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INTERNATIONAL AFFAIRS MANAGEMENT
REPORT

A GLOBAL *e*PHYTO FEASIBILITY STUDY

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for the IPPC/CPM ePhyto Steering Group

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TABLE OF CONTENTS

PART I: INTRODUCTION

I.1 BACKGROUND

Over the last decade there has been an increasing interest in determining how National Plant Protection Organizations (NPPOs) could electronically exchange the information currently provided in paper phytosanitary certificates. A harmonized, universally accessible, *entirely voluntary* system[1] for the electronic exchange of phytosanitary certificates could:

- increase efficiency by enabling electronically gathered phytosanitary data to be submitted to the importing country electronically, rather than downloaded onto paper and shipped, and could increase efficiency by storing and accessing data electronically without manual data entry;
- reduce costs associated with printing and shipping paper certificates, and reduce those costs associated with sorting, distributing, retrieving and archiving paper documents;
- expedite communication on specific phytosanitary certificates between exporting and importing NPPOs, including increasing ease and transparency of reissued certificates;
- decrease fraudulent certificates and increase transparency of certificates that have been issued and received between NPPOs.

Given these benefits, several NPPOs have been exploring and developing different systems for the electronic exchange of phytosanitary certificates. As a result, concerns have been increasing that in the absence of international harmonization, a multitude of exchange formats and mechanisms could be created, in effect undermining some of the advantages of electronic exchange. This concern was emphasized at the meeting of the Open Ended Working Group on Electronic Phytosanitary Certification in Paris in September 2012. At that meeting the possibility of multiple electronic exchange systems requiring significant IT investment, increase cost and present an insurmountable barrier-to-entry for countries with lower trading volumes or minimal IT resources. As a result, it was decided a harmonized approach should be pursued.

These concerns were echoed during the 2013 meeting of the Commission on Phytosanitary Measures (CPM). The CPM identified the need for a program to guide the development of an electronic phytosanitary (ePhyto) certification system, and to identify the tools countries would need in order to access such a system. Given the likely adoption of Appendix 1 to ISPM 12 and "the number of countries already developing ePhyto systems that may not be compatible with each other", the CPM characterized the need to proceed as "urgent"[2]. An ePhyto steering group (SG) was formed with the purpose of developing a vision for the ePhyto concept and, among other objectives, monitoring the delivery of a hub feasibility

[1] An ePhyto system is intended to augment the existing paper based system. It would be available between countries choosing to exchange data electronically. It is not intended to supplant the existing paper-based systems for those countries preferring to continue using a paper-based system, or that are regulatorily required to do so.
[2] IPPC, Terms of Reference for the ePhyto Steering Group, Annex 1

study and making recommendations for how and whether the IPPC should be involved in its development.

I.2 EXECUTIVE SUMMARY

An **ePhyto certificate** is an electronic phytosanitary certificate. It is the electronic equivalent of the wording and data of phytosanitary certificates in paper form, transmitted by authenticated and secure electronic means from the NPPO of the exporting country to the NPPO of the importing country.

At its most basic level, an **ePhyto system** involves **two national systems** and a **transmission mechanism** through which those two national (NPPO) computer systems exchange electronic phytosanitary certificates. An **ePhyto system** produces and transmits (providing for sending and receiving) electronic phytosanitary certificates. A **national system** is a component of an ePhyto system. It creates an ePhyto certificate and loads it into the **transmission mechanism** or retrieves (from the transmission mechanism) an ePhyto certificate sent by an exporting country.

There are two primary **transmission mechanism** options**.** They are referred to as **point to point** and **single point**. A **point to point system** is a bilateral agreement between two countries (NPPOs) to exchange ePhyto certificates directly between their national systems. A **single point (hub) system** involves multilaterally established transmission/retrieval requirements that all participating NPPOs accept, and that facilitate the exchange of ePhyto certificates between any two NPPOs participating in the hub.

The advantages of a hub or a point to point option depends on whether the IPPC facilitates a single transaction control protocol (TCP) for the exchange of ePhyto certificates between NPPOs. If it does, then both options have different advantages and each NPPO will need to determine which approach best addresses its needs and concerns. If the IPPC does not facilitate such standardization, then a single point hub system has several operational advantages over the point to point option.

Even if the IPPC adopts a single TCP, it is recommended the IPPC develop a hub as a means of facilitating the broad implementation of harmonized rules and schema.

Common business rules, combined with a single transmission control protocol (TCP), would facilitate the exchange of ePhyto certificates even among NPPOs using different transmission options. This is why regardless of whether a hub is developed, broader and deeper harmonization of transmission protocols, schema, terms and business rules is necessary.

The integrity of ePhyto certificates transmitted via the hub can be assured through three levels of security: system, data and transmission. Security of ePhytos transmitted via a hub would be further enhanced by the ePhyto certificates only moving through the hub; no data would be stored in the hub.

Certificates being transmitted through an IPPC sponsored hub would remain the property of the two NPPOs involved.

A hub should be organized so that the IPPC has no more legal liability with the exchange of ePhyto certificates than a postal service would in the event paper phytosanitary certificates were mailed and lost.

The cost to develop a hub system varies depending upon what functionality is described in the scoping document, and the business rules decided upon by the SG. The features and services, not the number of participants, drive development costs.

Based on the features and services discussed in this report, most likely, the development process (from scoping to delivery) would cost around US$300,000-$400,000. If a basic national system (that could be made available to all NPPOs) were to be included as one project element, then the costs could move into the US$450,000-$650,000 range.

Maintenance cost, given no more than 6 million transactions annually, may be under $350,000 per year.

Technical support and training seminars will be an essential part of a needed outreach program.

I.3 RECOMMENDATIONS

First, all IPPC members should accept and use the same transmission control protocol (TCP) for the exchange of electronic phytosanitary data. This would enable point to point and single point transmission options to co-exist and interface within a single IPPC sponsored ePhyto system.

Second, in addition to establishing a single TCP, NPPOs should harmonize operating or business rules, and further harmonize codes, terms and schema. All NPPOs should agree to use the same version of the approved schema.

Third, even if the IPPC adopts a TCP and adopts business rules and a more harmonized schema, it should still develop a hub as a means of widely implementing the harmonized business rules and transmission protocols.

The next step in the development of an electronic phytosanitary (ePhyto) certificate system would be for the SG to develop a scoping document for an IPPC sponsored hub. The scoping document should stipulate that the hub be built such that:

- no records of transmissions are kept;
- ePhyto certificates are deleted from primary and backup servers once they have been received by the importing NPPO.
- verification business rules should require an XML pattern on "the outside of the envelope", so that the presence or absence of that XML pattern may be used to determine whether the certificate is valid.
- it uses https, which is a secure communications channel used to exchange information and uses a Secure Sockets Layer (SSL) and requires a SSL certificate on the receiving NPPOs national system. The use of additional layers of security, such

as Virtual Private Network (VPN) tunnel, could aid in the establishment of a secure transmission.

- it can initially accommodate 3 million transactions annually and easily scale up to 6 million or more transactions per year.

The hub servers should be located in countries that legally protect the confidentiality of the data.

If an IPPC sponsored hub is built, the IPPC should select a vendor to host it. A cloud platform, such as Azure, should be used.

NPPOs, upon agreeing to participate in the ePhyto system, should agree to hold the IPPC harmless for system failure or data loss and recognize that they are voluntarily availing itself of a transaction option the IPPC has made available.

Ongoing maintenance and operation of the hub should be paid for through a transaction fee. The fee would be set annually by the steering group based upon the previous year's maintenance costs and transaction volume, and projected costs and transaction volume.

In addition to building a hub, the IPPC should build and make available a standard, basic national system. This "off the shelf" system is needed to facilitate many countries participating in the ePhyto system.

The IPPC should provide training seminars on how to install, use and maintain the national system and the hub. This is an integral element of an outreach program that will be critical to a successful launch of the ePhyto system.

The IPPC should retain a vendor to work with all members of the steering group. Prior to the end of 2014 this vendor should identify common or acceptable positions on business rules and transmission protocols for both the operation of an ePhyto system and a hub, and also further outline the needed outreach program.

I.4 PROJECT APPROACH

In August 2013, Bill Bryant, Bryant Christie Inc., was retained to develop the hub feasibility study for the steering group (SG). Bryant and others at BCI conducted interviews with representatives of the United States, Australia, New Zealand, the Netherlands, Korea and Argentina. Bryant met with the steering group at its September 2013 meeting in New Zealand and then subsequently posed questions (via email) to its members, and then exchanged proposed terms of reference and possible positions among those members to facilitate consensus on critical issues.

In October 2013, Bryant presented the IPPC Strategic Planning Group with an overview of the project and a report on the status of the feasibility study. While at the FAO, Bryant met with legal and financial IPPC staff members as well as with representatives of NPPOs.

In the subsequent weeks, Bryant consulted with BCI's internal technology group as well as with a Microsoft developer and submitted partial drafts to different SG members for their comment. In early December, he submitted a very rough draft to the full SG. In January 2014, a preliminary draft was circulated among SG members for their comment. Following the receipt of SG comments, BCI consulted with developers at Microsoft, Hewlett Packard, Amazon, and JHC Technology, circulated a survey among IPPC representatives,[3] and revised the draft consistent with that new information. This final report was submitted to the SG on March 12, 2014.

I.5 FEASIBILITY STUDY'S OBJECTIVES

This feasibility study has three objectives.

First, the feasibility study should describe the options for electronic data transfer; identify and review critical operational and political issues associated with the options; recommend which option has the best potential to increase efficiency, reduce costs, improve communication and decrease fraud.

Second, the feasibility study should assess the financial viability of the recommended IPPC ePhyto system.

Third, the feasibility study should raise awareness of ePhytos (that is, what an ePhyto is and what it is not), and recommend in general terms, whether or what outreach is needed to ensure all NPPOs, with reliable Internet access, that desire to participate in the electronic exchange of phytosanitary certificates, may participate.

What is an ePhyto certificate?

*An **ePhyto certificate** is an electronic phytosanitary certificate. It is the "electronic equivalent of the wording and data of phytosanitary certificates in paper form…transmitted by authenticated and secure electronic means from the NPPO of the exporting country to the NPPO of the importing country."*

What is an ePhyto system?

*At its most basic level, an ePhyto system involves two **national systems** and a **transmission mechanism** through which those two national (NPPO) computer systems exchange electronic phytosanitary certificates.*

What does an ePhyto system do?

*An **ePhyto system** produces, transmits (providing for sending and receiving) electronic phytosanitary certificates.*

PART II: OPERATIONS

II.1 DEFINITIONS

It is essential to understand what an ePhyto system is and is not; what it does and does not include. To assist with this understanding, before proceeding with this feasibility study, the reader should understand how the terms ePhyto certificate and ePhyto system are used.

[3] 197 surveys were emailed to IPPC representatives. 58 responses were received, providing a nearly 30% sample. Of those, 60% (40) issue fewer than 50,000 phytosanitary certificates each year, 25% (14) issued between 50,000-500,000, and 2% (3) annually issue 2-3 million phytos.

An **ePhyto certificate** is an electronic phytosanitary certificate. It is the "electronic equivalent of the wording and data of phytosanitary certificates in paper form…transmitted by authenticated and secure electronic means from the NPPO of the exporting country to the NPPO of the importing country."[4] An ePhyto certificate is a secured data set that uses Extensible Markup Language[5] (XML), for the transfer of data between computer systems. An ePhyto certificate is not an electronic version of a paper phytosanitary certificate (such as a scanned .pdf document) that is emailed. The ePhyto certificate can be printed, although when printed or viewed on a computer monitor, it might not appear as a paper phytosanitary certificate appears. Even if in some systems the ePhyto certificate, when printed or displayed, does not appear as a paper certificate appears, an ePhyto certificate is equivalent to a paper phytosanitary certificate (if the importing NPPO has to accept ePhyto certificates from the exporting NPPO).

What is the function of the national system in an ePhyto system?

*A **national system** creates an ePhyto certificate, accesses the transmission option, and loads an ePhyto certificate into the transmission mechanism or retrieves an ePhyto certificate sent by an exporting country.*

An **ePhyto system** produces and transmits electronic phytosanitary certificates. At its most basic level, it involves two **national systems** and a mechanism through which two national (NPPO) computer systems exchange electronic certificates.

Every NPPO participating in an ePhyto system needs a **national system**. A national system creates an ePhyto certificate and loads an ePhyto certificate into the **transmission mechanism** or retrieves an ePhyto certificate sent by an exporting country from the transmission mechanism. National systems may differ based on how an NPPO prefers to enter, display, manipulate and archive data.

There are two primary transmission options:
Point to point and
Single point (hub)

There are two **transmission mechanism options** that can be utilized as part of an ePhyto system. They are referred to as **point to point** and **single point** or **hub**.

A **point to point system** results from a bilateral agreement between two countries (NPPOs) to exchange ePhyto certificates directly between their national systems. Unless their systems are already capable of interfacing, the two countries may need to agree on access, encryption and authentication

[4] ePhyto fact sheet: ePhyto, State of Play in IPPC, July 2013
[5] Extensible Markup Language (XML) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable", Wikipedia definition
[5] ePhyto fact sheet: ePhyto, State of Play in IPPC, July 2013
[5] Extensible Markup Language (XML) is a markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable", Wikipedia definition

systems, on notification protocols and on the schema (including terms and codes) for the ePhyto certificates.

Figure 1: Point to Point

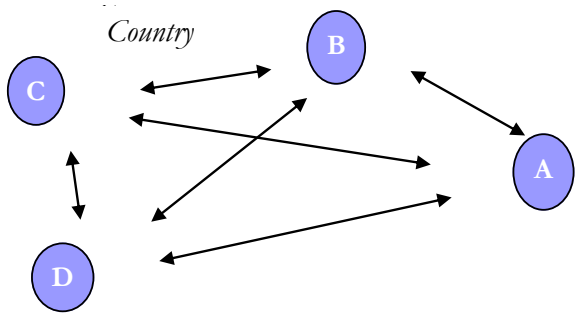


Figure 1 illustrates the complexity of bilateral relationships required to exchange certificates using a point to point system (in the absence of a single TCP and harmonized protocols and schema). In such a scenario, each country must negotiate a bilateral transmission access agreement with every country it wants to exchange ePhyto certificates with. As shown in this graphic, Country A would need a bilateral understanding with Countries B, C, and D in order to exchange ePhyto certificates with them, and Country B would need bilateral understanding with A, C, and D. While A and B would have one bilateral agreement between them, it would be possible that there would be four other bilateral agreements just to facilitate A and B exchanging ePhytos with C and D. For a country such as New Zealand, that might need 80 transmission understandings/protocols in order to exchange ePhyto certificates with all its trading partners, the possibility of maintaining that many slightly different systems is daunting; some would suggest unsustainable.

What are the ePhyto transmission options?

There are two transmission options. They are referred to as ***point to point*** *and* ***single point****. The single point option is sometimes also called "the hub".*

How are the two options different?

A ***point to point system*** *is a bilateral agreement between two countries (NPPOs) to exchange ePhyto certificates directly between their national systems.*

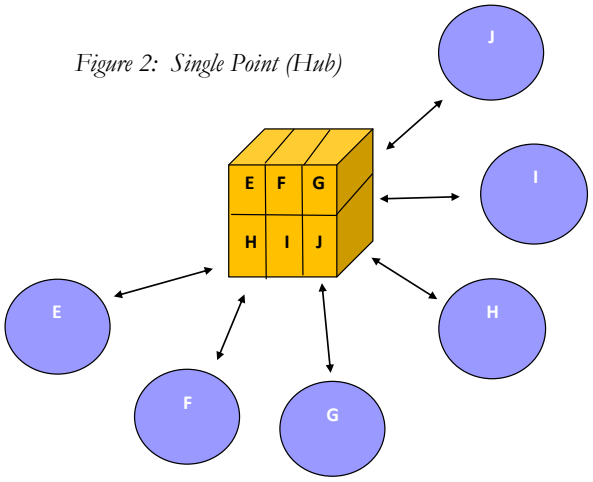
A ***single point (hub) system*** *involves multilaterally established transmission/retrieval requirements that all participating NPPOs accept and that facilitate the exchange of ePhyto certificates between any two NPPOs participating in the hub.*

Negotiating a single transmission protocol and more fully harmonizing protocols and schema could negate the need for many of the bilateral understandings. In the absence of a single TCP and deeper harmonization, a single point or hub option would be more practical.

A **single point (hub) system** is a multilateral approach. It establishes common transmission/ retrieval requirements that all participating NPPOs accept. An exporting NPPO can send an ePhyto certificate via a secured system to the importing country's mailbox, upon which the hub notifies the importing country that it has an ePhyto certificate in its box, and the importing country can then retrieve the ePhyto certificate. This option eliminates the need for multiple bilateral access agreements and enables all countries (NPPOs) that adopt the hub protocols to exchange data with one another.

Figure 2 represents the ability of country J to exchange ePhyto certificates with countries I, H, G, F, and E by adopting a single agreement. That agreement reflects the terms of the "hub". Given that all countries build national systems consistent with hub standards, each are able to exchange ePhytos with any of the other "hub" countries without negotiating a bilateral access agreement or adjusting national systems.

Figure 2: Single Point (Hub)

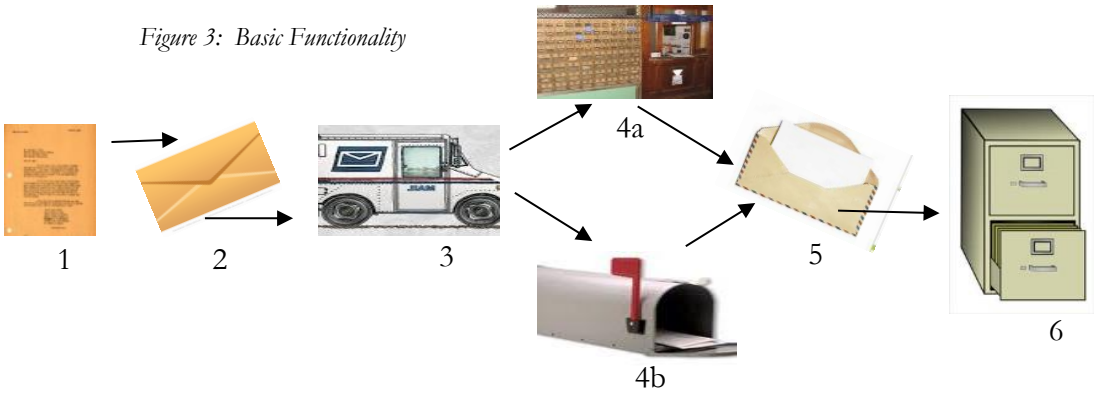


A **transmission control protocol (TCP)** is the transmission process, for example, https:// is a secured transmission protocol. If the same transmission control protocol (TCP) were used by all NPPOs, then national systems would only have to be configured to accommodate it.

II.2 BASIC FUNCTIONALITY

At its most basic level, an ePhyto system functions like a postal system. The first step in a postal system *(*see Figure 3 below*)* is 1) is the sender writes a letter. 2) Once the letter is written, the sender addresses it in a harmonized manner, and protects it from others reading it by enclosing it in a more or less standardized envelope and drops it into a mailbox. 3) The postal system then securely carries the letter ether to (4a) the recipient's mail box in a post office or (4b) directly to the recipient's house, where it is retrieved. 5) The envelope is then opened, and 6) the letter might be stored in a drawer or file.

Figure 3: Basic Functionality



Steps 1-2 are the responsibility of the sender. Steps 3-4 involve transmission. Steps 5-6 are the responsibility of the recipient. All steps are part of a functioning postal system.

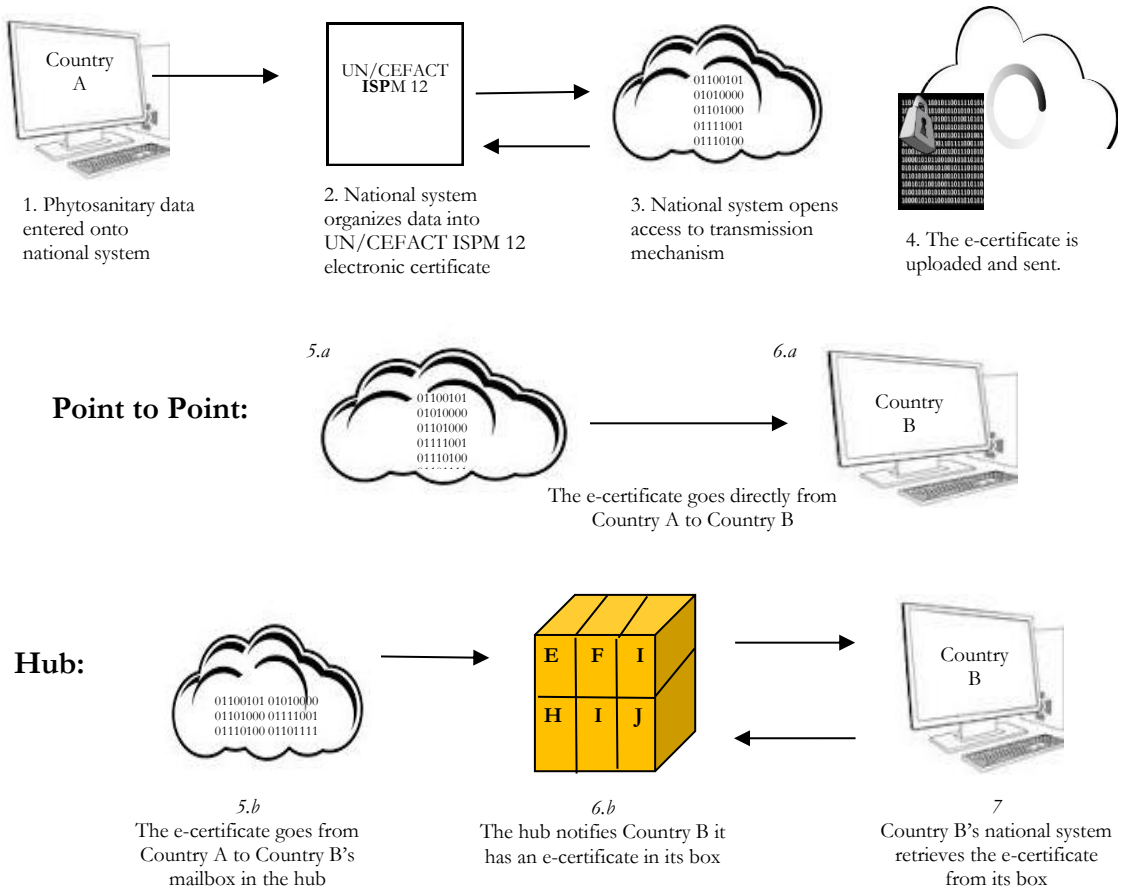
An ePhyto system performs similarly. In an ePhyto system (Figure 4 representing steps 1-7), Step 1) data regarding an export shipment is entered into a national system via a handheld device or a computer (by the industry and/or the NPPO). 2) The national system then produces an ePhyto certificate (a data set, conforming to ISPM 12, organized per the accepted UN/CEFACT schema. 3) The NPPO opens access between its national system

and the transmission mechanism with an authentication key (username and password), and 4) uploads the ePhyto certificate, and sends it.

This is where the system varies depending on which **transmission option** is used.

In a **point to point** option, the encrypted ePhyto certificate is sent directly (5.a on Figure 4) to the importing NPPO's system using a transmission mechanism agreed upon by the two countries involved. This requires both national systems being configured so that they may exchange ePhyto certificates. If the two national systems are not so configured, adjustments to the national systems might be required.

Figure 4: ePhyto System



5.b) In the **single point**, or hub option, the ePhyto certificate is delivered to the recipients "mailbox" in the system's "postal office" or hub. All NPPOs participating in the hub accept common rules and protocols, and as a result may send or receive ePhyto certificates from any other NPPO participating in the hub, via the hub. ePhytos are delivered to NPPO "mailboxes' and retrieved from one's 'mailbox'.

6.a) In a point to point option, the recipient, depending on how its national system is set up, can review, accept, reject, download, forward and/or archive the ePhyto certificate.

6.b) In the single point option, the hub notifies the recipient that a certificate has arrived and is "being held" in its "mailbox".

7) In the single point, or hub option, the importing NPPO *national system* accesses the ePhyto system with its authentication key and "pulls down" or retrieves the ePhyto certificate from its private "mailbox".

Steps 1-4 and 6.a and 7 (Figure 4) are functions of a national system that each NPPO must build itself. Steps 5.a, 5.b and 6.b are transmission functions. All steps are part of the ePhyto system.

II.3 CASE STUDIES

The following two case studies highlight some of the differences between point to point and the hub options, and some of the operational issues associated with each.

Netherlands: Point to Point

The Netherlands is one of the world's largest trading countries. Not only does the Netherlands itself export a significant amount of product around the world, but it is a primary European transshipment point. Given the volume of phytosanitary certificates, as well as reissued and superseding phytosanitary certificates that Netherlands' authorities must track daily, in 2001, they began developing a system, named CLIENT, for the electronic certification of imports. The system was designed to accommodate both plant and veterinary products entering the Netherlands. In 2006, CLIENT was expanded to accommodate exports as well. Netherlands exporters enter data via the Internet into CLIENT which then produces a paper phytosanitary certificate. If a bilateral access agreement exists, CLIENT can be used to transmit the data electronically to the importing country.

CLIENT has evolved over the last dozen years. It is currently in version 3.0 for phytosanitary import, version 2.6 for veterinary import and version 2.0 for export and is the result of €6,000,000 investment on the part of the Netherlands. Importantly, however, most of these costs (roughly 99%) were for the development of the Netherlands national system. Countries with less trade volume would not need to build such an elaborate national system nor invest a similar amount.

Before another country's national system may interact with CLIENT and electronically exchange ePhyto certificates, an access agreement must be negotiated between the Netherlands and the other country. Based on that access agreement, the Netherlands adjusts CLIENT and the other country adjusts its national system, so the two systems can communicate via the Internet. Given that access is defined by the access agreement, different countries interact with CLIENT in different ways. For example, an arrangement has been established providing Kenya access to submit information on cut flower shipments being exported to or thru the Netherlands. This access agreement is one way. It does not accommodate the Netherlands' sending ePhyto certificates to Kenya. An agreement is being implemented with the Republic of Korea that should enable the exchange of ePhyto certificates. China has an arrangement that provides for the receipt of the Netherlands' electronic certificates on animal products and it is hoped this will be expanded to also include ePhyto certificates on plant products from the Netherlands to China. The Netherlands' is implementing an agreement that should provide for the bilateral electronic exchange of certificates between it and the United States, but at present it only provides for

the U.S. receipt of ePhyto certificates from the Netherlands on seeds. The U.S. national system is not yet reconfigured to accommodate sending ePhyto certificates to the Netherlands' national system. Expanding the system so that ePhyto certificates may be exchanged in both directions by all parties is not an insurmountable problem, but it does require an agreement on how the two national systems will be adjusted to provide mutual access.

The Netherlands has spent a great deal of time and resources working with other countries, including Brazil, Mexico, Chile and Turkey to negotiate such access agreements. According to Netherlands' authorities, the time it takes to reconfigure national systems consistent with bilateral access agreements depends on the maturity of the national system in the other country. In countries with less capacity, face to face meetings are needed and costs can start at €50,000.

New Zealand: Single Point (Hub)

New Zealand has been considering the possibility of electronically exchanging phytosanitary certificate data for well over a decade. In New Zealand, data to complete a phytosanitary certificate are electronically gathered and entered into an "electronic certificate production system" by industry and Plant Protection and Quarantine (PPQ) authorities. In the absence of a system for sending that electronic data to the importing country, the electronic data must be downloaded onto a paper form and then shipped. This creates unnecessary costs; it denies New Zealand the efficiency and cost advantage of simply transmitting electronic data. In addition, New Zealand has been looking for ways to increase fraud prevention and found that a closed, electronic government–to-government system for transmitting phytosanitary data best accomplished that.

New Zealand explored both point to point and the "hub to spoke" ("hub to spoke" is another name for single point or "the hub") options for electronically exchanging phytosanitary data. Both options provided the benefits of transmitting electronically collected data electronically, and both provided the transparency and validation that minimized the possibility of fraud. However, the point to point approach required negotiating bilateral access agreements with each of New Zealand's 80 trading partners. It was determined negotiating that many point to point access agreements, and maintaining that many slightly different systems was not a sustainable structure. The hub approach was considered simpler because all parties participating in the hub system adopted the same technical standards and business rules enabling all of them to exchange data with each other under a single agreement. It was also considered less expensive because the national system only needed to be built once to multilaterally agreed upon specifications. The simplicity of the hub approach, it was determined, yielded cost savings over the point to point approach. After consideration, New Zealand decided to pursue the hub approach and developed a prototype.

In 2013, New Zealand partnered with Microsoft New Zealand to develop a proof of concept prototype hub. The hub prototype, which is called SMIE (Secure Method of Information Exchange), emerged from a development process that considered 14 versions. SMIE is a software to software exchange system that enables multiple countries to exchange data amongst themselves via a hub, negating the need for multiple bilateral access agreements. It

uses a system of multiple security layers, including authentication for logon, and encryption of transmitted data. SMIE is built on Microsoft's Azure platform making it scalable, secure and financially inexpensive to operate on an overall and transaction basis.

SMIE enables countries (NPPOs) to submit an ePhyto certificate with attachments if necessary, replace the ePhyto certificate if required, and accept or reject ePhyto certificates it has been sent.

New Zealand recognized that some countries with which it trades might not have the capacity to develop a national system. A national system is required to generate the ePhyto certificate, and then interface with the hub in order to push an ePhyto certificate into it; it's also needed to pull down an ePhyto certificate that has been pushed into its hub mailbox awaiting retrieval. New Zealand realized that while this could present a barrier-to-entry for participating in the hub system, it considered this less of a barrier than the one presented by the point to point system. In the point to point system, national systems not only have to be built, but might also have to be "tweaked" multiple times in order to interface with the multiple national systems. New Zealand recognized that different countries having different access and transmission criteria could require a country to build and maintain multiple variations of a national system in order to participate in a multiple bilateral point to point exchanges. While the hub (multilateral) approach still requires every participating country to develop its own national system, since transmission protocols and business rules are standard among all NPPOs participating in hub, a national system only needs to be developed once to the hub's specifications.[6]

Nonetheless, New Zealand recognized that even developing one national system could present technical and financial challenges for some countries that might otherwise want to exchange phytosanitary data electronically. To mitigate this barrier, New Zealand's prototype included a portal. The portal was designed to provide hub access to NPPOs that didn't have the technical or financial capacity to develop a national system, or the trade volume to justify doing so.

The portal, in effect, is a "one way national" system that countries that do not have national systems can use as an introduction to participating with the ePhyto system. It is a platform onto which an exporting NPPO with a national system can push ePhyto certificates into the importing country hub mailboxes then holds in the importing country's mail box. The hub notifies the importing NPPO via email that it is holding an ePhyto certificate for them, and the importing NPPO can then view the information online, print it, or download it as a PDF.

The prototype hub portal does not allow an importing NPPO to electronically exchange certificate data/information, but it does give them access to ePhyto certificates for their imports through a simple mechanism that interfaces with the hub.

[6] The adjustments to national systems that may be required when entering into a new point to point arrangement could be minimized through the adoption of a single TCP and IPPC harmonized business rules for the electronic exchange of phytosanitary certificates.

As of January 2014, New Zealand is exchanging ePhyto certificates on a point to point basis with one NPPO and four NPPOs through email. Based on initial use, New Zealand concluded that the single point or hub approach is simpler to set up and maintain at lower cost than would be the case setting up and maintaining multiple, slightly different interface access systems that would be required under a multiple point to point approach.

II.4 POINT TO POINT / HUB COMPARISON

Are there more advantages to a single point or a point to point option?

That depends on whether the IPPC facilitates a single transaction protocol for the exchange of ePhyto certificates between NPPOs. If it does, then both options have different advantages. If the IPPC does not facilitate such standardization, then a hub has operational advantages over a point to point.

The operational comparison between a point to point and a single point approach really depends on whether there is a single TCP for the electronic exchange of phytosanitary certificates between NPPOs. If there is a single transmission protocol, then single point and point to point approaches have different advantages. If the IPPC does not provide for such standardization, then a hub has several operational advantages over the point to point option.

As the two case studies made clear, in the absence of a single TCP, common business rules and a harmonized schema, NPPOs wanting to exchange ePhyto certificates must bilaterally negotiate these and then adjust their national systems to accommodate that bilateral agreement.

For example, the United States, which is trying to participate in ePhyto systems being established by the Netherlands and New Zealand, has to negotiated different protocols and terms with each, and then adjust the U.S. national system to accommodate each. Some estimate that to negotiate such terms with a new NPPO costs the U.S. $50,000. This is consistent with some estimates provided by the Netherlands. In the New Zealand case study, it was made clear that New Zealand does not have the time and resources to negotiate protocols and terms with each of the eighty countries with which it trades.

In addition to set up costs, the cost and resources that would need to be allocated to maintain multiple slightly different systems is likely unsustainable. Additionally, the absence of a harmonized schema could complicate the archiving, searching, and storing of the data gathered from multiple countries into a single national database.

The advantage of a point to point is two countries may agree on transmission and operational protocols and schema, and begin working together. The disadvantage is that in the absence of harmonization, bilateral access agreements and supporting technical adjustments need

It is recommended that as a first step all IPPC members agree on a single transmission control protocol (TCP) that will enable point to point and single point options to co-exist and interface within a single IPPC sponsored ePhyto system.

to be made with every trading partner. The cost of maintaining multiple, slightly different systems is another disadvantage, and could present a barrier-to-entry for countries with limited financial and technical resources.

The advantage of the hub is that once transmission and operating protocols are agreed upon by all countries, data may be easily exchanged via the hub. The disadvantage is that it might take some time to reach an agreement on protocols when many countries are involved. However, once an agreement is reached, maintenance costs are reduced, since only one system needs to be maintained and staff only need to understand one set of protocols.

II.5 STANDARDIZATION

Different countries have different capacities, needs and concerns and should be able to develop national systems and employ transmission options most consistent with those capacities, needs and concerns. To this extent, a robust ePhyto system should accommodate both single point and point to point transmission options. This is possible, and recommended, but it requires 1) standardizing a TCP for all NPPOs exchanging phytosanitary certificates electronically; 2) largely harmonizing operating (or business) rules; 3) to a lesser extent but still importantly, establishing further harmonized schema, terms, codes and fields within the ePhyto certificate.

To extend the earlier metaphor, a robust ePhyto system should be built more like our planet's current email system than like its postal and private courier systems. The current email system, because there is only one TCP, enables different users to use the email option that best meets their needs, while still being able to send email to those using a different option. For example, my wife uses Yahoo for email and I use Outlook. I like the way I have configured Outlook to search and archive my emails. My wife likes the way Yahoo organizes and displays her email. When I try to send an email from her system, I get frustrated because its functions are different from those in Outlook. Despite these different configurations however, because there is one TCP for all email, I can easily send an email from my Outlook account into her Yahoo account. To build such an ePhyto system, broader and deeper harmonization is required.

First, all IPPC members need to agree on a single TCP that will enable point to point and single point options to co-exist and even interface within a single IPPC ePhyto system.

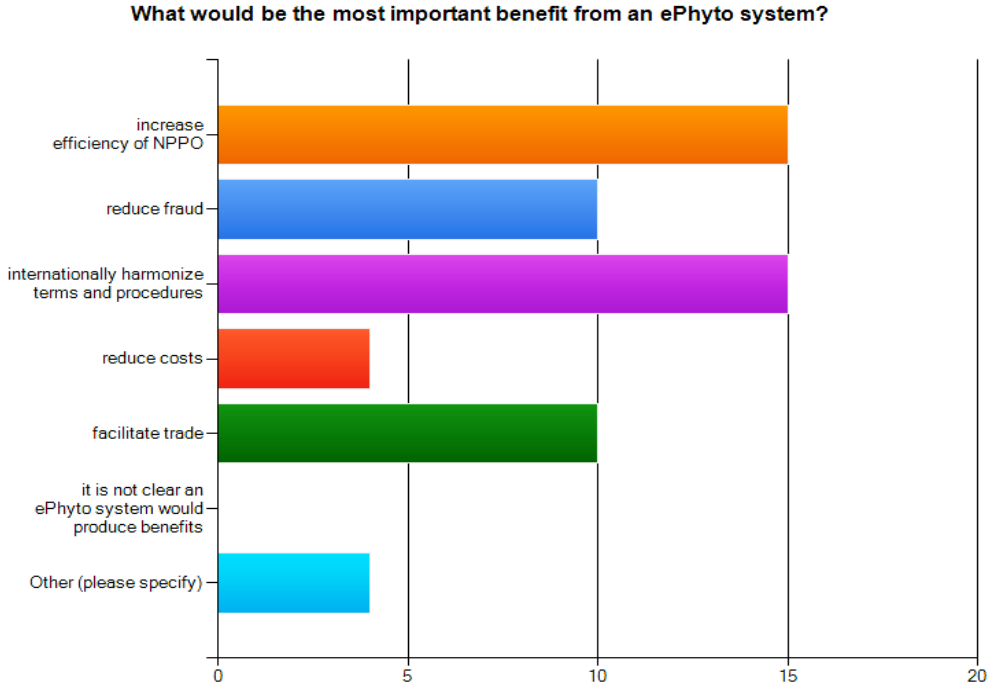
Second, in addition to establishing a single TCP, NPPOs should fully harmonize operating and business rules. Among other subjects, these rules involve notification and verification procedures. A rule for how an exporting NPPO is notified if an ePhyto certificate it sent was deemed invalid is needed, as is a rule for what happens to the invalid ePhyto certificate. Verification business rules should require XML pattern on "the outside of the envelope", so that the presence or absence of that XML pattern may be used to determine whether the certificate is valid. Another needed business rule involves procedures for a country joining the hub and testing the

It is recommended that in addition to establishing a single TCP, NPPOs should more fully harmonize operating and business rules.

interface between the hub and the national system. Additionally, the SG needs to develop business rules for a withdrawn certificate, a replacement certificate, re-export certificates and the appropriate use of additional declarations.

Third, even though the schema is irrelevant to the completion of the transmission, harmonizing schema is critical to the efficient operation of a global ePhyto system. In a survey of IPPC representatives (see Figure 5), nearly 26% responded that the most important benefit of an ePhyto system was the harmonization of terms and procedures, and nearly 26% responded that the most important benefit would be increased efficiency of the NPPO.

Figure 5



Increased efficiency can be secured by developing an ePhyto system that enables any two NPPOs to exchange ePhyto certificates without bilateral agreement on how to configure or transmit the data, and by having a uniform schema that can seamlessly be inserted into any national system designed consistent with agreed upon standards. In the absence of a more standardized schema, NPPOs would still need to bilaterally agree upon how data is to be presented. That could drive up costs and undermine the efficiency of an electronic system. While minor variations or exceptions may need to be bilaterally agreed upon, XML schema, terms, codes and fields need to be more fully harmonized.

While important work has been done to harmonize the schema, some countries receiving ePhyto certificates have experienced difficulties due to inadequate standardization. For example, apparently the "treatment" section is open to too much interpretation for it to be electronically handled. On the schema, "treatment" falls under the fields designated for "processing". On paper phytos that is broken down into date, treatment type, duration, temperature, comments, concentration. On the electronic schema each NPPO decides how to complete the processing field. Some use the general processing field to represent

treatment. Some use it to represent fumigation. Some use the field specifically for methyl bromide. Such areas of the schema are still open to so much interpretation that before being able to exchange ePhyto certificates, NPPOs must agree on how to use those fields. That bilateral discussion undermines one of the advantages of an electronic system.

The UN/CEFACT (SPS) certificate should be the foundation of the ePhyto certificate's schema. However, all NPPOs electronically exchanging ePhyto certificates need to use the same version of the schema and complete it in the same way.

II.6 HOSTING ENVIRONMENT

If a point to point transmission option is utilized, which servers facilitate the exchange between the two national systems is entirely a matter of the country sending the ePhyto certificate, or possibly a bilateral agreement. If an IPPC sponsored hub is built, the IPPC should select a vendor to host it. A cloud platform, such as Azure, should be used.

II.7 REDUNDANCY

An ePhyto system that encompasses both transmission options operating with the same TCP has, as a system, inherent redundancy (or back-up/contingency). However, each option needs to be concerned about redundancy. If a point-to-point system is being employed, then redundancy of hard drives and servers is a matter between the two NPPOs involved. If a third party vendor were retained to maintain an IPPC hub, the scoping document should stipulate that redundancy of hard drives and servers be provided. Having back-up servers in different locations is a straightforward matter.

It is recommended that any IPPC sponsored hub be designed such that ePhyto certificates are deleted from primary and backup servers once they have been received by the importing NPPO.

II.8 SCALE

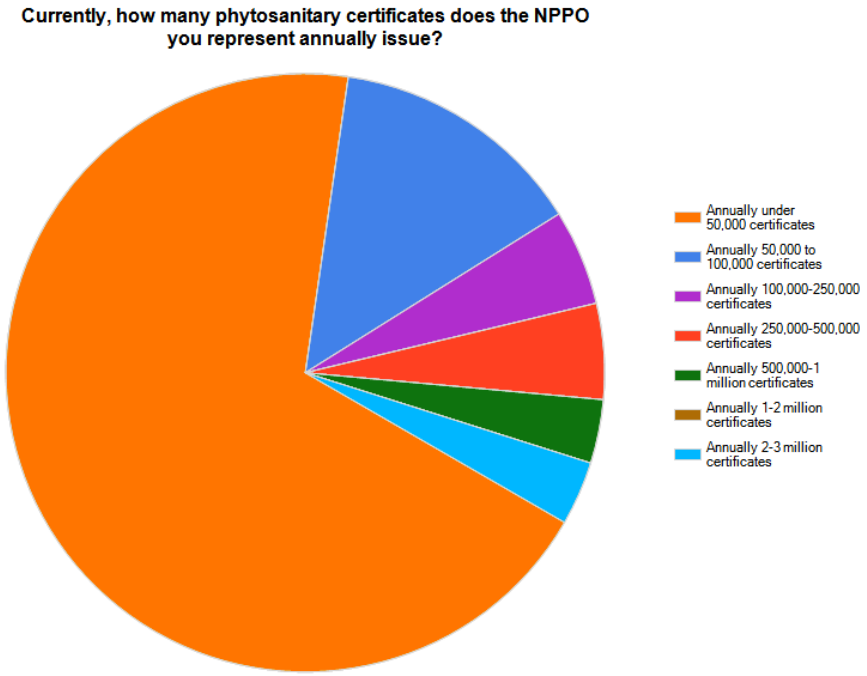
An IPPC sponsored hub would need to be robust enough to handle all ePhyto certificates from all participating NPPOs. In a survey of IPPC representatives, over 70% (40 NPPOs) reported they issue fewer than 50,000 certificates annually. Only 2 NPPOs issue 2-3 million annually.

When asked how quickly the NPPO they represent would begin adjusting national operations to use the system, 28% responded they would begin immediately, and the exact same percentage responded they would begin within 1-3 years.[7] So, initially 1.5-3 million annual transactions[8] could move through the hub. As other NPPOs avail themselves to

[7] Just over 41% responded technical or financial assistance would determine when they could adjust practices and develop a national system.
[8] The average size of an ePhyto certificate is estimated to be about 20KB. 4KB would be a small certificate. Certificates with attachments or for multiple commodities could be much larger than 20KB.

ePhyto exchange, the number of transactions could rise to 4-6 million annually. Even at this expanded level, this is not considered a large system. To provide perspective, Facebook reportedly is designed to carry roughly 9 billion transactions per second. In discussions with developers, the contemplated scale does not present any obstacle, except that, one remarked, the system might not be large enough to attract the attention of major developers.

Figure 6



II.9 SECURITY

When asked what their primary concern within an ePhyto system was, only 5.3% of IPPC representatives responding to the survey (3 out of 58) cited security as a primary concern. Nonetheless, for an ePhyto system to be accepted and used by NPPOs it must be secure. Since no data would be stored in an ePhyto system, security should be focused on transmission. Three levels of transmission security should be provided. They are system security, data security and exchange security.

- System security refers to ensuring only IPPC signatories can access the TCP.
- Data security refers to ensuring the data is encrypted and immune to manipulation once entered by the NPPO.
- Exchange security refers to ensuring it is difficult for an unauthorized entity to divert or mine data during transmission.

In laymen's terms, think of the ePhyto system as a tunnel between two countries. System security ensures only participating countries may insert or withdraw data from the open ends of the tunnel. Data security ensures that the data moving through the tunnel is encrypted and only the sender and receiver have the key that can open and read the data. Exchange security ensures no one can drill a hole into the tunnel and pull out or insert data.

The first ensures that only participating NPPOs may access the system. Each participating NPPO needs to be given a "key" that enables their national system to interface with the ePhyto system. As an initial security step, the system should incorporate the use of https, which is a secure communications channel used to exchange information. It should use a Secure Sockets Layer (SSL) and requires a SSL certificate on the receiving NPPOs national system. The use of additional layers of security, such as Virtual Private Network (VPN) tunnel, could aid in the establishment of a secure transmission. At OEWG4 it was decided an X509 certificate (digital fingerprint) verified and digitally signed by a recognized Certificate Authority must be used for verifying the authenticity of the importing and exporting NPPOs. This digital signature would attest that the NPPO purportedly sending the ePhyto certificate was really the party that sent it. The digital signature would also help ensure the data has not been tampered with enroute.

Aren't there security concerns?

The security of paper documents being shipped and electronic documents being transmitted is always a concern. The integrity of electronically transmitted documents can be protected by providing three levels of security: system, data and transmission.

The second level of security is ensuring the integrity and privacy of the ePhyto certificate data itself. The ePhyto system (subject to business rules) would validate the certificate's envelope and once the certificate arrived in the recipient's hub box, would send a notice to the sender. If the sender receiving a notice that the ecertificate it sent has been delivered to the appropriate hub box had never sent an ecertificate to that hub box, it would signal a security breach. Importantly, before transmitting the ePhyto certificate, the hub would encrypt the data. Ensuring proper document encryption and transmission can be achieved at several points (https, VPN, file level encryption). None are particularly complex when incorporated from the initial design.

The third level of security is focused on the means of exchange. Not only the document, but the transmission also needs to be encrypted between two authorized NPPOs.
Combined, these three layers of security provide a system that 1) only allows a participating NPPO to access the system; 2) encrypts ePhyto certificates; and 3) provides for a secure exchange.

PART III: POLICY ISSUES

III.1 SOVEREIGNTY

Who owns the ePhyto certificates?

The NPPOs involved in the exchange own the ePhyto certificates and the data contained in them.

The same sovereignty standards that apply to paper certificates being mailed, or to emails exchanged between two governments, would apply to ePhyto certificates exchanged within an ePhyto system.

III.2 REGULATORY

What happens if a country's regulations require paper certificates?

Participation in any ePhyto system is entirely voluntary.

Some countries have national regulations which require phytosanitary certificates to appear in a certain schema or be printed. Some countries have regulations that prohibit or control charging for phytosanitary certificates. These concerns should not inhibit development of an ePhyto system, since participation in an ePhyto system would be voluntary. No NPPO would be compelled to exchange phytosanitary certificates electronically. Countries may participate in an ePhyto system when they believe it is in their interest to do so, and when national regulations permit it.

III.3 POLITICAL ACCESS

Could national intelligence agencies access ePhyto certificates?

Since ePhyto certificates are encrypted, and since the transmission would be encrypted, and since the certificates merely move through the system but are not recorded and stored in any database, there would not be any repository from which to access ePhyto certificates.

While this issue did not emerge as a concern among surveyed IPPC representatives, there was some sensitivity among certain SG members about the possibility of a national intelligence service accessing ePhyto certificates "in the system".

The current system of shipping paper documents might be more vulnerable to such intrusion than would an ePhyto system, since an ePhyto system would provide encrypted electronic transmission. Since no trade or commercial data nor any activities log would be kept in the hub, it would not be possible for the IPPC or any country to access or extract it. The ePhyto system is merely a means of electronically transmitting ePhyto certificates. It is not a database.

Hypothetically, if a hub were built and maintained by a contracted third party vendor, and a national intelligence service approached that vendor and requested access to the ePhyto certificates, the vendor would not have any ePhyto certificates to provide. The only access that could be surrendered would be to those encrypted ePhyto certificates that were waiting in hub "mailboxes" for pick-up. Given those certificates would likely be in "the Cloud",[9] encrypted, and in various states of encrypted transmission, accessing them would be difficult. In addition, since no data is stored, ePhyto certificates would be constantly moving through the system at electronic speed, and therefore at any given moment only a small, random sample would ever even be transmitting.

[9] "Cloud computing commonly refers to network-based services, which appear to be provided by real server hardware, and are in fact served up by virtual hardware, simulated by software running on one or more real machines. Such virtual servers do not physically exist and can therefore be moved around and scaled up (or down) on the fly without affecting the end user - arguably, rather like a cloud." Wikipedia definition

Nonetheless, measures could be taken to further reduce this small risk. Since the anticipated ePhyto system is not likely to be that large relative to many international data exchange systems, the data, despite being "in the cloud", is likely to move between a few servers in physical locations. It is recommended that servers only be located in countries that legally protect the confidentiality of the data.

It is recommended that servers only be located in countries that legally protect the confidentiality of the data.

III.4 LEGAL

A cursory review of the ePhyto concept with FAO counsel did not raise any apparent legal issues with the IPPC developing a hub to facilitate the exchange of ePhyto certificates. The IPPC would simply be providing a means of transmission. The certificates being transmitted through the IPPC sponsored system would remain the property of the two NPPOs involved. The system should be organized so that the IPPC has no more legal liability with the exchange of ePhyto certificates than a postal service would in the event paper phytosanitary certificates were mailed and lost.

The liability associated with system failure is an area that would need to be clarified by IPPC/legal. Liability for extended absence of service would need to be assigned to the vendor, not the IPPC. The likelihood of data loss could be minimized by simply requiring that NPPOs maintain a copy of any ePhyto certificate they submit into the system, or at minimum maintaining a copy until notified that the ePhyto certificate they sent has been received and accepted by the importing NPPO. Similarly, requiring the vendor to provide sufficient redundancy would minimize the likelihood of data loss.

A final area of liability that will need to be explored is related to security. If the system were compromised and data regarding transactions were mined or fraudulent ePhyto certificates were introduced into the system, it would need to be made clear that the IPPC was not liable. NPPOs would, upon agreeing to participate in the ePhyto system, hold the IPPC harmless for system failure or data loss and recognize that they are voluntarily availing itself of a transaction option the IPPC has made available.

It is recommended that NPPOs agree to hold the IPPC harmless in the event of system failure and data loss.

PART IV: FINANCIAL SUSTAINABILITY

While slightly under 7% of IPPC respondents stated "reducing cost" was the most important benefit of an ePhyto system (see Figure 5, page 15), financial sustainability is the paramount concern among IPPC representatives that responded to the survey. Over 27% stated that the NPPOs they represent have the financial resources needed to develop a national system, and another 10% responded they had the financial resources, but lacked the needed technical expertise. However, while 38% have the financial resources needed to participate in an ePhyto system, 62% responded they did not. When asked about their primary concern with an ePhyto system, nearly 28% responded "the national cost of setting up and maintaining an electronic system." A little over 10% responded "the overall cost of maintaining an

international system." Clearly, the financial costs and the financial sustainability of an ePhyto system are a significant concern, and should weigh upon any SG recommendation to proceed with hub development. Such a hub system involves both initial development and ongoing maintenance costs.

IV.1 HUB DEVELOPMENT COSTS

The cost to develop a hub system depends upon its functionality. The features and services, not the number of participants, drive development costs. To this extent, until basic business rules that define functionality are agreed upon by the SG, it will be difficult to develop a request for proposals that could secure meaningful bids. Nonetheless, in an effort to provide a meaningful range, general estimates were requested, based on the features and services discussed in this feasibility study. Those very rough estimates suggest developing a hub is likely to cost between US$200,000-US$500,000 to scope, develop, test and deliver. Most likely, the development process from scoping to delivery would cost around US$300,000-$400,000. If a basic national system (that could be made available to all NPPOs) were included as one project element, then the costs could move into the US$450,000-$650,000 range.

Experience provides some guide. The New Zealand prototype was developed for US$17,000, but had all costs been billed the prototype would have cost about US$75,000 and a fuller functioning prototype likely would have costs US$120,000 to develop, test and deliver. The U.S. worked with Hewlett-Packard to develop a functioning pilot system. Those development costs were well under US$100,000. Given that basic prototype proof of concept hubs have been developed for US$50,000 to $120,000, it appears reasonable to expect that bids for the development, testing and delivery of a fully operational, but still basic hub should be about US$350,000 (not including the development of a basic national system).

IV.2 MAINTENANCE COSTS

Technical upgrade costs are likely to be minimal. Of course, a hub would be an evolving system and annual technical upgrades would need to be made. Depending on the number of upgrades requested, the costs are likely to be under US$100,000 per year.

Hosting charges are likely to depend upon traffic and storage space required. Estimates secured by the United States suggest that the cost to move 500,000 ePhyto certificates per month (6 million per year) would be about US$315,000 per year. Other estimates could put this figure as high as $450,000. At this rate, moving 170,000 certificates per month, or roughly 2 million certificates a year, would cost about US$215,000-US$300,000. (This estimate might be erring on the high side.) The hosting fees would include basic technical assistance.

At least in the first years, technical assistance should be available to NPPO's using the system. As users become more familiar with how an ePhyto system operates this will be less important, but initially such assistance will be needed. Fortunately, technical assistance is included in hosting charges. However, if 24/7 technical assistance needed to be available in all IPPC languages, additional cost could be in the $240,000 range, although this would

depend upon the vendor. It is not clear, however, given initial volumes, and the not entirely time sensitive nature of these transactions, that such a level of technical assistance is needed. A reduced level of technical assistance might be sufficient, but this is a decision for the SG to make.

Based on these estimates, one could project that technical upgrades would range between US$50,000 and $80,000 per year; hosting would range about $300,000 per year; technical assistance/support would cost up to US$240,000 per year. That provides a sum of a very rough range of US$450- $620,000 annually. The IPPC administration fee would range between $60,000-$90,000. So, the annual cost to operate the hub could be about US$500,000-$700,000. If the initial system moved 2 million ePhyto certificates, the cost per certificate would be between 25-35 US cents. To put that in perspective, the cost of paper and printing for a phytosanitary certificate is about US4-10 cents, with the cost of completing and shipping a phytosanitary certificate over $25 each.

IV.3 POINT TO POINT/SINGLE POINT COMPARATIVE COSTS

For the purposes of this analysis, let's assume the development of a basic hub that all NPPOs could use were to cost US$350,000. That is an amount equal to what the United States estimates it would cost to negotiate bilateral point to point agreements with seven other NPPOs. While the Netherlands estimates that the cost of negotiating a point to point agreement is much less when working with NPPOs that already have sophisticated national systems and technical capacity, it also acknowledges it can cost more than US$50,000 to establish a point to point exchange with other countries. It was precisely this cost to establish point to point agreements with multiple trading partners that led New Zealand, the United States and other countries to explore the possibility of developing a single hub. Based on these figures, cumulatively IPPC members would spend much more establishing multiple point to point arrangements than they would building a basic hub that facilitated harmonization and was accessible to all NPPOs with basic national systems and reliable Internet access.

Similarly, maintaining slightly different technical arrangements and accommodating national systems to handle different rules and schema, and upgrading each of these slightly different interfaces to accommodate innovation, regardless of the volume being moved through the system, would require ongoing financial and technical resources beyond the reach of some NPPOs. Alternatively, the ongoing costs associated with an IPPC-sponsored system would be more certain and volume based.

IV.4 FUNDING THE IPPC-SPONSORED HUB

There is some disagreement among steering group members about how the development of an IPPC-sponsored hub should be financed. Ultimately, this is a policy, possibly a political decision.

One option is for proponent countries to serve as donor countries and divide the development costs among themselves. If four or five major countries were to sign on to such an agreement, pro rata costs would likely be under US$150,000. This would be the easiest way to get hub development underway.

If this is not agreeable to the steering group, a second option would be for four or five countries to lend funds for the hub's development and delivery, with the understanding that these costs would be reimbursed over the first five years of the hub's operation.

The ongoing maintenance and operation of the hub should be paid for through a transaction fee. The fee would be set annually by the steering group based upon the previous year's maintenance costs and transaction volume, and projected costs and transaction volume. Every NPPO would annually deposit into an IPPC account an amount based upon the amount expended the previous year. If the country's account were drained prior to the end of the year, a fee to cover the balance of the year would be charged based on the previous months' usage. If an NPPO had a positive balance at the end of the year, the amount would be credited toward the next year's fee (which would be appropriately adjusted).

It is recommended that the ongoing maintenance and operation of the hub should be paid for through a transaction fee. The fee would be set up annually by the steering group based upon the previous year's maintenance costs and transaction volume, and projected costs and transaction volume.

If at the end of the year, transaction fees were insufficient to cover costs (that is, if the transaction fee had been set at too low of a level for full cost recovery), NPPOs would need to agree to cover all costs on a retroactive pro rata (based on transaction) basis. That information would be taken into account when the SG set the subsequent year's transaction fee.

The IPPC finance staff would be responsible for estimating each users annual fee and collecting it from all participating NPPOs at the beginning of the year, providing the steering group with quarterly statements of NPPOs accounts, paying the vendor per the agreed upon terms, notifying the vendor when any NPPOs account fails to have a positive balance and requesting its access to the hub be denied. The IPPC would likely charge 15% of the budget in exchange for this service.

PART V: OUTREACH

There is broad interest in developing a system to exchange electronic phytosanitary certificates. Over 67% of IPPC representatives responding to the survey indicated their NPPO was interested in an ePhyto system (Figure 7).[10] However, almost 42% responded that they would need both technical and financial assistance before they could begin developing a national system (Figure 8). And, when asked if they would prefer to develop their own systems or have the IPPC provide a basic system (Figure 9) over 67% indicated they would prefer an off the shelf system to purchase or an IPC sponsored basic national system.

[10] This broad interest has positive financial consequences, since the more transactions moving through the system the lower the transaction fee. This is an additional reason to ensure the IPPC implements an outreach program that facilitates broad participation.

Figure 7

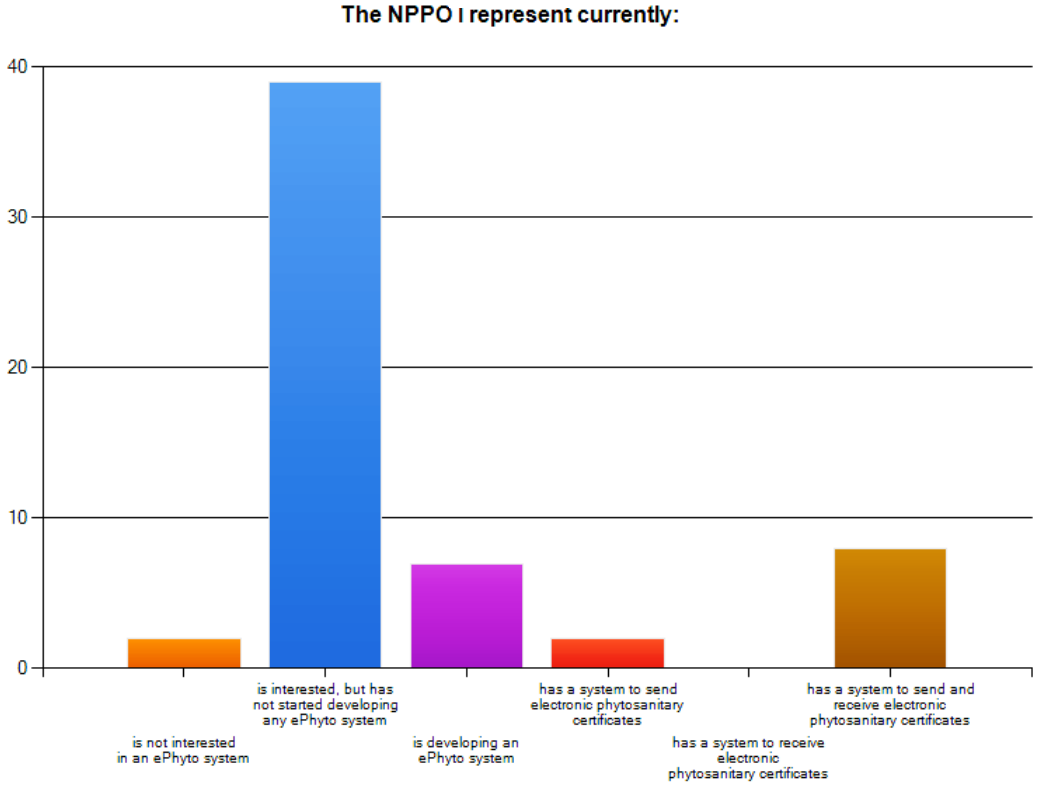


Figure 8

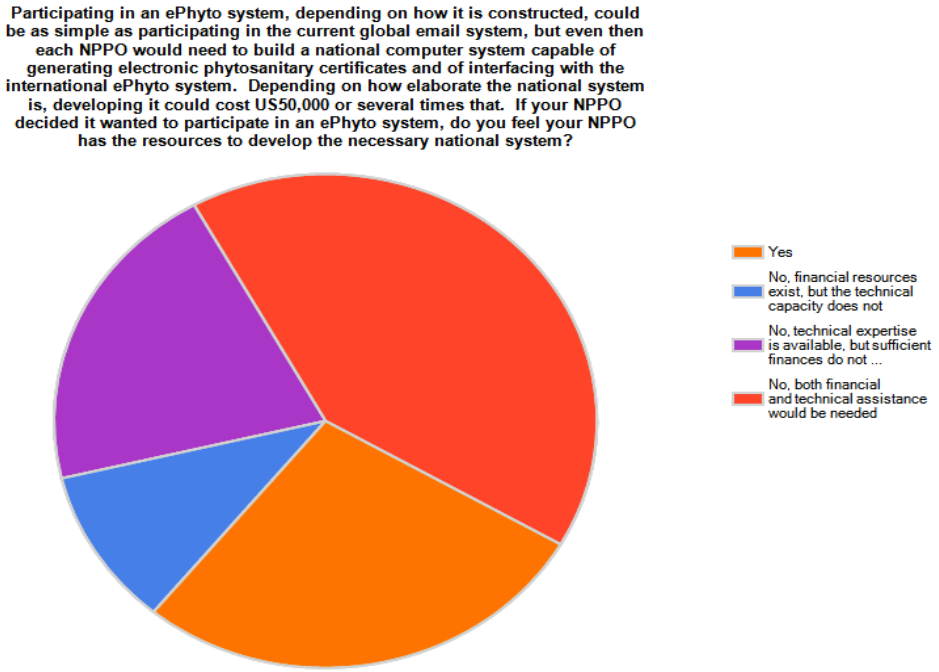
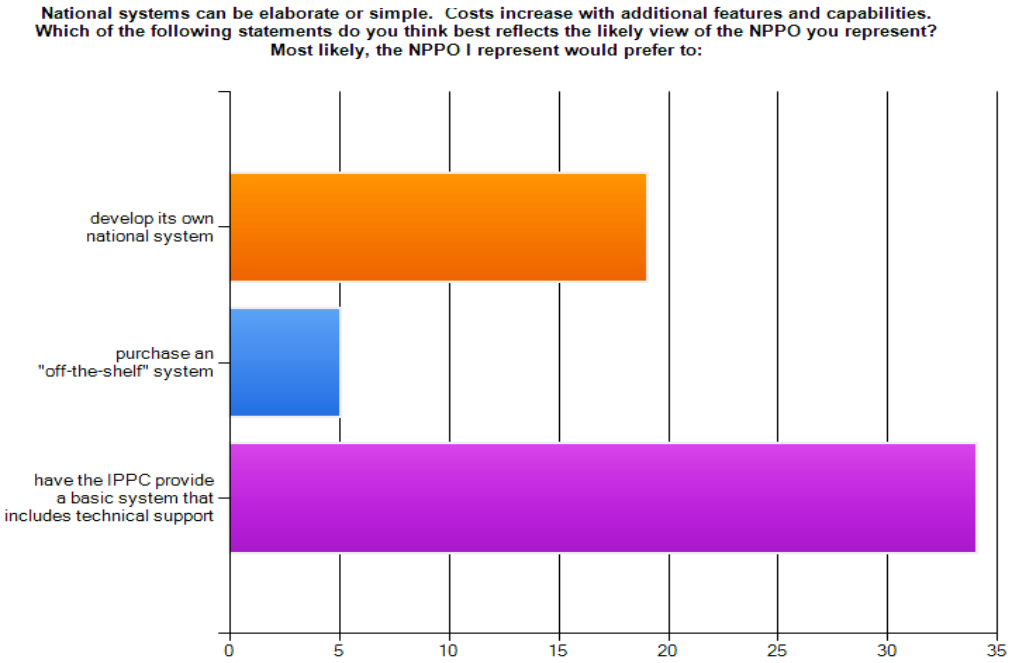


Figure 9



In addition to needing financial assistance and some means of providing a basic national system, technical training will be needed. In BCI's survey, 60% of IPPC representatives responded they would want IPPC sponsored training seminars.

To this extent, an aggressive outreach program needs to accompany the development of an IPPC facilitated ePhyto system. This program should include developing and making available a basic national system and be accompanied by training seminars.

PART VI: NEXT STEPS

VI.1 STANDARDIZATION

The IPPC should facilitate the universal adoption of a single control protocol for the transmission of ePhyto certificates between NPPOs, common business rules and a further harmonized schema. While this could fall to IPPC staff, it is unclear whether that arrangement provides the resources necessary to move forward with the urgency the CPM identified. As the CPM has already recognized, if the IPPC does not move forward quickly, incompatible point to point and national systems are likely to evolve, driving up the costs of electronically exchanging phytosanitary certificates and reducing the efficiency of an ePhyto system. In order to move forward with some alacrity, the IPPC should retain a vendor to work with all members of the steering group. Prior to the end of 2014 this vendor should identify common or acceptable positions on business rules and transmission protocols for both the operation of an ePhyto system and a hub, and also further outline the needed outreach program.

VI.2 SCOPING DOCUMENT

Based on harmonized business rules, the SG (or its vendor) should draft a scoping document that defines the hub's functionality. That scoping document should then be put out to bid.

VI.3 FINANCE

The SG needs to select a means of funding initial development costs. The basic decision is whether funds to cover hub development will be donated by proponent countries, or whether those funds will be lent by the IPPC or donor countries and then reimbursed from transaction fees. The SG also needs to agree on how the transaction fee will be calculated.

VI.4 IPPC ACCOUNT

An IPPC account should be created. Initial research suggests that the account could be created within the IPPC's Technical Cooperation Department and that existing standard agreements between donors and users could be adjusted to accommodate funding an ePhyto system.

VI.5 REASSESS

After receiving bids on the development of a hub and standard national system, and finalizing how sufficient funds will initially be raised and collected on an ongoing basis, the SG should conduct regional outreach seminars describing the proposed ePhyto hub, its functionality and cost. At that point, NPPOs would be asked to decide whether they are prepared to "sign up" given the projected costs. That information will help the SG determine whether the level of interest is sufficient for the hub to be financially sustainable, and project what the initial transaction fee would need to be. If the SG decides to proceed, it should award the contract to the selected vendor.

VI.6 VENDOR

Once a hub is built, the IPPC needs to submit a request for proposals and select a vendor to provide for the hub's operation and maintenance. The vendors would need to be retained such that no contractor is "locked in" and becomes integral to the system itself. The group will need to consult with IPPC legal to ensure all rights to intellectual property, patents, registered names and developed programs are retained by the IPPC.

VI.7 IPPC STEERING GROUP

The vendor would be responsible for the hub's ongoing maintenance and upgrades per the direction of an IPPC steering group comprised of hub user representatives. This group would address:

- upgrading the system to incorporate new technology or security features;
- receiving a report from the contractor of system errors and evaluating which need to be addressed;
- reviewing whether transaction fees have been set at a level to recover costs;
- managing the vendor's scope of work.

VI.8 OUTREACH

As the hub and basic national systems are being developed, the CPM will need to implement an outreach and capacity building program to ensure all NPPOs with reliable Internet access understand how to access the ePhyto system.

APPENDIX

IPPC e-phyto survey

SurveyMonkey

1. Currently, how many phytosanitary certificates does the NPPO you represent annually issue?

		Response Percent	Response Count
Annually under 50,000 certificates		**69.0%**	**40**
Annually 50,000 to 100,000 certificates		13.8%	8
Annually 100,000-250,000 certificates		5.2%	3
Annually 250,000-500,000 certificates		5.2%	3
Annually 500,000-1 million certificates		3.4%	2
Annually 1-2 million certificates		0.0%	0
Annually 2-3 million certificates		3.4%	2
		answered question	**58**
		skipped question	**0**

2. Participating in an ePhyto system, depending on how it is constructed, could be as simple as participating in the current global email system, but even then each NPPO would need to build a national computer system capable of generating electronic phytosanitary certificates and of interfacing with the international ePhyto system. Depending on how elaborate the national system is, developing it could cost US50,000 or several times that. If your NPPO decided it wanted to participate in an ePhyto system, do you feel your NPPO has the resources to develop the necessary national system?

	Response Percent	Response Count
Yes	27.6%	16
No, financial resources exist, but the technical capacity does not	10.3%	6
No, technical expertise is available, but sufficient finances do not exist	20.7%	12
No, both financial and technical assistance would be needed	**41.4%**	**24**
	answered question	**58**
	skipped question	**0**

3. National systems can be elaborate or simple. Costs increase with additional features and capabilities. Which of the following statements do you think best reflects the likely view of the NPPO you represent? Most likely, the NPPO I represent would prefer to:

	Response Percent	Response Count
develop its own national system	32.8%	19
purchase an "off-the-shelf" system	8.6%	5
have the IPPC provide a basic system that includes technical support	**58.6%**	**34**
	answered question	**58**
	skipped question	**0**

4. If the IPPC decided to facilitate the development of an ePhyto system, and if the NPPO you represent chose to participate in the system, what sort of support would be most useful:

	Response Percent	Response Count
I do not think any technical support would be needed	3.4%	2
one on one, personal staff instruction	10.3%	6
training seminars	**60.3%**	**35**
on-line instructional videos	15.5%	9
printed instructional material	10.3%	6
Other (please specify)		10
answered question		**58**
skipped question		**0**

5. The NPPO I represent currently:

		Response Percent	Response Count
is not interested in an ePhyto system		3.4%	2
is interested, but has not started developing any ePhyto system		**67.2%**	**39**
is developing an ePhyto system		12.1%	7
has a system to send electronic phytosanitary certificates		3.4%	2
has a system to receive electronic phytosanitary certificates		0.0%	0
has a system to send and receive electronic phytosanitary certificates		13.8%	8
		Other (please specify)	3
		answered question	**58**
		skipped question	**0**

6. What would be the most important benefit from an ePhyto system?

		Response Percent	Response Count
increase efficiency of NPPO		**25.9%**	**15**
reduce fraud		17.2%	10
internationally harmonize terms and procedures		**25.9%**	**15**
reduce costs		6.9%	4
facilitate trade		17.2%	10
it is not clear an ePhyto system would produce benefits		0.0%	0
Other (please specify)		6.9%	4
		answered question	**58**
		skipped question	**0**

7. My primary concern with an ePhyto system is:

	Response Percent	Response Count
not having the staff expertise or technical capacity to access and use the ePhyto system	17.2%	10
the security of transmitted data	5.2%	3
the reliability of a system operating 24/7	8.6%	5
the national cost of setting up and maintaining an electronic system	**27.6%**	**16**
the adjustment of national practices to accommodate ePhyto system	15.5%	9
I do not have any concerns with an ePhyto system	5.2%	3
the overall cost of maintaining an international system	10.3%	6
Other (please specify)	10.3%	6
	answered question	**58**
	skipped question	**0**

8. If the IPPC developed an ePhyto system, it is likely the NPPO I represent would:

		Response Percent	Response Count
within a year begin adjusting national practices to use the system		27.6%	16
within 1-3 years begin adjusting national practices to use the system		29.3%	17
need technical and/or financial assistance in order to adjust national practices and build the needed national system		**41.4%**	**24**
choose not to adjust national practices and continue exchanging paper documents		1.7%	1
		answered question	**58**
		skipped question	**0**