electronic phytosanitary certification. The main aim of this steering committee, which was composed of 5 members from the Food and Agriculture Organization of the United Nations (FAO) regions, was to guide a process leading to harmonization.

In the developing world, limited examples of successful implementation of ePhyto had been reported prior to the project. Kenya was experimenting and had made significant progress in development and application of electronic phytosanitary certification with financial and technical assistance from The Netherlands. Similarly, the Netherlands assisted Ethiopia to begin a trial of a “single window” approach for the issuance of phytosanitary certificates. The system, termed ASCYER, is a phytosanitary component of UNCTAD's customs automation program ASYCUDA. ASYCUDA is a customs management system that facilitates trade procedures including manifests and customs declarations, accounting procedures, transit and suspension procedures. The Ethiopian trial noted a number of challenges including: turnover of trained personnel; the sub-optimal location of the server; lack of trained technical support staff; etc.

which require careful consideration in the design, training and field implementation of such systems. At the time the project was approved for funding by STDF, ten countries had active ePhyto systems in place. But of these, five could only receive ePhytos and five could only send them. There was already substantial interest in a generic national system solution that could do both. Twelve countries had already expressed interest at the time of project funding application.

In addition to national interest, regional support through regional plant protection organizations (RPPOs), and international institution support, the private sector demonstrated a keen interest, likely due to the fact that the benefits of a transition to e-certification were both clear and substantial. A project advisory committee (PAC) had been established with the intention of supporting public-private cooperation on this issue. And the PAC supported the implementation of an Industry Advisory Group (IAG). The IAG was (and continues to be) composed of international plant and product industry associations that support businesses trading the commodities that are subject to phytosanitary certification.

3 EVALUATION APPROACH

The evaluation approach was approved by the STDF Secretariat during the inception phase of this study. It includes both *Context Analysis* and *Contribution Analysis*. The context analysis relies on a mixture of quantitative and qualitative data to assess how the project has performed, relative to the evaluation questions, *within the context in which it was implemented*. The contribution analysis specifically focuses on how the project contributed to observed outcomes. The primary mechanism for this part of the assessment is the analysis of the theory of change, how it anticipated change would come about, and assessment of whether those *mechanisms of change* materialized or not. For this reason, it is often referred to as a *theory-based analysis*.

Approach to Contribution Analysis[11]

The evaluation has critically considered the evidence regarding project outcomes to understand how, and to what extent, the work of IPPC on ePhyto, as funded by STDF, contributed to achieving each specific result. This consideration also looks at what other factors, such as other organizations or actors' actions and contextual factors including political developments, including those outside the control of the programme.

Data collected for the evaluation includes secondary and programme documentation as well as qualitative information gathered through semi-structured interviews with a range of stakeholders, including designers and implementers, implementing partners at multi-lateral institutions, external

[11] Contribution is particularly recommended for evaluations of programs where there was no experimental design to implementation, where a clear theory of change exists or can be articulated and where there is little scope for variance to how it is implemented. All three conditions describe the ePhyto project well. The project was implemented without trials or testable alternatives. During this inception period a clear theory of change, based on the existing logical framework was developed. And lastly the project was implemented one time, more or less in the way originally envisioned by IPPC.

stakeholders in the area of SPS, RPPOs, a range of NPPOs in both developed and developing countries, and shippers in developing countries.

As an output, the report from a contribution analysis is not definitive proof, but rather provides evidence and a line of reasoning from which a plausible conclusion can be drawn that, within some level of confidence, the project has made an important contribution to the documented results.

APPROACH TO CONTRIBUTION ANALYSIS

Traditionally, Contribution Analysis includes six major steps that define how this evaluation will be undertaken:

Step 1: Set out the attribution problem

STDF has set out the fundamental impact attribution evaluation question. To what extent did the development of an ePhyto hub and GeNS solution contribute to improving safe trade?

But, as can be seen in the evaluation matrix in the annex, this question has multiple components that needed to be answered to derive an answer.

Step 2: Develop a theory of change and risks to it

A theory of change was developed during the inception period, reviewed by STDF and is included in this report.

Step 3: Gather the existing evidence on the theory of change

This was started during the inception phase – through collection of OECD studies and FAO and FAO draft studies on eCert and ePhyto – and continued through the field work period via further documentary review, two case study missions and a number of stakeholder interviews.

Step 4: Assemble and assess the contribution story, or performance story, and challenges to it

The data have been assembled at the evaluation sub-question (SEQ) level (see the evaluation matrix in annex) to ease the ability to interpret it and make collective judgements on the results at the evaluation question (EQ) level.

Step 5: Seek out additional evidence

Better evaluation suggests that, "where the contribution story is less credible, additional evidence is now gathered to augment the evidence in terms of what results have occurred, how reasonable the key assumptions are, and what has been the role of external influences and other contributing factors. Augmenting evidence can include the collection of additional, new data such as from surveys, field visits, administrative data, focus groups, national statistical data, etc. as well as the synthesis of evidence from other research and evaluations." This was the purpose of the majority of the field work, including phone-based Key Informant Interviews (KIIs) and the two case studies.

Step 6: Revise and, where the additional evidence permits, strengthen the contribution story

The preliminary results of the contribution analysis have been shared with and validated by key stakeholders as identified by STDF in a review process that created an opportunity to strengthen the contribution story and tie it to lessons and recommendations.

In order to gather evidence, the evaluation undertook a structured document review, preliminary interviews with key stakeholders, semi structured interviews with a wider set of stakeholders (Key Informant Interviews or KIIs) and two case studies in Uganda and Samoa. Collectively these are referred to herein as "respondents". The set of respondents included representatives of the IPPC Secretariat, STDF secretariate, members of the ESG, representatives of WOAH and Codex, the OECD, the World Bank, Global Alliance for Trade Facilitation, Trademark East Africa, Pacer+, representatives of a variety of NPPOs and RPPOs in both developed and developing country contexts, including in the EU, USA, New Zealand and Australia, Uganda, Samoa, Morocco and Kenya, members of private-sector interest groups represented on the IAG, and shippers (exporters) of plant commodities covered under phytosanitary measures (including, flowers, seeds, coffee, fresh fruit and vegetables, and wood and woven goods).

Additionally, two case studies were undertaken of GeNS implementing-NPPOs. For the case studies, one pilot (Samoa) and one non-pilot country (Uganda) were selected.[12] The case studies were documented in back to office memos, appended to this report, and the document review and interview notes were used to populate the evaluation matrix that was approved at inception and is also appended to this report. Respondents were guaranteed anonymity and therefore evidence collected from KIIs and case studies are only referred to collectively in this report.

4 EPHYTO SOLUTION PRIMARY RESULTS

On a total budget of $1.7 million[13], the ePhyto Solution project developed the system of electronic exchange, a hub through which multi-lateral exchange could be facilitated, and a generic national system (GeNS) that could be implemented by counties without access to a national electronic system to connect to the hub, generate ePhytos and both send and receive them from trading partners. In addition, significant outreach and education activities were undertaken and three pilot countries were engaged with to test and refine the GeNS (Ghana, Sri Lanka and Samoa). Following the pilots, uptake of the ePhyto solution has been steady, reaching 109 participating NPPOs as of April 2023, of which 75 are actively exchanging certificates. Notably, of these, 49 have implemented or are in the process of implementing GeNS, with 24 of these actively using the interface. This is a reasonable indicator of the reach of the Solution into developing country contexts. The volume of phytosanitary certificates being electronically exchanged through the HUB continues to grow, reaching over 100,000 per month at the end of 2021.

[12] Samoa was selected as the pilot country case study due to continuing instability in Sri Lanka and concurrent work in Ghana that was already engaging the NPPO. Uganda was selected as the non-pilot country case study due to the desire to select from a region not-represented by the pilot case study, the fact that Uganda had implemented GeNS without significant external assistance and the fact that they had switched to an electronic Phyto-only framework. Case studies were undertaken in the first quarter of 2023.

[13] In addition to direct expenditures by IPPC, the successful implementation of the ePhyto solution was aided by investments in technical support at country level by the World Bank, the Global Alliance for Trade Facilitation, and Trademark East Africa, among others. Any assessment of value relative to cost would need to factor these investments into the calculus, but this evaluation was not able to determine the scale of those investments.

IPPC had several goals set out at the time the ePhyto solution was conceptualized. These are described in the theory of change at the output, outcome and impact levels:

Level	Goal	Testable Lever[14]	Result
Output	A global framework for electronic phytosanitary certification is established, accessible, used and maintained	Broad agreement on solution and acceptance of use	While, the selection of an approach was subject to appropriate debate and discussion, the xml, post-office style approach selected was broadly agreed to and is now widely accepted.
		Workable system for a variety of development statutes	Legal status of e-certificates has been one of the bigger stumbling blocks to uptake globally, sometimes requiring legislative action prior to adoption at the national level. Despite this issue, uptake and use have continued to grow.
		Uptake and use of training materials	Among sampled countries, the availability of training materials and support was cited as a key factor in encouraging use and successful implementation. In case study countries, shippers noted the availability of training in the use of GeNS.
Outcome	IPPC Contracting Parties are able to provide phytosanitary assurances in trade in an innovate, cost-effective and globally harmonized way	Pilot countries are able to effectively exchange certificates	The three pilot countries represent a spectrum of successful implementation. Samoa, which has a limited larger-scale export community is successfully exchanging certificates with a handful of trading partners and Ghana, which experienced complications in getting the system up and running, now also exchanging certificates (all three pilot countries are now both sending and receiving ePhytos)[15].
		Cost of engaging in trade is reduced through implementation and use of the system	The average trade cost reductions observed to date are relatively minor for routine trade. But in exceptional cases, ePhyto can have a dramatic savings effect – reducing interception-related delays and even re-shipping in some cases. Administrative cost savings for NPPOs have also been reported.
Impact	The capacity of countries to facilitate safe, secure, and efficient trade in	Existence of an accepted, harmonized solution leads to uptake	ePhyto has resulted in re-affirming a fairly standardized process and certificate, relative to other trade product certifications. Harmonization is

[14] As identified and approved by the STDF secretariat in the evaluation inception report.
[15] See https://www.aphis.usda.gov/aphis/ourfocus/planthealth/sa_export/ephyto-participating-countries for a non-comprehensive list of counties sending, receiving or both sending and receiving ePhytos.

Level	Goal	Testable Lever[14]	Result
	plants and plant products is improved		clearly a necessary condition for ePhyto uptake, but it is not clear that that implementation has resulted in further or improved harmonization of certificates to-date, given that work on harmonization was largely complete by kick-off.
		Cost savings are noted by NPPOs and result in increased interest.	Administrative cost savings were reported by all NPPOs interviewed. While these have tended not to be dramatic savings, many NPPOs in developing countries are poorly funded and any savings can be significant incentive to uptake.
Cross-cutting Impact	Supports equal employment for men and women	n/a	While conceptually, bringing trade activities on line are thought to assist equality of participation, none of the traders or NPPOs interviewed reported specific examples of gender-empowerment via ePhyto.
Cross-cutting Impact	Reduced paper requirements for trade	n/a	In most cases, for those NPPOs and traders interviewed, paper savings were modest as ePhytos are still being printed and shipped with goods shipments as a risk-mitigation measure. Note, however, that in Vanuatu, UNCTAD reports that electronic facilitation of SPS requirements has reduced paper consumption by 88% and trip taking by 76%, though this includes all SPS requirements, and not only those covered under ePhyto.
Cross-cutting Impact	Reduced physical travel for trade	n/a	ePhyto has resulted in reduced advanced shipping of certificates, as well as reduced re-shipping of corrected certificates due to documentary non-compliance interceptions.

In summary, the ePhyto solution has successfully instituted a system and mechanism of exchange that is working, is steadily growing in both scope and scale (number of users and total use), has cost and time savings effects, *increases plant trade security*, and has demonstrated usability amongst developing nations. As is discussed in the findings sections below, these successes do not mean that either the road to the current state or the system as it currently stands today are without problems or potential improvements. However, the scale of benefit being generated, relative to a modest development cost, has already been highly impressive and can therefore be considered successful in aggregate.

5 KEY EVALUATION FINDINGS

The terms of reference for this evaluation set out a relatively long list of evaluation questions and the evaluation approach taken resulted in an even longer list of sub-questions. These are addressed in the evaluation matrix in the Annex. For ease of presentation here, findings are set out by DAC[16] criteria instead of by question. Key findings are summarized for each criterion, followed by a fuller discussion.

5.1 EFFECTIVENESS

Key results of the ePhyto Solution are described in the preceding section. The stakeholders describe the project as effective to highly effective in meeting its primary goals:

- The solution is functional and successfully facilitates bilateral exchange of certificates as expected and with minimal on-going issues.
- The solution has added significant security to the process of plant trade, greatly reducing incidence of fraudulent certificates among countries using ePhyto.
- The ease of movement of ePhytos, relative to traditional paper phytosanitary certificates, has facilitated ease of trade for those countries using them.
- The GeNS platform has enabled NPPOs with relatively low capacity and resources to access the Hub with minimal issues, including, in some cases, without significant external support in the implementation process.
- The use of UNICC as the developer and host has resulted in a user-responsive administration and continual improvement in the system in response of user requests.

The ePhyto Solution is effective. The Hub has eliminated the need to establish bilateral agreements between trading partners for the exchange of electronic phytosanitary certificates (phytos) which prior to the program was a costly, time-consuming process. The Generic ePhyto National System (GeNS) allows those participants without a national system to access the hub and send and receive ePhytos. Both are predicated on a harmonized exchange method, developed under the project, which resulted in the currently-used XML format of mapping the ePhyto document. As a result of this work, and the three-country pilot (Ghana, Sri Lanka, Samoa) used to test the Solution, use of the system has grown consistently since implementation was completed, reaching over 100 participating NPPOs as of April, 2023. The overall goal of the project was to provide any interested country with the opportunity to exchange ePhytos in order to facilitate safe and efficient trade in plant products. This evaluation has determined that this goal has been met. The system as designed and implemented has enabled interested parties to participate in electronic exchange of ePhytos.

The GeNS web interface has enabled lower-capacity and financially challenged contracting partners to implement ePhyto domestically. It is simplified enough that it is possible to implement with minimal

[16] Donor Advisory Committee of the OECD

assistance, though many NPPOs are getting third-party support. Further, users in-country are able to use the web portal to file for ePhytos successfully, improving the overall business process efficiency for the issuance of phytosanitary certificates.

Not only has the ePhyto Solution met its top-line goal, it works well. The system has demonstrated very low downtime.[17] That is not to say that there have been no technical problems. Problem-free electronic systems probably do not exist. But problems have been minimal and are generally easily resolved. The most common issue has been "loss" of certificates issued by NPPOs but not sent via the system during a scheduled downtime event. Once experienced, NPPOs using the system have become accustomed to identifying and rectifying such an event with minimal issue. Likewise, key informants reported no cases of false notifications of incoming ePhytos.

UNICC has provided high-quality user service and support. Any new system will require user adjustment. Further, GeNS is designed to be used by contracting partners that do not have an existing national system in place, and therefore tend to have the lowest available internal technical capacity. UNICC has provided technical support both in setting up and in the routine use of GeNS, staffing a 24-hour support hotline and having dedicated trouble-shooting resources. Key informants indicate that these are responsive and useful, with no cases reported of exceeding maximum response time and frequent on-call support immediately being available.[18]

Of the effects of transitioning to ePhyto, the benefit most cited by agricultural inspectors and other NPPO staff in developing country contexts has been the greatly enhanced fraud detection resulting from having an easily accessible and uniquely coded electronic phytosanitary certificate to compare to any hard copy presented. Fraudulent phytos are cited as a common and not-infrequent issue by some NPPOs. Historically, fraud has been committed either using fake documents or altered official documents. ePhyto has effectively made both much more difficult to accomplish successfully. Each printed ePhyto carries a QR code that enables inspectors to easily and quickly compare to the electronic version. Forging fake certificates is no longer possible, where contracting partners are exchanging ePhytos, as there is no way to get the fraudulent certificates onto the Hub. While traders tend to cite time and cost reductions and reliability improvements as benefits of the ePhyto Solution, along with administrative cost savings, fraud reduction is the most frequently noted benefit by NPPO staff.

Shippers of plant products are, by and large, enthusiastic about the transition to ePhyto. Discussed further under "Impacts," traders note the reduction in interceptions due to documentary non-compliance as well as the reduction in time and cost to resolve such instances when they do occur. The ability to swap out corrected ePhytos via the system means that time and cost to move corrected

[17] Respondents estimated planned downtime to be less than 30 minutes per day and UNICC states that back-up servers preserve functionality during this period. No extended world-wide outages have been experienced to-date.
[18] Note, however, that satisfaction with customer support tended to vary with time zone, where NPPOs located in zones with working hours during EU night time, had more frustrations and less immediate response from the UNICC help desk.

documentation is greatly reduced and as ePhytos can precede shipments, issues are sometimes even identified prior to shipment arrival in port.

5.2 EFFICIENCY

Given that the ePhyto solution was the first global attempt at serving the plant protection and trade facilitation needs of NPPOs across the full development spectrum, and sought to be highly inclusive, the project development was remarkably efficient. The piloting process was more challenging, though ultimately resulted in an implementable GeNS system, though one that does not yet deliver the maximum potential operational efficiency.

- Cost relative to output was low.
- Cost of continuing use is low, though hampered in some contexts by equipment and internet access issues common in developing countries.
- Geographic and development status reach is diverse.
- Most developing country NPPOs lack sufficient capacity, budget and capital financing to self-manage implementation and upkeep and this will be a continuing issue for the project.
- The GeNS, while meeting immediate needs, could deliver significantly more value at the national level with further enhancements.

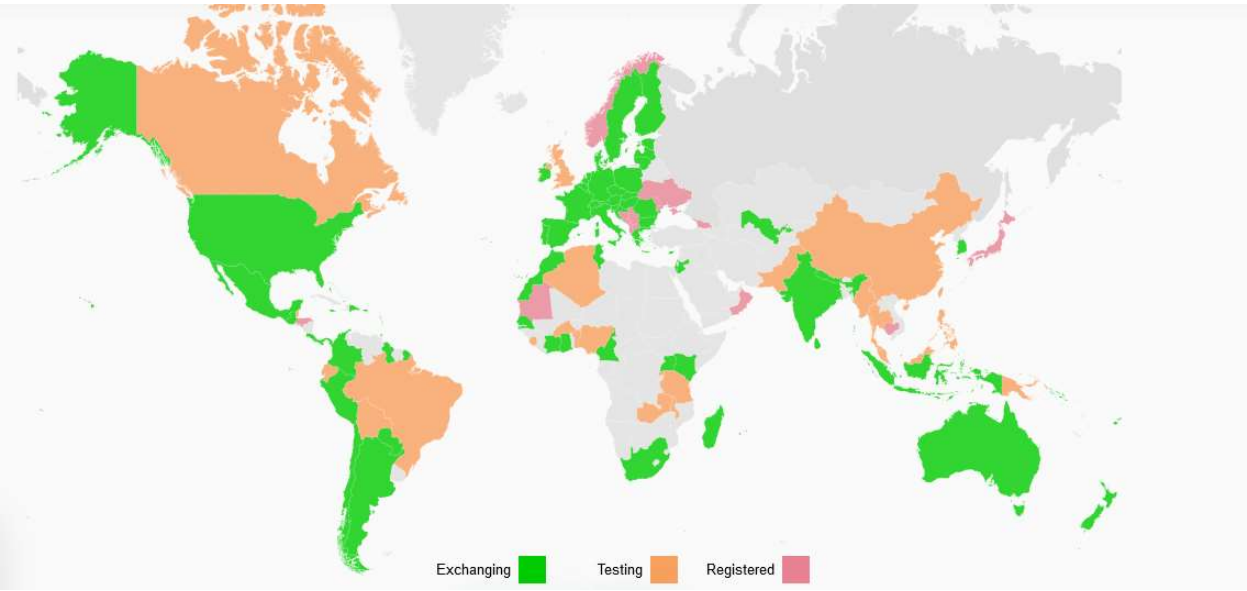
On a cost to output basis, the ePhyto Solution project delivered significant results on a relatively limited budget. In the end, IPPC implemented the ePhyto Solution for a budget of USD 1,728,000, of which USD 1,120,000 were via a grant from STDF and USD 608,000 were in-kind or other contributions. Not all of the budget was spent as of project close out and about USD 24,000 were carried forward to fund additional operations. For this budget, the system of harmonization was finalized[19], the Hub was designed, developed, tested and implemented, and the GeNS was developed, tested, piloted, and finalized. Given the typical costs of systems development, respondents judged this to be substantial value for money. Some respondents from developed country NPPOs noted that the cost of running the ePhyto solution, in total, is less than the administrative cost of adding a few bi-lateral connections to their existing national system alone, and therefore the operating cost value for money was also high.

However, the cost of development and implementation does not include the cost of implementation at the country level, beyond the three pilot countries. National implementation cost varies significantly across country contexts. The cost for countries with existing national networks to connect to the Hub are fairly minimal according to respondents. NPPOs implementing GeNS have a somewhat greater burden, though in most cases implementation has been supported by third-party multi-lateral development partners. Countries seeking to build new national systems that integrate an interface and connection to the Hub have the greatest financial burden, often exceeding the total ePhyto development cost, though ePhyto transfer capacity is only a portion of that cost.

[19] Work on harmonizing phytosanitary certificates had been ongoing prior to project kick off.

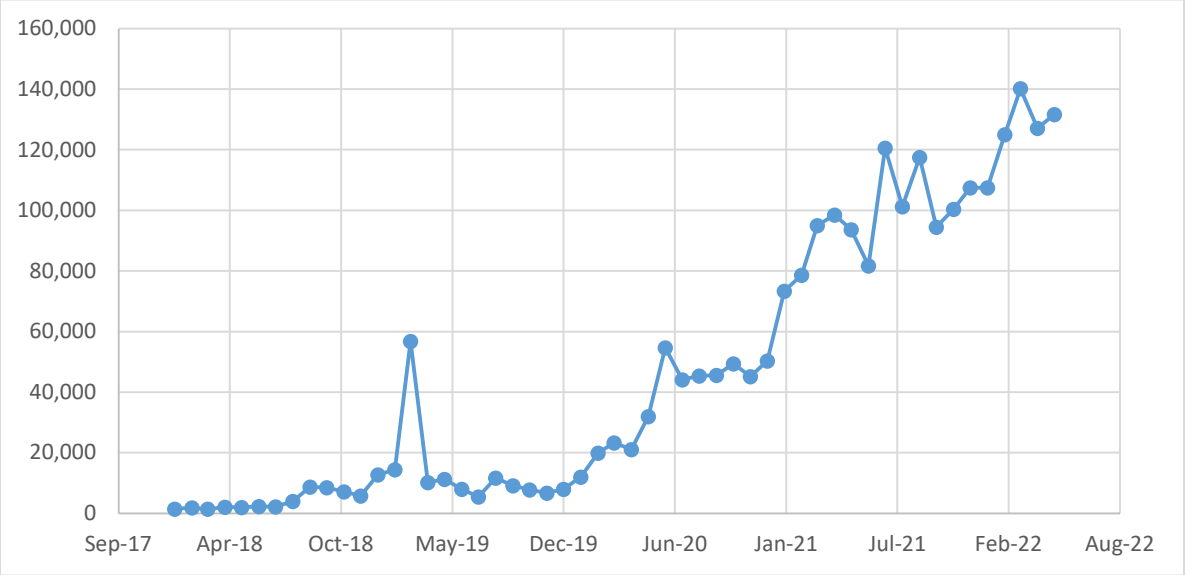
For developing country partners, the financial burden can exceed the cost of setting up GeNS use on local servers. The transition to ePhyto also requires hardware to host and access the GeNS, including mobile equipment if GeNS access is to be used in the field, which increases its utility in terms of benefit production. Internet access is also needed, including mobile internet access if it is to be used efficiently. This equipment needs to be acquired and maintained and/or replaced periodically. The financial capacity shortfall was observed across both case studies (Uganda and Samoa) and noted by a number of respondents. Organizations such as the World Bank, the Global Alliance for Trade Facilitation, Pacer +, and Trademark Africa have indicated their intention to support both implementation and capital acquisition needs. But it is clear that, in most cases, on-going support is needed. Were third-party development partner support not to have been made available, it is unlikely ePhyto would be very far along today amongst developing nations.

One of the primary goals of the ePhyto Solution project was ensuring access to the system for contracting partners across all contexts. The system as developed is simplified enough, and sufficient third-party support has been made available that this goal has been met. As of writing, the map of contracting partners with connections to the Hub or working on developing them is as below.



Source: IPPC

As is indicated, ePhyto has penetrated every major region, with significant uptake in Europe and North America along with substantial uptake in South and Southeast Asia, West Africa and Latin America. With access to the US market and the EU via TRACES for ePhytos, a substantial proportion of global plant and plant product trade is now traveling under electronic certificate. China is currently testing ePhyto and, if implemented will likely result in the majority of phytosanitary certificates being traded electronically. As indicated in the figure below, ePhyto use has continued to grow linearly.



Source: IPPC

While the ePhyto solution and particularly GeNS has been impactful for developing countries, its full potential impact has not yet been realized. Access to ePhyto via GeNS has helped both NPPOs and traders of plant products to be more efficient. NPPOs report reduced administrative costs, improved fraud detection, and greatly eased data analysis capacity. Traders report shorter wait times and complexities for phytos, improved certainty in avoidance of interceptions for documentary non-compliance, and reduction in costs for moving phytos.[20] However, there are a number of potential efficiencies cited both by traders and NPPOs that are yet to be realized. The most frequently cited efficiency opportunity relates to e-payment. All NPPOs interviewed charge a cost-recovery fee for the issuance of a phytosanitary certificate. Because GeNS is not yet set up to facilitate electronic payment[21], in many instances, traders still need to make a physical journey, often of some distance, to make payment for the phyto, even if it is to be issued electronically. This reduces the potential efficiency of having an electronic system in place. Additionally, all shippers interviewed indicated they still print and ship a hard copy of the phyto, even when sent electronically, for the avoidance of risk. This reduces some of the potential environmental benefit and some of the cost savings associated with the ePhyto Solution. UNICC maintains a list of requested upgrades and with approval of the ePhyto Steering

[20] Where shippers would have traditionally moved phytos by courier, they now send them electronically, with a back-up copy included in the shipment itself. Where certificates need to be replaced to address an error or omission, this can be done electronically as well, where it would previously have required an additional couriered shipment.

[21] This is for good reason, as a generic system, fit for all potential contexts, would not be able to accommodate the wide variety of payment systems in use globally. However, UNICC has developed a payment module capable of capturing and storing a pdf receipt for e-payment, off-site. The UNICC module is new as of April 2023, so we don't yet know if or how well it will meet user requirements. However, we do know it is designed to capture, store and associate with an ePhyto record, a pdf of a receipt for payment, rather than facilitate the payment itself or link directly to an off-GeNS payment system. This indicates additional design and transaction requirements that may limit its effectiveness in resolving the payments issues highlighted by GeNS-using NPPOs.

Committee, prioritizes and implements these. So that, over time, additional benefits may continue to be unlocked.

5.3 RELEVANCE

The ePhyto solution addressed a genuine need: one that was not obvious at the initiation of the project – COVID-19 – and another that remains relevant today – the desire to improve efficiency of trade while maintaining the plant protection mission of NPPOs. The selected approach met the needs of most and was implementable and accessible. A wide variety of stakeholders were successfully integrated into the development process.

- The project effectively integrated NPPOs, RPPOs, and the private sector into decision making and design of the solution.
- Advisory groups and an oversight committee were key to developing a workable system.
- While the collaboration approach was successful and resulted in broad participation, it did not engender a faster pace of collaboration in the plant protection space.
- The ePhyto project did result in outreach and training, including on broader plant protection issues, both within the trading community and between NPPOs and other government counterparts.
- The development process and resulting systems appear to be relevant to other potential e-certification efforts.
- The project had little to no effect on gender[22] and minor effect on the environment.[23]

The project development approach was highly inclusive and broad in its outreach. The STDF grant to fund development was contracted in December of 2016. By January 2017, a global survey of ePhyto readiness was already underway. UNICC and IPPC agreed to the design and development path by the start of 2018.[24] The project was managed by a steering group (ESG) that also served as its technical committee. This steering group included members from all seven FAO regions, UNICC and the IPPC Secretariat. In addition to representation across all contracting party types, the project also formed an Industry Advisory Group (IAG) to gain input and representation from the private sector. The IAG was

[22] This is largely because the scope for impact on gender is very limited. The evaluation did not find any evidence there was a gender-specific need related to ePhyto issuance or transmission that could have been addressed by the project, but wasn't.
[23] The evaluation did not result in clear evidence of quantified environmental effects, but the balance of information suggests that there are positive environmental impacts, though these may be less at this point than in the future, when fuller acceptance of ePhyto results in greater trust of the system and reduced printing. There are clear reductions in trips, and therefore carbon reductions, but there are also additional environmental costs resulting from added equipment and electricity use.
[24] Per the ePhyto Project Closeout Report: "The IPPC Secretariat and the United Nations International Computing Centre (UNICC) finalized contracting for the development of the GeNS in late January 2018. Prior to its selection as the developer of both the ePhyto Hub and the GeNS, UNICC first attempted to work with UNCTAD to review the feasibility of using ASYCER as a GeNS. Unfortunately, ASYCER failed to provide a proposal for consideration, despite numerous requests, causing a lengthy delay to the beginning of work on the GeNS. As a result, the piloting of the GeNS in Sri Lanka, Samoa and Ghana suffered a slight delay in launching. However, the GeNS component of the ePhyto Solution was opened to all interested IPPC contracting parties as of 15 July 2019."

particularly active and much of the drive to get ePhyto implemented came from the private sector, for whom the benefits of digitization were perhaps more readily apparent. While this public-private approach was helpful in catalyzing support and getting to a faster determination of how to implement ePhyto, it is not seen by respondents as being specifically novel or different to prior or subsequent approaches. Rather, multiple respondents felt it represented a "best case" scenario for a framework of public-private collaboration that is often attempted but not always as successfully realized.

IPPC, STDF and other stakeholders[25] have engaged in ongoing outreach and education as a component of the development and implementation of the programme. This process has helped encourage uptake of ePhyto. One developing country NPPO director noted that outreach came at exactly the right time and immediately convinced them that ePhyto was a solution to a pressing need. Outreach by RPPOs was cited by NPPOs as crucial in establishing not only the value of ePhyto, but identifying best practices in implementation. Traders noted that NPPO outreach into the export community was highly useful in transition process (from paper to electronic phytos). The training materials developed by IPPC for use by NPPOs in delivering outreach were "relevant" and "useful".

While the ePhyto Solution is seen by stakeholders as both highly relevant to their needs, and also relevant to efforts to digitize other SPS certifications, there does not appear to currently be a will to push those efforts forward.[26] Most of the stakeholders interviewed see a connection to other e-certification efforts. Australia and New Zealand ran a test transfer, for example, of a single meat certificate, using the Hub. Exporters who are using ePhyto now expressed interest in being able to exchange other SPS certificates electronically. OECD's recent study (2021) of the benefits of e-certification note expansive benefits are available via digitization.[27] However, the will to push forward from within WOAH and Codex appears to be more tempered. Both organizations indicated they would not be inclined to move forward, absent an internal membership-driven push.

Both the cross-cutting gender and environmental effects of ePhyto implementation appear to have been more muted than hoped for. While the conceptual gender benefit of a move to increased online activity that could allow women greater ease of participation in trade was expressed by a number of respondents, there is no specific evidence that this has or has not been realized.[28] It is now policy for STDF to undertake gender analysis at project start up, and had this been required and undertaken for the ePhyto Solution it is possible that avenues through which gender mainstreaming and impact could have been achieved might have been identified and acted upon. This is also true for environmental impacts, though here effects are more intuitive to most stakeholders who note the paper user

[25] Including a number of private sector stakeholders, such as International Seed Federation.
[26] See, for example, the assessment of the potential for an eVet system developed by Eric Boskers for STDF, STDF/PG/609 in which it is noted that "A collaborative approach by the OIE and Codex to standard setting on certain key topics is important to ensure harmonisation of standards and recommendations, when relevant, while avoiding duplication of effort, overlap and gaps in standard-setting work."
[27] Aside from inclusion and environmental benefits, OECD estimates substantial trade benefits of SPS certification digitization of 15 to 30% after two years depending on the category of goods.
[28] When prompted, respondents could only cite hypothetical examples of gender benefits associated with implementation of ePhyto.

reductions of e-certification, as well as the travel reductions associated with decreased movement of certificates. However, to date, these benefits, while likely real, have been less robust than hoped for. Paperwork reductions are being realized but not at the scale originally hoped for due to the fact that most shippers are printing hard copies of ePhytos to send with shipments. However, shippers did report expenditure savings on couriered phytos resulting from ePhyto implementation, indicating some reduced transport effect is being experienced. Whether or not this offsets the increased energy consumption resulting from the added technology requirements is not readily clear, though it seems likely.

5.4 COHERENCE

At the country level, there is some limited evidence that the ePhyto project resulted in improved coordination on SPS issues across government departments, and these largely relate to either issues of payment processing or data management and reporting. However, there is more evidence that the project helped facilitate coordination between NPPOs and multi-lateral development partners and private sector stakeholders on plant protection and SPS issues more broadly.

- Country level, cross- government coordination arising from implementation of ePhyto has been fairly limited, and related mostly to integration with national single windows and/or e-payment integration.
- A number of development partners have mobilized around ePhyto, assisting developing country NPPOs with implementation as a component of trade facilitation assistance.

For developing countries implementing ePhyto there is some evidence that improved cross-departmental coordination resulted at the national government level, where the NPPO function is separate from the customs agency. This coordination wasn't always expansive or necessarily resulted in improved outcomes. Those contracting partners implementing GeNS sometimes worked with Revenue Authorities to seek to integrate ePhyto with new or existing customs systems. In many cases, customs agencies have existing online portals that include an e-payment system or capacity and several NPPOs reported having worked across departments to seek mechanisms for integrating on-line phyto payments into existing systems. Likewise, ePhyto data is useful and desirable for Customs Agencies seeking to assess and report on trade data, and some coordinating work was reported on topics of data capture and sharing. However, most respondents indicated that the work to coordinate rarely resulted in impactful outcomes and in both case studies, the NPPO function around phyto-issuance and review remains largely siloed from Customs systems and processes.

In contrast, the assessment of coordination between IPPC and the ePhyto solution and the donor community is highly positive. Donors seeking to assist in Trade Facilitation Agreement implementation, like the World Bank, the Global Alliance for Trade Facilitation, and other entities invested in trade facilitation assistance, including private sector partners, have engaged fully in supporting ePhyto

implementation across a variety of contexts.[29] The World Bank has a unit which, along with single-window support, is funding and providing technical support for implementation. The Global Alliance is currently supporting nine implementation projects. Material support in the acquisition of capital equipment has also been provided by TradeMark Africa (previously TradeMark East Africa). Likewise, UNCTAD has supported single window integrations that include linkages to ePhyto.

5.5 IMPACT

The ePhyto solution did deliver the majority of the hoped-for impacts, though there are further improvements that could improve upon current results.

- Both cost and time savings have resulted; cost savings to traders tend to be infrequent but significant while time savings tend to be smaller and more regular.
- Fraud reduction is the most frequently cited impact at the national level and the line of sight from ePhyto to fraud detection is clear, which indicates a direct safe-trade impact.
- As a result of improved fraud detection and improved management of phytosanitary documentation and record keeping resulting from the ePhyto Solution, overall SPS capacity amongst developing country authorities can also be said to have improved.
- In addition to improved trade management and time and cost savings for traders, ePhyto has delivered administrative efficiencies to NPPOs including cost reductions, data management and reporting efficiencies and improved recognition of their mission within government.
- ePhyto is also delivering support to traders in terms of records, traceability and compliance requirement notification and resolution.

The ePhyto solution delivers both routine and extra-ordinary savings of time and cost effects. These include cost savings to NPPOs and savings to shippers. On the routine side, respondents noted that, on balance, NPPO administrative costs have decreased with implementation. While running a national system, including GeNS, brings certain administrative costs, respondents believed that the cost savings exceeded these expenses. Cost savings included specialized paper and stamp acquisition, printing costs, and, particularly, travel and travel time costs for liaising with exporters that can now be largely accomplished on-line. One NPPO noted that prior to ePhyto, inspectors spent substantial time and cost traveling to retrieve books of certificates to deliver the requisite phytos. With implementation, this can now be accomplished via a mobile device or by telephoning back to the NPPO to have the data entered into GeNS. Further, ePhyto allows for low transaction cost certificate replacement. Where traditional

[29] The ePhyto Solution contributes to the implementation of TFA articles 10.1 "Formalities and documentation requirements", specifically subsections 10.1.1(a) Formalities for sanitary and phytosanitary conditions are simplified to ensure a rapid release and clearance particularly of perishable goods; and subsection 10.1.1(b): Time and cost for documentary compliance by economic operators are reduced. It also contributes to the implementation of TFA article 7.9 Perishable goods, subsection 7.9.1: An ePhyto Generic National System is introduced ensuring a rapid release and clearance of perishable goods.

paper phyto replacement would carry the same administrative cost as the original issuance, electronic certificates can be swapped out with corrected ones quickly and easily.

Routine costs for shippers are also impacted through ePhyto implementation. With ePhyto the process of obtaining a phyto is eased. Respondents estimated the time cost to obtain a phyto had gone down significantly since ePhyto came online. One respondent estimated that a formerly 3-4 hour transaction process had fallen to under 20 minutes. Others indicated that the delay time awaiting an inspector to process phytos could now be avoided via on-line entry, reducing delays, including delays to shipment times, by hours. Not all shippers interviewed utilize online systems, where available, but those that do recognized that the routine savings were substantial, with the cost of travel to the NPPO to retrieve certificates often cited as a direct benefit. Additionally, and of key importance to shippers interviewed, electronic phyto transmission has removed the cost for routine advance phyto shipment by courier, representing a direct cost savings that shippers value.

ePhyto also impacts extraordinary costs, including the frequency of interception and the cost of in-port delays related to paperwork issues including holding costs and loss and spoilage of goods during delays. ePhyto largely helps resolve issues of interception due to documentary non-compliance. These occur for a variety of reasons – changes in the shipment volumes or contents immediately prior to shipment may not get reflected in the phyto. Entry errors may result in incorrect data or identifications on phytos. Inspectors may be unaware of a specific destination's requirements or make errors in attempting to comply with these. Because the ePhyto system, GeNS or otherwise, can have pre-populated pull-down menus for things like scientific names of products, destinations, and other properties of the phyto, entry error has been greatly reduced. This was observed both through the case studies for this report, but also by other institutions currently implementing ePhyto. These types of errors can be avoided, but where they still occur, for whatever reason, the time and expense of resolving them is also greatly reduced via ePhyto. With the ability to instantaneously deliver a corrected phyto, where a document error has been made, ePhyto avoids days of potential delay. Not only is time therefore saved, but the cost of resolution is greatly reduced. One respondent estimated that in cases of diversion due to documentary non-compliance, the costs can range from hundreds to thousands of dollars in demurrage, port storage costs, depreciation of goods, late delivery penalties and, potentially for time-sensitive goods, total loss.

While the private sector respondents focused first and foremost on time and cost savings, the primary impact of interest by public sector respondents was reduced fraud and improved ease of fraud detection. Estimates of the baseline level of fraud varied by country context. But all NPPOs interviewed reported some level of fraud. And all respondents noted that ePhyto had both reduced the avenues available to get a fraudulent certificate into the system and the ease of detecting such activities when they do occur. NPPOs report that under the paper system, blank certificates were stolen and/or forged, both for outgoing and incoming plant commodities. Under ePhyto, however, only the NPPO has access to the system to create the electronic version that gets sent via the Hub. An operation to inject a fake certificate into the system would be highly complex and therefore has become less likely. It is still possible for NPPO credentials to be stolen and used, so no NPPO felt that the system eliminated all

possibility of fraud. But the existence of a QR code on each certificate allows for quick comparison to the electronic version, making altered certificates easy to spot. Respondents estimated that attempted fraud had declined by over 75% since the implementation of ePhyto.

5.6 SUSTAINABILITY

Financial and technological sustainability are the most significant remaining challenges to ePhyto.

- The project largely deferred decisions on financial sustainability, though resolutions are currently being negotiated amongst members. As it stands, however, the system is not self-funding.
- There is not likely to be a technological approach that is sustainable indefinitely. The selected technology achieved a balance of ease of use for the lowest capacity members and lifecycle potential.
- The ePhyto Solution is operationally sustainable, with UNICC representing the best-value for reliability and neutrality.
- However, the selection of UNICC has resulted in a more complex arrangement for NPPOs hoping to integrate ePhyto within revenue authority systems, many of which utilize ASYCUDA-world.

IPPC recognizes that financial sustainability is one of the most important issues remaining to be resolved for ePhyto. Decision making on financing on-going operation was deferred during the project development period and remains undecided today. ePhyto development was primarily financed by STDF, with some contribution by the IPPC. Operational costs have been funded to-date by savings from the project development budget and through funds made available by select donors. Stakeholders agree that securing the funding of the system is crucial for continuing uptake as the relevant institutions push toward global use. A proposal for a five-year funding plan was considered by the IPPC membership in 2019, but not agreed upon. However, it was agreed that a funding plan be developed and presented for ratification in 2023. In late 2022, the IPPC Secretariat prepared an analysis of three funding options prior to finalizing recommendations for 2023.[30] The primary suggestions for financing ongoing costs made by respondents have fallen into a few categories: (1) The funding come from FAO, (2) The funding come voluntarily from participating countries, scaled by development status, (3) The funding come from user fees collected by NPPOs. All three options have issues and risks associated.

The cost of operations is relatively low for a global system. 2022 operations cost just over USD 500,000 with the budget forecast in 2025 at just over USD 900,000. Of this, the largest expense is UNICC operations costs. UNICC sets its pricing at-cost. The residual cost is IPPC ePhyto support costs. Altogether the required contribution per NPPO is relatively low. One respondent from a developed country NPPO noted that even with their on-going contribution, the cost savings from use of ePhyto over bilateral system connections meant that their organization was saving administrative costs. Further, while costs are increasing, they do not scale directly with volume of use, such that the goals of world-wide implementation and sustainable funding are not contradictory.

[30] IPPC Contracting Parties did not make a decision at their annual meeting (CPM) in April 2023, so it remains unclear if a funding approach will, in fact, be selected in 2023.

Operationally, UNICC has been a fortuitous choice of partner, in that they have provided operational stability, a high level of customer support and ongoing enhancements of GeNS. Prior to the selection of UNICC, UNCTAD was approached to assess the use of ASCYERS as a generic ePhyto platform. The ultimate cost estimate (both financial and administratively) exceeded resources and UNCTAD has not, since, been intimately involved in ePhyto development, despite IPPC efforts to encourage collaboration.[31] This has unfortunately meant that integration with ASYCUDA has been more complicated and costly than ideal, for those seeking such a system. Integration with customs would probably be the best outcome from a data management and ease of use for shippers' perspective, given the increasing move toward single windows for trade.

In other senses, operational sustainability has been well-considered. Technologically, the solution meets the needs of most with the least complexity and is appropriately life-cycled. Respondents largely, though not uniformly, felt the XML approach was straightforward enough to be usable and the GeNS API easy enough for an NPPO with limited capacity to implement without significant assistance. In one case study, GeNS was self-implemented by the NPPO with only remote assistance from UNICC and the RPPO representative. Most respondents recognize there is not technology with an infinite lifecycle, but all felt the selected technology should be usable for at least the next decade.

6 LESSONS LEARNED

1. Harmonization of certificates is fundamentally crucial to implementing e-certification

   Having a harmonized, accepted phytosanitary certificate was crucial to the successful implementation of ePhyto. This was recognized in the project plan as a first, key step in implementation, though work on harmonization had begun well before hand. Tests of the Hub to trade other certificates indicate the structure of the Hub will work for any certificate type, but the need to create a common, accessible interface requires uniformity in certificate. Any future effort to implement e-certification, such as for eVet or other e-food safety certificates, will have to consider and resolve this requirement.

   The implications of this lesson for eVet, e-food safety, etc., are that a central force for standardization is a baseline requirement to further digitization forward. This ePhyto project benefited from having a pre-existing effort that was already fairly close to achieving harmonization. This is not the case for eVet, where differences in certificates are still fairly significant from country to country which will likely hamper any effort to establish a global system of exchange. A possible interim approach would be to take a regional approach among

[31] Note that UNCTAD has engaged in a limited manner in implementation of ePhyto at the national level, in select cases.

countries that use similar or equivalent animal certificate formats that could be adapted easily into use on the Hub.

2. Relatively minor investments in digitization can have significant catalyzing effects in trade facilitation

   E-certification has clear trade facilitation benefits, even if these are not yet fully accounted for in the literature. Forthcoming work by GATF, work by OECD and the data and perspectives collected for this study point to significant trade facilitation benefits associated with digitization of certification processes. The relative ease of use and reduced cost of process, as well as avoidance of documentary non-compliance and associated trade costs, result in reduced costs to trade and therefore net added capital with which to engage in trade. It is therefore not surprising that the OECD measured an associated growth in trade volumes with digitization of certification.

   The ePhyto solution was enacted on a relatively small budget given the scale of the project. That investment was insufficient to meet all the investment needs for uptake and IPPC rightly anticipated other institutions would assist developing countries in implementation if the solution were available. This was in fact the case as a number of donor and donor-funded institutions have assisted implementing countries. Dialogue, coordination, and understanding what would be necessary to get to a functional solution that could then be taken forward by others were key to catalyzing this additional investment while working on a relatively limited budget.

   Many, though not all NPPOs formally incorporate trade facilitation goals into their organizational mission, which has helped drive uptake as it becomes clearer that there are trade facilitation benefits to be achieved via ePhyto. It is however, not clear that similar trade facilitation objective exists with the veterinary authorities that are responsible for animal trade regulation and would need to drive eVet uptake at the national level.

3. Developing countries have access and equipment challenges that can inhibit uptake

   While the GeNS has enabled NPPOs in developing countries access to ePhyto without a costly national system, there are still significant costs to access. In addition to technical support for implementation, which has generally been provided to LDCs by donor organizations, NPPOs typically require capital equipment, internet access and maintenance. Having technically savvy staff seems to make a big difference for LDC NPPOs seeking to maintain ePhyto without external support. The costs of ongoing maintenance of equipment and internet access, including remote access need to be considered when implementing in new contexts.

For eVet, e-food safety, etc. proponents, this should be fairly encouraging, however, assuming that a path is chosen which allows for use of equipment already being used for ePhyto, to also be used for eVet, etc. A test of the hub indicates that there is no technical barrier to allowing for use of the hub to also exchange Vet certificates. UNICC did not believe there would be a technical barrier to establishing a Vet module within GeNS. To that end, there are no significant technical barriers to maximizing the efficiency of eVET, etc., implementation via use of already established soft and hardware, both at the global and national levels.

4. The private sector is interested, engaged, and willing to contribute to improving trade facilitation in the right circumstances

   The private sector[32] was actively engaged in advising on and promoting ePhyto. The potential benefits of digitization were readily apparent to a number of private sector stakeholders, who engaged actively in the IAG and made offers of participating in the financial cost of implementation and/or operations. This suggests that in circumstances that present clear and accessible time and cost savings opportunities, the private sector is willing and able to participate in trade facilitation improvement efforts. Key steps to encourage participation are early dialogue, an opportunity to influence or provide input to decision making, and a regular advisory role.

5. Implementation of e-certification does not need to be all or nothing – a rolling implementation is both possible and effective.

   By design, ePhyto has been implemented on a steady growth path. Readiness was determined at the outset and targeted assistance was used to slowly bring additional countries online. This has allowed UNICC to continue to improve GeNS while avoiding being overwhelmed by assistance requests and to maintain service levels with the Hub. This approach was very effective in building momentum for ePhyto over time.

   The implications of this lesson for eVet, e-food safety, etc., are that a regionalized approach to gradual implementation is possible, if a group of partner countries with an interest in moving forward can be identified. As both Codex and WOAH indicated that any further work to move to adoption of e-Certification would have to be membership-driven, STDF may consider focusing their advocacy efforts into identifying such a group of partners and supporting a smaller, regionalized effort for piloting e-Certification in the veterinary and food safety area.

[32] Including trade associations and other industry representative groups.

7 RECOMMENDATIONS

Following on from the findings and lessons, this report makes several recommendations. Recommendations are directed primarily at STDF, who commissioned this study, IPPC and UNICC who are implementing it, and the broader SPS community. Certain recommendations are more usefully directed at Codex and WOAH who are the likely implementers/partners of other SPS e-certification projects. In this case, the report asks STDF to encourage those bodies to consider or implement a change. Priority for implementation of recommendations are described as the following durations:

- Immediate – the responsible party(ies) should begin implementing immediately
- Short term – the responsible party(ies) should work to implement over the next 1-2 years.
- Mid term – the responsible party(ies) should work to implement over the next 2-5 years.

#	Recommendation	Responsibility	Priority
1	Resolve the financial arrangements to support ongoing operation. IPPC has committed to a financial plan for sustained operation in 2023. Adopting this should be the first priority for stakeholders. As no financial plan was agreed upon at the April meeting, advocates for ePhyto, who are concerned with financial sustainability should press for a resolution as soon as possible.	IPPC / ESG	Immediate
2	Continue to improve GeNS to open up realization of full potential benefits: e-payment, traceability, data analysis. UNICC maintains a list of planned improvements to GeNS, as approved and directed by the Steering Committee. Key improvements that should be considered for inclusion are – improved linkage options to on-line e-payment systems (beyond the current ability to attach a pdf payment receipt), improved traceability mapping, and access to (own) data extracts on demand	IPPC / UNICC	Short term
3	Encourage WOAH and/or other relevant regional organizations to consider piloting a regional Veterinary certificate exchange via the hub to (1) serve as proof of concept (2) identify any needed technical adjustments for the Hub to carry additional certificate types (3) provide an example of an approach to harmonizing the certificate amongst a less-than-global group of participants, and (4) work out any technical complexities in adding additional transaction types. The pilot would not explicitly require addition of a Vet module on GeNS, but one may be considered, especially if the pilot is intended as a way to build momentum towards global uptake.	ECAC / WOAH / IICA	Mid term
4	STDF should use its convening power, financial resources and influence amongst the SPS community to encourage veterinary authorities in developing countries, WOAH and other relevant regional organizations to sponsor a pilot program on eVet as described under recommendation 3. Opportunities for influence may include developing a proposed group of participants through regional	STDF Working Group, ECAC and STDF Secretariat	Mid term

#	Recommendation	Responsibility	Priority
	or multi-bilateral dialogues, offering support through consideration of a grant application, and continuing to advance the cause of e-certification through publication of events and/or papers on the trade facilitation benefits of ePhyto. Given the appeal of fraud reduction as a benefit to NPPOs, the STDF Working Group and/or ECAC may consider carrying out a study on phyto fraud and the effects of ePhyto. Such a study may have appeal to regulatory bodies responsible for animal health and food safety.		
5	IPPC/STDF should continue outreach and education efforts to bring more plant trade into ePhyto. Current growth strategies appear to be successful and as such should be maintained. These include the outreach and education efforts to continue to enroll additional NPPOs in ePhyto, relying on RPPOs to help spread the message about ePhyto and encouraging interest among peers.	IPPC / STDF	Mid term

ANNEX 1 - EVALUATION MATRIX

The STDF ePhyto evaluation terms of reference poses 14 evaluation questions and asks that these be addressed using the STDF MEL framework as well as the OECD DAC criteria. To operationalize these questions, some of which ask similar underlying questions from different perspectives, we consolidated them into 10 Evaluation Questions (EQ) but then expanded many of these with Sub Evaluation Questions (SEQs).

Why consolidate?

The purpose of consolidating the EQs is to ensure that the evaluation is focused on what STDF truly wants to know while keeping the resulting output focused and concise. STDF has asked for an end product of 20-30 pages – a very long list of EQs will generate a lot of evidence to be discussed. When these questions overlap, the evidence may become repetitive.

Why expand with SEQs?

The function of SEQs is to allow the evaluation to ensure that each element of each question is addressed in the evaluation process. By separating each element of an EQ into an individual SEQ we can plan for the type of evidence needed, improve the evaluation tools to collect these, and ensure that every element of interest in actually addressed in the end product. Please note, however, that the evaluation report will describe results at the EQ level to ensure it is concise.

Evaluation Matrix

The evaluation matrix is a common tool to help clarify and communicate the intentions and application of the evaluation process. The matrix below includes a mapping of the original to final EQs and SEQs to demonstrate that no aspect of the terms of reference was lost in the consolidation and SEQ definition process. It separates out the elements of each EQ into SEQs. It describes the data collection method expected to be employed to address each SEQ. And it suggests the scale of evidence needed to answer the question. The scale of evidence only exists to pre-identify how the evaluation will determine whether the evidence is sufficient to assign a positive response to the question. It does not mean that description or detail will be omitted or that there is no room for a nuanced answer in the evaluation report. The evaluation matrix also describes how the questions align to the DAC criteria to help ensure no criteria is missed.

ePHYTO EVALUATION MATRIX

EQ #	SEQ #	EQ Text	DAC Criteria	Data Source	Findings
1		To what extent and how did the ePhyto project contribute to facilitating safe trade and to the STDF's programme goal (increased and sustainable SPS capacity in developing countries)? How has the transition to ePhyto certificates benefitted government authorities and the private sector in developing countries? What were the key results achieved?			
	1.1	Did the ePhyto project contribute to facilitating safe trade? Was there a time savings that resulted from use of the ePhyto System? Was there a cost savings that resulted from use of the ePhyto System?	Impact	Project documentation; Kiis	Though the significant savings are primarily related to cost avoidance during non-regular trade actions (interceptions). The ePhyto project has contributed to facilitating safe trade. While there are limited time savings for traders and government authorities with the production of phytos, most of the time and cost savings observed result from reduced requirement to send advance hard copies of certs, where the recipient country accepts ePhytos, and the reduction in documentary compliance interceptions and the reduction in time required to resolve the same. Safe trade, per respondents, was primarily facilitated via the reduction in fraudulent certs.
	1.2	Did the ePhyto project contribute to the STDF's programme goal (increased and sustainable SPS capacity in developing countries)?	Impact	Project documentation; Kiis	Some developing country partners indicate that ePhyto has enabled improved oversight and regulatory functionality, where prior systems were not working well.
	1.3.1	What are the benefits of the ePhyto solution for government agencies in developing countries?	Impact	Project documentation; Kiis	Streamlined workflow: reduction in multiple trips per export to produce phytos. Simplification of workflow. Reduction in physical paperwork and the need for production and storage. Improved data analysis capacity

EQ #	SEQ #	EQ Text	DAC Criteria	Data Source	Findings
					(with limitations). Ease of identifying fraudulent import certificates.
	1.3.2	What are the benefits of the ePhyto solution for the private sector in developing countries?	Impact	Project documentation; Kiis	Private sector partners report improved ease of access and timeliness of receipt of export certificates, reductions in cost related to moving certificates, and improved confidence in acceptance of certificates at the recipient end. Integration of some source tracing capacity into GeNS is also helping certain export sectors improve tracing requirement compliance. Most exports report no or almost no interceptions related to documentary non-compliance since implementation of ePhyto.
	1.4	What are the key results achieved?	Effectiveness	Project documentation	The project successfully designed and implemented the ePhyto Hub and deployed the GeNS. 125 NPPOs registered to exchange ePhytos, with 75 actively exchanging as of 17 May, 2023 49 NPPOs using or planning to use GeNS with 24 actively using to exchange. At the end of 2021, 107,000 certificates per month were being exchanged via the Hub.
2		To what extent and how did the ePhyto project contribute to the STDF's two outcomes: o To what extent and how did the projects promote the engagement of diverse stakeholders and facilitate the emergence of collaborative processes, activities or work in a way that supported STDF's Outcome: "More synergies and collaboration driving catalytic SPS improvements in developing countries?"			

EQ #	SEQ #	EQ Text	DAC Criteria	Data Source	Findings
		o To what extent and how did the projects generate, disseminate and/or increase access to new knowledge in a way that supported STDF's Outcome: "Greater access to and use of good practices and knowledge products at global, regional and national level?"			
	2.1.1	To what extent and how did the project(s) promote the engagement of diverse stakeholders and facilitate the emergence of collaborative processes, activities or work in a way that supported STDF's Outcome: "More synergies and collaboration driving catalytic SPS improvements in developing countries?"	Relevance	Project documentation; membership lists	The project effectively integrated NPPOs, RPPOs, and the private sector into decision making and design of the solution. Advisory groups and an oversight committee were key to developing a workable system. The pace of uptake indicates that the approach was successful. Some private sector partners report ongoing concern with the appropriateness of design (seeds), though, overall, even critical partners believe the solution is an improvement on the before-state.
	2.1.2	Did this collaboration (if any) promote improved, new, or more frequent coordination between public and private sector stakeholders that might not otherwise have occurred?	Relevance	Project documentation; membership lists, Kiis	There is no evidence that the pace or frequency of collaboration has improved. However, there is limited evidence that the quality of such coordination – the move from informing to engaging – has improved in some places in limited ways as a result of the project.
	2.1.3	Did the project facilitate dialogue to build knowledge on the topic of e-SPS certification (including via ECAC)?	Effectiveness	Project documentation; Kiis	IPPC and STDF have engaged in extensive outreach and promotion of ePhyto among RPPOs, NPPOs and other trade forums, in ways that have facilitated knowledge sharing and development on e-SPS certification.
	2.2	To what extent and how did the project(s) generate, disseminate and/or increase access to new knowledge in a way that supported STDF's Outcome: "Greater access to and use of good practices and knowledge products at global, regional and national level)?"	Relevance	Project documentation, country-level Kiis	As a component of project outreach, a number of NPPOs educated exporters on SPS requirements and procedures. The project was largely about enabling, including through outreach and capacity building, use of the ePhyto solution, but some education on general SPS and trade procedures was necessarily part of that process.

EQ #	SEQ #	EQ Text	DAC Criteria	Data Source	Findings
	2.3	To what extent and how did the ePhyto project promote collaboration and synergies on ePhyto certification and SPS e-certification more broadly, as well as use of electronic systems for trade facilitation objectives?	Relevance	Literature review, Kiis with external stakeholders	The project has successfully catalyzed collaboration between developing countries and development partners, including bi-lateral support, multi-lateral support and regional cross-support between NPPOs.
3		To what extent and how did the ePhyto project **encourage innovation** (in processes, approaches and/or solutions) related to electronic certification?	Impact	Literature review, Kiis	The project as a whole is innovative. However, additional innovation was observed in the way NPPOs re-oriented their approaches to include electronic data and systems management, adding capacity to accommodate requirements.
4		To what extent and how did the ePhyto project, and other work on ePhyto certification contribute to improved coordination on trade facilitation across SPS agencies and other authorities (including Customs) at the country level, as well as across development partners and donors supporting digitalization for trade facilitation (including as part of NSWs)?			
	4.1	How did the ePhyto project and related work contribute to improved coordination on trade facilitation across SPS agencies and other authorities at the country level?	Coherence	Kiis with external stakeholders	There is some minimal evidence that the need to harmonize systems (see ePayment, for example) and data management has led to limited improved coordination between NPPOs and revenue authorities. In some cases, the SPS agency has connected to a national single window. While this may not be a direct result of the ePhyto Solution, it has helped facilitate/ drive a need for that coordination.
	4.2	How did the ePhyto project and related work contribute to improved coordination on trade facilitation across development partners and donors supporting digitalization for trade facilitation (including as part of NSWs)?	Coherence	Kiis with external stakeholders	A number of international development partners have supported implementation of ePhyto among developing country partners at the national level. This has led to, not only improved engagement between donors and recipients of support, but coordination between donors to maximize the effectiveness of technical support.

EQ #	SEQ #	EQ Text	DAC Criteria	Data Source	Findings
5		To what extent and how did the ePhyto project enable stakeholders to address challenges and take advantage of opportunities for mutually beneficial solutions on digitalization and e-certification, as well as border agency coordination, risk management, etc. more broadly?	Coherence	Project documentation, country-level Kiis, Kiis with external stakeholders	Evidence is limited that this has occurred – and is largely limited to integration with national single window efforts.
6		How did the ePhyto project address, promote and/or achieve interoperability with National Single Windows and other digital systems and tools including the Automated System for Customs Data (ASYCUDA), e-CITES, etc.?	Efficiency	Project documentation, country-level Kiis, Kiis with MLD stakeholders	There is no evidence collected that GeNS has been integrated with ASYCDUDA. Where there has been some effort to link them, it has been via a national single window hosting both services (Kenya, Fiji). There is clear evidence that ePhyto has been connected to other single windows systems in several countries (Morocco, Madagascar, Cote d'Ivoire, Senegal, Nepal, to name a few).
7		To what extent is the solution (Hub) developed for exchange of ePhyto certificates relevant for the exchange of other (SPS-related) certificates, and what opportunities (if any) exist for it to be adapted for such use to support trade facilitation?	Relevance	Project documentation, Kiis with stakeholders	Both stakeholder feedback and the results of a test between Australia and New Zealand indicate that the Hub is entirely suitable for exchange of other SPS certificates, with the understanding that the certificates themselves need to be developed and that that represents the larger challenge.
8		To what extent and how did the ePhyto project address gender equality, as well as cross-cutting issues related to the environment? How might future work on electronic certification better address gender equality and cross-cutting issues related to the environment and climate change?			
	8.1	To what extent and how did the ePhyto project address gender equality?	Relevance	Kiis	There is no evidence that the ePhyto made a significant impact on gender equality. However, there is anecdotal evidence that the reduction of need for travel and ability to conduct business on line, instead of face-to-face has a marginal safety and development benefit for women.

EQ #	SEQ #	EQ Text	DAC Criteria	Data Source	Findings
	8.2	To what extent and how did the ePhyto project address cross-cutting issues related to the environment?	Relevance	Kiis	The major impacts include reduction of movement of paper in advance of shipments and the reduced use of paper, though this later effect is minimized by the fact that in most cases the ePhyto is printed in multiple copies. Additionally, the overall environmental effect is also minimized by the energy input requirements for running the system, including additional equipment and terminals for NPPOs
	8.3	How might future work on electronic certification better address gender equality and cross-cutting issues related to the environment and climate change?	Sustainability	Kiis	Further benefit could be derived from, and may still be forthcoming due to, improvement in confidence which might encourage shippers not to print copies for shipments. There is no evidence that additional gender-equality benefit might be derived from a different approach.
9		To what extent and how were linkages and synergies leveraged under the ePhyto project, including for the mobilization of resources to support scaling-up (including work by the World Bank and GATF)? What are the opportunities (if any) to further build on and maximize such synergies and scaling-up with other ongoing/planned initiatives and work on e-certification in the future?			
	9.1	Were linkages and synergies leveraged, including resource mobilization to support scaling-up, under the ePhyto project?	Efficiency	Project documentation, Kiis with stakeholders	Linkages and synergies were well-leveraged. In particular, synergies between different development and trade partners to support uptake and implementation of ePhyto.
	9.2	Are there opportunities to further build on and maximize such synergies and scaling up with other ongoing and /or planned initiatives and e-certification work in the future?	Sustainability	Kiis, literature review	There is a tension between desire for bespoke solutions and developing systems and tools that are broadly applicable. However, the approach selected has maximized capacity for participation in the solution with minimum spend.

EQ #	SEQ #	EQ Text	DAC Criteria	Data Source	Findings
10		How was sustainability (including aspects related to financing, operations, technology) addressed during the ePhyto project and to what extent have the results achieved been sustainable over time? What has been learned about the scalability and sustainability of the ePhyto Hub, and how is this relevant for other models and approaches to e-SPS certification, including e-food safety, e-vet certificates?			
	10.1.1	How was financial sustainability addressed during the project?	Sustainability	Kiis	Financial sustainability was largely deferred during project implementation and remains unresolved. A number of approaches have been proposed and the will to a solution exists amongst stakeholders.
	10.1.2	Is the project financially sustainable today?	Sustainability	Kiis	The project is not financially self-sustainable today.
	10.2.1	How was operational sustainability addressed during the project?	Sustainability	Kiis	The choice of UNICC as a system developer and host proved to be prescient and effective, ensuring maximum likelihood of operational sustainability.
	10.2.1	Is the project operationally sustainable today?	Sustainability	Kiis	The project is operationally sustainable at the global level. However, developing country partners may not have the resources needed to maintain NPPO-side systems without additional and on-going support.
	10.3.1	How was technological sustainability addressed during the project?	Sustainability	project documentation, Kiis with implementation team	A variety of technological approaches were considered and assessed (see Bryant Christie ePhyto Feasibility study, 2014). The selected approach balanced security, ease of implementation and sustainability. Most respondents felt it was sufficiently robust to last at least a decade, but none felt an ultimate solution that would never need to be replaced or updated existed.
	10.3.2	Is there a tradeoff between technological sustainability and ease of application for	Sustainability	Kiis	Yes. The xml approach allowed for implementation across all country contexts, while supporting a minimum level of security. Other options, such as block chain, that

EQ #	SEQ #	EQ Text	DAC Criteria	Data Source	Findings
		developing countries, and, if so, how were these reconciled.			might offer enhanced security and life span were considered.
	10.4.1	What has been learned about the scalability and sustainability of the ePhyto Hub?	Sustainability	Kiis	The Hub itself appears to scale well, with costs rising slower than use and no volume-based slow-downs yet observed.
	10.4.2	Is this learning relevant to other e-SPS models and approaches?	Relevance	Kiis with external stakeholders	Yes – the fact that the Hub approach scales well and minimizes bilateral connection costs, presents a useful lesson to other SPS models in that, a centralized system, managed by a neutral party (the UN) can inspire confidence that leads to uptake and the existing system does have capacity and expansion potential to support trade in additional types of certificates.
	10.5	Do any opportunities to use the STDF's global partnership to further influence and/or scale up good SPS e-certification practice or identify and/or address any outstanding needs rise up from the learning identified during evaluation work?	Relevance	reflection on collected evidence	It was noted during the evaluation that (1) ePhyto, while being a significant investment for STDF, was relatively low cost for the value delivered and therefore elevated STDF as a participant in the SPS advocacy space. And (2) use of RPPOs as venues for influence on enhanced SPS measures and ePhyto uptake was particularly effective in terms of generating interest and confidence through peer support.

ANNEX 2 – CONSULTATIONS

All stakeholders consulted for this evaluation are listed below. Select private-sector stakeholders were guaranteed anonymity and are listed as [Omitted].

[Omitted]	Agricado (Fresh fruits and vegetables exporter)
Dr. Caroline Nankinga	Assistant Commissioner Phytosanitary & Quarantine, Uganda
Peter Neimanis	AUS/Pacer +
Barbara COOPER	Australia Department of Agriculture, Fisheries and Forestry
Shawna Enz-Cross	Bunge / IAG
MaryLucy Oronje	CABI International
Farid El Haffir	Codex Secretariat, FAO
Hilde Kruse	Codex Secretariat, FAO
Patrick Sekitoleko	Codex Secretariat, FAO
Tom Heilandt	Codex Secretariat, FAO
Paul Mwamb	Commissioner Phytosanitary & Quarantine, Uganda
Brenda Kisingiri	Department of Crop Inspection and Certification, Uganda
Remico Kibago	Department of Crop Inspection and Certification, Uganda
Okwir Raymond Bruno	Department of Crop Inspection and Certification, Uganda
Nakato Esther	Department of Crop Inspection and Certification, Uganda
Ekaterina Krivonos	FAO
Philippe Isler	GATF
Amine Belkhadir	GATF
Tom Butterly	GATF, formerly UNECE
Eric Quaye	Ghana Plant Protection and Regulatory Services Directorate
Rose Souza Richards	International Seed Federation / IAG
Aoife Cassin	IPPC Secretariat, FAO
Osama El-Lissy	IPPC Secretariat, FAO
Craig Fetchcock	IPPC Secretariat, FAO
[Omitted]	Kawacom (Coffee exporter)
Peter Thompson	MPI New Zealand
Ann Oliver	MPI New Zealand
Erik Boskers	Netherlands NPPO
Annelies Deuss	OECD
[Omitted]	Saints Exports (Fresh fruits and vegetables exporter)

Segialii Marie Malaki	Samoa Quarantine Division
Nafanua Malele	Samoa Quarantine Division
Tanumafili Seuao	Samoa Quarantine Division
Marolionel Polataivao	Samoa Quarantine Division
Paulo Siliato	Samoa Quarantine Division
Daryl Elisaia	Samoa Quarantine Division
Terance Sua,	Samoan exporter
Melvin Spreij	STDF Secretariat
Simon Padilla	STDF Secretariat
Marlynne Hopper	STDF Secretariat
David Bazwane	Trademark Africa
[Omitted]	Tropical Dynasty (Fresh fruits and vegetables exporter)
[Omitted]	Tropical Dynasty (Fresh fruits and vegetables exporter)
Sue Probert	UNCEFACT
Constantin Cuita	UNCTAD
Jayvee SANTOS	UNCTAD
Venkatram VENKATESWARAN	UNICC
Christian Dellis	USDA
[Omitted]	Wagagi (flower exporter)
[Omitted]	Wagagi (flower exporter)
[Omitted]	Wagagi (flower exporter)
Gillian Mylrea	WOAH
Shane Sela	World Bank

ANNEX 3 – CASE STUDY MEMOS

ePhyto Solution Evaluation Mission Back to Office Report

Uganda: 18 Jan – 20 Jan, 2023

Mission Host and NPPO: Department of Crop Inspection and Certification, UG Ministry of Agriculture, Entebbe, Uganda

Image: Wagagi Flower Cuttings Greenhouse – a high volume ePhyto user

Mission purpose: Assess the approach to and experiences with Uganda's implementation of the ePhyto Solution (which includes the use of the GeNS for the production and receipt of ePhytos and the Hub for the exchange of ePhytos) as an indicator of the sufficiency of the GeNS, determine how the implementation impacted time and cost of trade of subject goods within Uganda, and identify lessons of relevance to other e-certification efforts, including eVet.

NPPO Staff Supporting the Mission:

Paul Mwambu, Commissioner Phytosanitary & Quarantine (Official IPPC Contact Point)

Dr. Caroline Nankinga, Assistant Commissioner Phytosanitary & Quarantine

Brenda Kisingiri, Senior Agricultural Inspector and E-Phyto Implementation Administrator, Department of Crop Inspection and Certification

Remico Kibago, Information Technologist, and System Administrator

Okwir Raymond Bruno, Agricultural Inspector

Nakato Esther, Agricultural Inspector

Exporters interviewed:

Wagagai – cut flowers

Agricado – fresh fruits and vegetables

Tropical Dynasty – fresh fruits and vegetables

Kawacom – coffee

Key findings:

1. Overall, the mission made clear that the ePhyto system is a substantial improvement on the previous paper-based system, both for government and for industry. Government finds the ePhyto system to be more time efficient, more reliable, provide better/easier tracking of phyto certificate status, provide better data availability and ease of collection and, most importantly to the NPPO, greatly reduce fraud and administrative challenges in procurement of the hard paper certificates. NPPO staff emphasized the frequency and ease of fraud under the prior paper-based system and how the ePhyto system has virtually eliminated avenues for fraud, with special note of the GeNS QR code system for ensuring alteration is easily identified.

   Industry also indicated that the new ePhyto system constitutes a significant improvement for them over the prior system. In particular, the ePhyto system is perceived to be quicker, more reliable, and helps to avoid down-stream issues, such as interceptions relating to paperwork deficiencies that are sometimes now detected on the ePhyto prior to, or during, transport.

   Of note, however, shippers continue to rely on officiated (signed, stamped) hard copies of ePhytos which are included with every shipment and particularly for non-participating countries. Advance couriering is avoided via use of electronic exchange (for participating countries such as the European Union) but the anticipated paper reduction effects are not being observed maximumly in Uganda.

2. The GeNS met Uganda's immediate needs. Prior to implementation of GeNS, Uganda had an unusable national system and relied on paper issuance. Fraud was not uncommon and the capacity of the NPPO to address its trade facilitation goals was limited. Procurement of hard paper certificates was normally hampered with administrative processes which caused delay for businesses. The leadership of the NPPO described GeNS (and the system enabled via the hub) as "the right solution for our needs at exactly the right time."

3. UNICC user support is perceived as excellent. The GeNS documentation along with UNICC support enabled Uganda to implement ePhyto + GeNS without other external financial support[33] (beyond capital support of equipment provision). The NPPO notes that the 24-hour availability of the UNICC team for system support has resulted in high reliability.
4. Long term GeNS improvements hoped for by the stakeholders (public and private)
    - Integration with e-Payment systems (which in UG presents the most significant opportunity for further time and cost savings)
    - Ability to seamlessly upload and add import permits and declarations to a file
    - Integration with the national single window
    - Ability to integrate traceability (detailed origins)
5. The NPPO and its user base also identified some shorter-term improvements in GeNS that they would like to see implemented:
    - Commodity name drop-down menu – to improve accuracy for commodity forms and commodity type and reduce documentary non-compliance interceptions which would be addressed in large part with standardized naming available by drop-down selection
    - NPPO-editable source location tables to improve traceability
    - Easier access to data for analysis. Preferably self-generated data downloads as needed, as opposed to the current quarterly system, with capacity to disaggregate data
    - A system-wide (at national level) alert system which would help disseminate information regarding changing regulations (EU) or procedures (UG)
6. Uganda's ability to implement ePhyto, using the GeNS, has been impressive, given it was done without external implementation support (World Bank, GATF, etc.) in an environment of extremely limited resources and capacity, and it demonstrates that the GeNS design, documentation, and technical support is sufficient and appears to be well-adapted to developing country contexts. However, of note, is the fact that the NPPO did have on hand IT-competent staff with the capacity to manage the introduction of the system and that this is a key requirement for successful implementation.
7. UG embarked on implementation following a mission to the USA sponsored by IPPC, that included UG, where ePhyto was presented. The mission made a significant impact on UGs decision-making on ePhyto and demonstrates the value of government-to-government relations in promoting ePhyto uptake.

[33] Note that technical support and advice was provided by the IPPC Secretariat and the ePhyto Regional Coordinator (Josiah Syanda).

ePhyto Solution Evaluation Mission Back to Office Report

Samoa: 01 Feb – 03Feb, 2023

Mission Host and NPPO: Samoa Quarantine Service (SQS) is part of the Ministry of Agriculture and Fisheries (MAF), Apia, Samoa

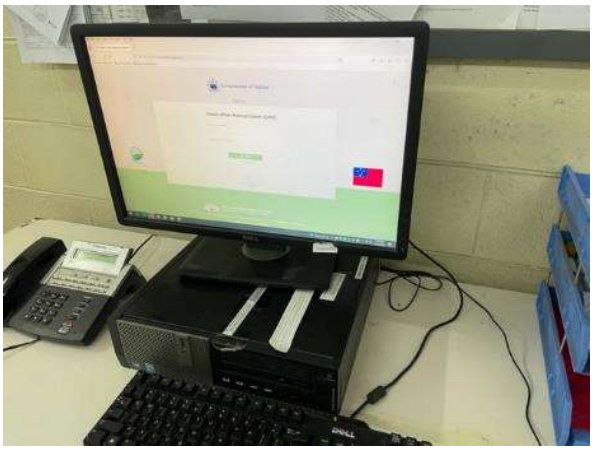


Image: Terminal running SQS GeNS

Image: SQS Quarantine Location

Mission purpose: Assess the approach to and experiences with Samoa's implementation of the ePhyto Solution (which includes the use of the GeNS for the production and receipt of ePhytos and the Hub for the exchange of ePhytos) as an indicator of the usability of the GeNS, assess how the implementation impacted time and cost of trade of subject goods for Samoa, if at all, and identify lessons of relevance to other e-certification efforts, including eVet.

NPPO Staff Supporting the Mission:

Segialii Marie Malaki, Assistant Chief Executive Officer, Samoa Quarantine Division, Ministry of Agriculture and Fisheries Dr.

Nafanua Malele - Principal Quarantine Officer (Borders Operation)

Tanumafili Seuao - Senior Quarantine Officer (Technical Policy)

Marolionel Polataivao - Senior Quarantine Officer (Awareness)

Paulo Siliato - Senior Quarantine Officer (Regulatory & Enforcement)

Daryl Elisaia - Quarantine Officer

Exporters interviewed:

Saints Exports – fresh fruits and vegetables

Terence Sua – fresh fruits and vegetables

Key findings:

1. On the whole, the mission determined that the ePhyto system has been successfully implemented in Samoa, meaning that ePhyto is currently up and running. All phytosanitary certificates, excepting extreme circumstances, are issued using the GeNS and where the relevant trading partner accepts electronic transmission of phytosanitary certificates, they are also transmitted via the Hub. The only trading partners currently receiving ePhytos are New Zealand, USA and Fiji. In addition, Samoa receives ePhytos from Australia.
2. As a pilot country, Samoa received substantial technical support to implement ePhyto. They also received limited capital grants to acquire computers that could be used to access GeNS. Capital equipment remains a significant challenge for the Quarantine Service, limiting the ability to access GeNS, especially at the airport. Technical assistance was crucial in getting GeNS set up and running.
3. Samoa has few large and regular exporters. The majority of transactions are for one, or few-time, exporters sending goods to family and friends abroad. As such, outreach and training on ePhyto can generally reach the major, routine exporters, but does not generally reach the

majority of exporters. Commercial exporters do have access to GeNS via web portal, but as of now, few are using it.

4. As with other developing countries, internet access tends to be a significant hurdle, limiting potential efficiencies of an on-line system. Access can be intermittent at the SQS headquarters and frequently inspectors must use private cell service (and equipment) to access GeNS.
5. While GeNS allows for certain efficiencies, including electronic signature that not all inspectors are willing to use, the lack of e-payment means that face-to-face interface at SQS headquarters is still required for export certification. The SQS believes that even with these limitations (internet access, low portal usage, need for in-person interface), the ePhyto solution has created time and cost efficiencies. Exporters still send copies of phyto-sanitary certificates with shipments, but generally not as couriered advance copies when exporting to ePhyto receiving destinations. This constitutes a cost and environmental savings. Likewise, while payment must be made in person, the GeNS system allows for advance processing, reducing the total in-person time experienced, on average. Additionally, intercepts for documentary non-compliance, for exports going to ePhyto-receiving countries were down significantly (possibly to 0) and that this represented the most significant economic savings of the system.
6. From a business process perspective, SQS believes that ePhyto, and particularly GeNS, represents a savings to the government through reduced paperwork and re-work time, given the ability to update phytos fairly easily. Transit goods were deemed to be particularly easier to process, with scan and upload of additional data working “seamlessly”.
7. While inspectors could not cite specific instances of fraud detection, they did generally feel that ePhyto had genuine value as a fraud-reduction tool. An inspector said that the “majority” of incoming certificates (for import goods) were fraudulent under the prior system. Collectively, the inspectors indicated that forged documentation did not generally occur with ePhyto and would be easily detected if it did. In particular they appreciated the QR code feature. However, the ability of the system to save and apply e-signatures to phytos was a security concern to some inspectors and at least one had removed their signature from the system for that reason and preferred to print and sign.
8. The SQS team uniformly expressed that the Hub was often slow, though not all the time or every day. In particular, they felt their time zone meant that system-slowing updates occurred during prime hours for them. Likewise, the on-call technical support provided by UNICC generally required one or more days to result in resolution.
9. Long term GeNS improvements hoped for by the stakeholders (public and private)
    - Ability to process e-payments is the most hoped-for improvement with the greatest opportunity for time and cost savings. This is a priority for both SQS and industry who expressed that the need to make payment in-person was the largest trade facilitation barrier of the current system.
    - Ability to integrate traceability, especially for seeds, with retrievable system for prior phytos so that they can be collectively transmitted.

- An improved app for mobile would aid use as much of the field work is done by mobile phone.
- Full implementation of an off-line mode so that work on phyto applications can continue, even when internet access is problematic is also desirable.

10. Samoa embarked on implementation following an approach by IPPC to participate in the pilot. They are more advanced in its use than the other pacific islands, with Fiji the next furthest along in implementation. None-the-less, use appears to be limited. The GeNS is the only system for producing phytos in Samoa, but all phytos are still printed and shipped, even when the recipient country accepts e-certificates. This is unlikely to change in the short term, given the cost of printing is low compared to the risk of an interception.

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