



Myanmar Plant Health System Strategy 2016-2020



Building the foundation of a modern, industrialized nation, through inclusive agriculture and rural development



August 2017

The vision of the Ministry of Agriculture, Livestock and Irrigation (MOALI) is to achieve higher “per capita income” and “standards of living” of the rural population relying on agriculture than neighbouring countries and be on a par with developed nations.

The MOALI mission is to attain maximum market share in regional and global markets for agro-based, value-added agricultural and speciality food products; improve food security and alleviate poverty, particularly in rural areas; and manage green growth.

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Foreword

There have been major economic and social reforms in Myanmar in the past few years, underpinned by the agricultural sector which is a key pillar in the Myanmar economy and represents over 50% of GDP. The Myanmar Government anticipates that the sector will contribute significantly to food and nutritional security, greatly enhance rural development, and achieve foreign exchange earnings through exports. This is in concert with Myanmar's over-arching goal of building the foundation of a modern, industrialized nation, through inclusive agriculture and rural development.

The combination of increasing diversification and intensification of the agricultural sector in Myanmar and the associated growth of pesticide manufacturing and supply chains is posing significant challenges. These challenges coupled with extensive illegal cross-border importation of pesticides and invasive pests and diseases represent all the ingredients for significant plant health problems that could lead to major threats to food security, food safety, human health, pollution of water and soil resources. Indeed, there is increasingly firm evidence that these problems are already unfolding. If Myanmar is not to experience the catastrophic outcomes from the above problems already experienced in neighbouring nations, it is clear that the potential crisis must be addressed as a matter of urgency, and a holistic and dynamic national Plant Health System (PHS) represents the only meaningful approach for doing so.

The aim of a PHS is to integrate resources and expertise of extension, research, regulatory and input supply actors to deliver effective responses to plant health problems for all farmers. Effective plant health management is fundamental to ensure food security and safety and to meet the demands of local and global markets against a backdrop of healthy and productive agro-landscapes. Regular, reliable and pragmatic plant health services, embedded in an effective PHS, are therefore much needed to support the many small farmers in Myanmar's rural communities.

The Ministry of Agriculture, Livestock and Irrigation (MOALI), is pleased to have worked closely with CAB International and other stakeholders to develop this Plant Health System Strategy to support Myanmar agriculture to produce sufficient, safe and quality agricultural crops whilst losing less and feed more. The PHS Strategy has been designed to be in line with the Myanmar 'National Strategic Framework for Rural Development' and is very much an integral part of the Myanmar 'National Action Plan for Agriculture'. It is a dynamic document gearing the country in the right direction and one that would provide the working framework for the government and other stakeholders to forge an evolving and strong PHS in the country.

I am grateful to the members of the drafting team for technical support and facilitation of the write-shop, and for constructive consultations that have resulted in this strategy document.

Dr. Tin Htut
Permanent Secretary
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Acknowledgement

The Myanmar Plant Health System Strategy (MPHSS) is an effort to reform the agricultural extension approach and increase the outreach to farmers using innovative technologies and ensuring food security and improvement in farmer livelihoods. The result of embedment of this document in the upcoming five year national plan for agricultural development will ensure a new era in Myanmar agriculture. We would like to express our sincere thanks to His Excellency Union Minister of MOALI, Dr. Aung Thu for his strong encouragement and interest shown towards the development of the Myanmar Plant Health System Strategy 2016-2020.

The formulation of the MPHSS is made possible through the technical assistance provided by the Department of Agriculture and CAB International (CABI).

We are grateful to Plantwise donors for providing support in organising the writeshops and facilitating necessary requisites enabling the development of this strategy and to the representatives of international development organizations such as IFAD, JICA and KOICA for their active participation.

We strongly believe that through the implementation of the MPHSS, we can further strengthen the collaboration and cooperation between MOALI and other stakeholders of the plant health system to achieve a secure and progressive agriculture in Myanmar.

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Table of Contents

Foreword.....	iv
Acknowledgement.....	v
Members of the Drafting Team.....	vi
Table of Contents.....	vii
List of Tables	viii
List of Figures	viii
Acronyms.....	ix
Executive Summary	x
Background.....	xii
Challenges in the Agricultural System.....	xiv
1. The scale of the problem.....	1
2. The need to reform extension delivery	2
3. The framework of action.....	4
4. Reaching farmers with information	8
5. The Myanmar Plant Health System Strategy.....	10
5.1. Strategic objectives of the Myanmar Plant Health System Strategy.....	13
Objective 1: Increase reach and impact of the existing extension system.....	13
Objective 2: Strengthen linkages amongst key stakeholders of the plant health system	13
Objective 3: Establish a systematic and reliable real time plant health data collection system for strategic use.....	13
Objective 4: Establish and populate knowledge platforms to share relevant local and global information on plant health.....	14
Objective 5: Develop and implement a systematic monitoring and evaluation system .	14
Objective 6: Strengthen the national commitment through governance and policy advocacy	14
5.2 Implementation strategy, funding of key themes and activities	15
Theme 1: Delivery of actionable knowledge to farmers	15
Theme 2: Linkages between key stakeholders	17
Theme 3: Data collection and management	22
Theme 4: Knowledge access, generation and dissemination	24
Theme 5: Continuous improvement through monitoring and evaluation	27
Theme 6: Sustainability and inclusiveness	29
References	33
Annex 1: Roles and responsibilities of different stakeholders in the Myanmar plant health system	35
Annex 2: Financing	37
Annex 3: Roadmap for implementation	40

List of Figures

Figure 1 Plant clinics as the entry point for the plant health system development approach..	5
Figure 2: Theory of change of the Myanmar Plant Health System Strategy using the Plantwise framework of action.....	6
Figure 3: Strategy Results Framework	12
Figure 4: Knowledge transfer approaches at Plant Clinics (left) or Plant Health Rallies (right)	16
Figure 5: Linkages between plant health system stakeholders such as agro-input suppliers (left) or research (right) are key to a well function plant health system.	18
Figure 6: A local agro dealer in Bago region connecting to the plant doctor through mobile for accessing information on popular recommendations (left) and local agro dealer in Yangon region informs deputy national coordinator of Plantwise on stock availability (right)	21
Figure 7: Plant doctors addressing farmers needs in the plant health rally (left) and farmer referring to brochures distributed during the plant health rally (right)	22
Figure 8: Uses of plant clinic data to monitor plant clinic queries over time (left) and monitor pesticide recommendations at clinics (right).....	22
Figure 9: Myanmar specific knowledge bank with both open access domain for extension materials for plant doctors and restricted access domain for plant clinic information and pest data.....	25
Figure 10: Monitoring Plant Clinic Performance Module training (left) and PPD monitoring visit (right)	28
Figure 11: High level senior officials of MOALI together with MPHSS drafting team (left) and opening speech of Dr. Tin Htut (Permanent Secretary) during writeshop	30

List of Tables

Table 1: Various stakeholder as identified critical for certain important functions of the plant health system of Myanmar	19
Table 2: Roles and responsibilities of National Organisations in the Myanmar Plant Health System Strategy.....	35
Table 3: Roles and responsibilities of International Institutions/agencies in the Myanmar Plant Health System Strategy	36
Table 4: Indicative financial requirements (in USD) for various activities of the Myanmar Plant Health System Strategy	39
Table 5: Roadmap to the MPHSS for the time period 2016-2020.....	42

Acronyms

AED	Agricultural Extension Division
CABI	Centre for Agriculture and Bioscience International
CGIAR	Consultative Group on International Agricultural Research
CSA	Climate Smart Agriculture
DoA	Department of Agriculture
FFF	Factsheet for Farmers
ICT	Information and Communication Technology
IFAD	International Fund for Agricultural Development
IPM	Integrated Pest Management
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
KC	Knowledge Centres
LIO	Local Implementing Organisation
MOALI	Ministry of Agriculture, Livestock and Irrigation
MPHSS	Myanmar Plant Health System Strategy
MRSDS	Myanmar Rice Sector Development Strategy
NPPO	National Plant Protection Organisation
NRO	National Responsible Organisation
NSC	National Steering Committee
PHS	Plant Health System
PMDG	Pest Management Decision Guide
POMS	Plantwise Online Management System
PPD	Plant Protection Division
TOT	Training of Trainers
YAU	Yezin Agricultural University

Executive Summary

The Government of Myanmar has positioned agricultural development as one of seven key pillars supporting and enabling inclusive and sustained economic growth. To achieve agricultural development, the Ministry of Agriculture, Livestock and Irrigation (MOALI), with technical assistance provided by CABI, developed the Myanmar Plant Health System Strategy (MPHSS). The MPHSS seeks to strengthen the capacity of agricultural institutions and organisations to establish sustainable plant health systems within the country and therefore contribute to increasing food security and livelihoods of the farming community in Myanmar. The MPHSS is also intended to be a major contributor to achieve the 2030 Sustainable Development Goals, in particular Goal Number 2 (*End hunger, achieve food security and improved nutrition and promote sustainable agriculture*).

The MPHSS is anchored on improving farm productivity, raising farmers' incomes, and enhancing the global competitiveness of Myanmar's agricultural sector. As described in the Myanmar Rice Sector Development Strategy (Ministry of Agriculture and Irrigation 2015), one main challenge for agricultural development is the 'weak extension and education system'. The MPHSS, through its promotion of an integrated approach to extension and inclusive plant health advice, is aligned and complementary to the Myanmar Rice Sector Development Strategy since it provides a pathway to overcome inefficiencies in extension and increase coordination among all stakeholders with extension mandate for both rice and non-rice crops.

The MPHSS is inspired by the Plantwise approach, a global programme for plant health system development, which has been successfully introduced to Myanmar in 2014. By the time the MPHSS was written, Plantwise-Myanmar, which is coordinated by the Plant Protection Division (PPD), was exploring new possibilities for partnership to increase its outreach.

The MPHSS has 6 strategic objectives:

- **Objective 1:** Increase reach and impact of the existing extension system;
- **Objective 2:** Strengthen linkages amongst key stakeholders of the plant health system;
- **Objective 3:** Establish a systematic and reliable real time plant health data collection system for strategic use;
- **Objective 4:** Establish and populate knowledge platforms to share relevant local and global information on plant health;
- **Objective 5:** Develop and implement a systematic monitoring and evaluation system;
- **Objective 6:** Strengthen the national commitment through governance and policy advocacy.

Each of the objectives is underpinned with a strategic theme:

- **Theme 1:** Delivery of actionable knowledge to farmers;
- **Theme 2:** Linkages between key stakeholders;
- **Theme 3:** Data collection and management;
- **Theme 4:** Knowledge access, generation and dissemination;
- **Theme 5:** Continuous improvement through monitoring and evaluation;
- **Theme 6:** Sustainability and inclusiveness.

Background

Agriculture plays a crucial role in the economy of Myanmar. The Government has placed agricultural development as one of the key pillars towards achieving economic development. To achieve the sustainable development objectives, a sustainable agricultural paradigm is a prerequisite. This requires the integration of environmental considerations with agricultural policy analysis and planning. By 2030, Myanmar envisions food-secure farmers and consumers enjoying the economic benefits provided by a transformed, dynamic, environmentally sustainable, and internationally competitive agricultural sector. Three main actions suggested to achieve the vision are: (i) Increase investment in capacity building, research and development and extension; (ii) Increase investment in rural infrastructure and (iii) Institution and policy reforms and innovations. The ultimate goal is to contribute to a food secure nation, where smallholder households have increased their household incomes. For rice production, the country's main staple food, the Ministry of Agriculture, Livestock and Irrigation (MOALI) targets a total production of at least 19.40 million metric tons (MT), about 60% of which is for local food consumption and 40% for international trade. The target will be achieved by maintaining 7.70 million hectares (ha) of rice area harvested with an annual average yield of at least 4.20 MT ha⁻¹ per cropping season.

However, meeting the above expectations of the Myanmar agricultural sector has been constrained by various factors such as macroeconomic instability, infrastructure constraints, marketing and financial issues, and farmers' lack of access to quality research and extension support. Specifically, in the crop production sector, Myanmar suffers from frequent and severe production constraints due to poor management of agro-ecosystems, which is often the result of limited knowledge on best practices. This has led to a stagnation of rice yields over the past 20 years (USAID and MDRI 2013) and an increasing yield gap between Myanmar and other countries. Countries such as Vietnam, for example, have increased their average rice yields from 3.18 tonnes ha⁻¹ in 1990 to over 5 tonnes ha⁻¹ in recent years; Myanmar, in the same time span, has gone from 2.85 t ha⁻¹ to average yields still slightly below 3t ha⁻¹ in 2014.

Another major factor influencing crop yields are crop losses due to pest (i.e. any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products) which have been estimated to cause losses as high as 30-40% worldwide. A recent survey conducted in 2014 including Myanmar came to similar findings with average rice losses to pests of 37% in South East Asia (Gianessi 2014). I.e. if Myanmar is to meet the post-2015 UN development goals (e.g. Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture) there is an urgent need to address this problem. In addition, the problem of low agricultural yields is aggravated by agricultural intensification, indiscriminate use of pesticides and climate change. Globalisation of trade and travel are also making the problem worse by accelerating the spread of invasive plant pests and increasing the overall negative impact on crops. For example, in the case of indiscriminate pesticide

use, Myanmar would be in the position to export high value crops such as mung beans if not for the issues of pesticide residues. There is thus a need for a holistic plant health system (e.g. as in Plantwise) that helps with the decrease of pesticide residues on a large scale and meet Myanmar's global market obligations. Myanmar essentially needs a well-performing plant health system, which is able to deliver high quality, research based information to millions of farmers at the right time and place when farmers need them. Further, considering the overall vision to modernize and transform the Myanmar agricultural sector given the backdrop of challenges, a business-as usual approach may not suffice. For a major strategic re-orientation, there is a need for a framework that entails forward-looking and innovative approaches.

Challenges in the Agricultural System

Agricultural development of Myanmar is in transition. It is facing, and will face, a variety of challenges. The principal challenges which need to be addressed are: (1) the worsening effects of climate change, which increase farmers' vulnerability to drought, flooding, salinity, heat, extreme weather events and other stress factors; (2) limited availability of improved technologies and management practices; (3) a weak extension and education system; (4) limited access to financial services; (5) limited facilities for postharvest handling and processing; (6) inadequate infrastructure, particularly for irrigation, power, and transport; (7) uncertain security of land tenure; (8) volatility of paddy price that contributes to low farmer income; and (9) policies that hamper investments in the agricultural sector. As the MPHSS is primarily targeting challenge (3), the specific challenges of the extension system will be shortly explained hereafter. Thanda Kyi (2016) in her paper 'Overview of Agricultural Policy in Myanmar', underscored that farm advisory service and extension service needs to be strengthened or reformed to increase the mobility of extension officers, improve links between farmers, researchers and extension staffs and the use of modern technologies for agricultural extension.

The agricultural extension network of Myanmar is extensive, from the national down to the village level. More than 4,700 extension staff members are deployed all over the country (Agricultural Extension Division, Department of Agriculture, unpublished data). Nonetheless, with more than 3.4 Million farm households (Ministry of Agriculture and Irrigation and FAO 2003), each extension staff has to manage over 1,200 ha during monsoon cropping (or up to 1,400 farm households), twice the optimum capacity and reach of the staff (Personal communication with Extension Division officials at DoA). The current modality of extension uses demonstration farms in specialized areas and farmers' TV/radio channel to educate farmers. Though this method has its own strengths, it needs to be combined with other approaches to provide timely crop advice and to reach farmers in remote villages. The critical issues that need to be addressed to achieve better delivery of extension services can therefore be summarised as follows:

- Limited bandwidth of communication and delivery channels (Ministry of Agriculture, Livestock and Irrigation 2015; CABI 2014);
- Limited or weak skills and knowledge on pest management (Ministry of Agriculture, Livestock and Irrigation 2015);
- Weak linkages among stakeholders and institutions in the plant health system (CABI 2015; EvidenceOnDemand 2015);
- Inadequate pest surveillance & response mechanisms (ACIAR 2015)
- Lack of an effective and interactive knowledge platform populated with user friendly extension material (Ministry of Agriculture, Livestock and Irrigation 2015);
- Weak monitoring and evaluation system for continuous learning and improvement (CABI 2015).
- Limited budget to support ground work of stakeholders with extension mandate (Ministry of Agriculture, Livestock and Irrigation 2015).



1. The scale of the problem

Based on the 2015 hunger report, about 795 million people are undernourished globally. Although the share of undernourished people in the developing world has decreased from 23.9% in 1990-91 to 12.9% in 2015 (FAO, IFAD, WFP 2015), food insecurity still remains a major issue affecting livelihoods of millions of people, of which over half are smallholder farmers and their families who rely on their crops for food security and income. Myanmar, the largest country in Southeast Asia with an estimated population of 51 million inhabitants (UNFPA 2015), is considered one of the poorest nations in Asia, raking 149 out of 187 countries in the 2014 UNDP Human Development Index (UNDP 2015). In Myanmar, approximately 80% of the population lives in rural areas and farming accounts for more than 60% of total employment, with agriculture contributing up to 37% of national GDP (OECD 2014). While many countries modernized their agriculture under the so-called Green Revolution, Myanmar fell behind and since gaining independence, production has stalled. Today, change is in the air with the country moving towards democracy and the economy growing rapidly with 7-9% per year (Hla Tun 2014). However, hunger, undernourishment and malnutrition still affects large segments of the population although Myanmar has made remarkable progress in addressing food security (e.g. the proportion of undernourished people in 2015 decreased by 77.4% compared to the baseline of 1990-91) achieving the Millennium Development Goal 1c target (*Halve, between 1990 and 2015, the proportion of people who suffer from hunger*). Nowadays, according to the 2015 UNDP Food Security Report, the proportion of undernourished population is 14.2%, or 7.7 million (Average between 2014 and 2016 projection). According to the World Food Programme (2015), access to enough, adequate and nutritionally-balanced food in Myanmar remains a major challenge for the poorest and most vulnerable segments of the population. Twenty-six percent of the population is below the poverty line and close to three million people are considered food poor due to various reasons such as low yields, crop-failures/losses, or natural disasters such as cyclones and droughts. The nationwide prevalence of stunting among children under-five is 35%, indicative of a high burden public health problem by international benchmarks. Several States and Division of Myanmar suffer from high levels of food insecurity and there is a growing concern of rising inequalities and disparities among regions and division and among urban vs. rural areas.

For Myanmar to meet the Sustainable Development Goals, food security needs to be further improved, especially among the most vulnerable groups. Considering that up to 37% of production is lost to pests, there is a huge opportunity that an improved plant health system aiming to reduce crop losses can be a major driver for this transition to happen. Additionally, an effective and efficient agricultural extension system will play a pivotal role.

2. The need to reform extension delivery

Agricultural extension is an important driver to improve farmers' decision making and help them take advantage of more efficient technologies and farming practices. In Myanmar, extension services are typically delivered through a government entity or NGOs, but increasingly more extension services are offered by agro-input dealers or companies engaging in contract farming (Tun et al. 2015). The Department of Agriculture (DoA), based under MOALI, is in charge of extension provision. Within the DoA, the Agricultural Extension Division (AED) is tasked with the bulk of extension delivery (Cho 2013), while the Plant Protection Division (PPD) has a more specific plant protection extension mandate. The AED provides several types of extension services, ranging from education camps, farmer's groups, training and visit systems, and farmer field schools (FFS). However, like many developing countries, Myanmar faces many challenges to its extension system such as limited reach and impact, limited financial resources, weak linkages between extension and research, lack of demand driven and participatory extension approaches, lack of coordination among different extension providers and approaches, strong focus on rice extension but limited for non-rice crops, low ratio of extension agents to farmers.

In today's world, we may believe that information is more widely available than ever before. Yet, agricultural advisory services in developing countries are still weak and there is a fundamentally inconsistent dialogue between farmers and those who aim to help them. Many farmers do not have reliable access to advisory services due to their own restricted mobility. Similarly, the extension workers (official advisory service and support providers) are often too few in number and do not have the budget needed to travel to individual farm sites. Although there continues to be significant losses of food to plant pests, there is a poor and irregular flow of information about the threats that farmers face. Pest problems can flare up unpredictably yet often there is no mechanism for responding quickly or providing the technical support necessary to confirm causes and suggest effective, accessible, and pragmatic solutions. Farmers routinely have to make vital decisions in response to unpredictable conditions and unknown risks – and without the right information at the right time, this is truly a stab in the dark. The poorer the farmer, the greater will be the impact of making the wrong decision or failing to get timely advice. The recommendations given to both female and male farmers have to be effective, available, practical, safe and economical, as well as gender and diversity sensitive. There are several sources of potential advisory services that include public and private extension providers, agricultural institutes and agro-input suppliers. However, an inconsistent engagement with farmers has several important consequences for the entire plant health system such as slow awareness of new and emerging plant health problems, delayed responses in identifying the nature of the problems and giving suitable recommendations, systematic failure to learn from experiences, inefficient use of existing sources of technical expertise and inefficient use of production resources such as land, fertilizer, or pesticides. The net result is a failure to provide timely solutions that

enable farmers to grow more food, earn more money and built resilience and reduce vulnerability to climate change.

These challenges are common in many countries, including Myanmar, a CABI member country since 1993. Together with other 46 CABI member countries, Myanmar gave CABI the mandate to tailor and apply the Plantwise framework of action with the aim of enabling female and male farmers to lose less and feed more by strengthening Myanmar's plant health system, contribute to food security and poverty alleviation and thus spur the achievement of the 2030 Sustainable Development Goals. After successfully piloting Plantwise activities on a project base in selected Divisions, the Permanent Secretary MOALI (Dr. Tin Htut) gave PPD and CABI the mandate to up-scale the initiative on a country-wide level. This strategy document shall therefore primarily guide this process towards an inclusive and demand driven extension system embedded in a well-functioning and sustainable plant health system.

3. The framework of action

Agricultural services that farmers need are present in Myanmar (e.g. diagnostic services are offered by PPD; general extension is done via DOA, relevant agricultural research is implemented by DAR, Yezin Agricultural University (YAU); different NGOs/INGOs conduct knowledge transfer activities such as Farmer Field Schools, etc.) but operate in isolation, lack in up-to date and user friendly agricultural information and have poor information flows between them. The strategy and approach towards achieving a holistic and better performing plant health system proposed in this strategy document is based on the Plantwise approach, and has three inter-linked components:

a. Plant Health System Development

A plant health system is defined by four key components: (1) extension, which delivers available knowledge intended to improve plant health; (2) research, which develops new knowledge about plant health and is often linked to higher level education; (3) input suppliers, who deliver knowledge and physical inputs such as seeds, biological and other crop protection products and fertilisers; and (4) regulation, which regulates sale and use of agricultural inputs, protects countries from new and emerging pests (invasive species included), and regulates produce trade requirements. Strengthening plant health systems removes barriers to high quality information, leading to improved service delivery by all components for better advice and information for farmers. Plant clinics (an extension approach modelled after the human health clinic concept) have proven extremely effective in driving change at the ‘front end’ of a plant health system, strengthening critical linkages between existing organizations and stakeholders in a number of ways. This is summarised in the Theory of Change (ToC) as described in Figure 2.

b. Knowledge Bank

The knowledge bank is a global gateway to practical plant health information from diverse expert sources, with online and off-line resources in multiple languages for advisory services (<https://www.plantwise.org/KnowledgeBank/CountryHome/Myanmar/>). It also serves as a pest-related data management and use, where permitted, as well as information exchange within countries is uploaded. As a part of a global vigilance system it helps to identify invasive species and other emerging threats to plant health. Overall, the knowledge bank serves as a free, open-access source of locally relevant, comprehensive knowledge about plant health problems affecting any crop grown. At the same time, evidence is gathered to assess impact on crop losses, productivity, food security and livelihoods.

c. Monitoring and Evaluation

Building on lessons learned from monitoring and evaluation (M&E) activities and sharing this knowledge among stakeholders, particularly extension providers and policy makers, is of high priority. Research shall be carried out to test and improve processes involved in strengthening plant health systems and delivering the knowledge bank, assessing new ideas and concepts for improving effectiveness and sustainability of plant health systems. At the same time,

evidence will be gathered to assess impact of the approach on crop losses, productivity, food security and livelihoods.

The approach used for achieving the strategic objectives outlined in this plant health system development plan aims to strengthen the capacity of agricultural institutions in Myanmar such as Plant Protection Division (PPD), Agriculture Extension Division (AED), Department of Agricultural Research (DAR), Yezin Agriculture University (YAU), and other public and private institutions with direct or indirect extension involvement, to establish a more effective and sustainable national plant health system. In addition to this core activity there is a much wider potential of addressing complementary issues such as phytosanitary compliance for trade and market access and invasive species; all underlined by cross cutting factors such as gender and diversity, open data, and information and communication technology (ICT).

With its integrated, holistic and cross-sectorial approach to extension (Figure 1), the MPHSS can be considered as a framework with high potential for upscaling in Myanmar and become a major contributor to eradicate poverty and hunger, increasing food safety, and all this considering environmental, social, and economic sustainability

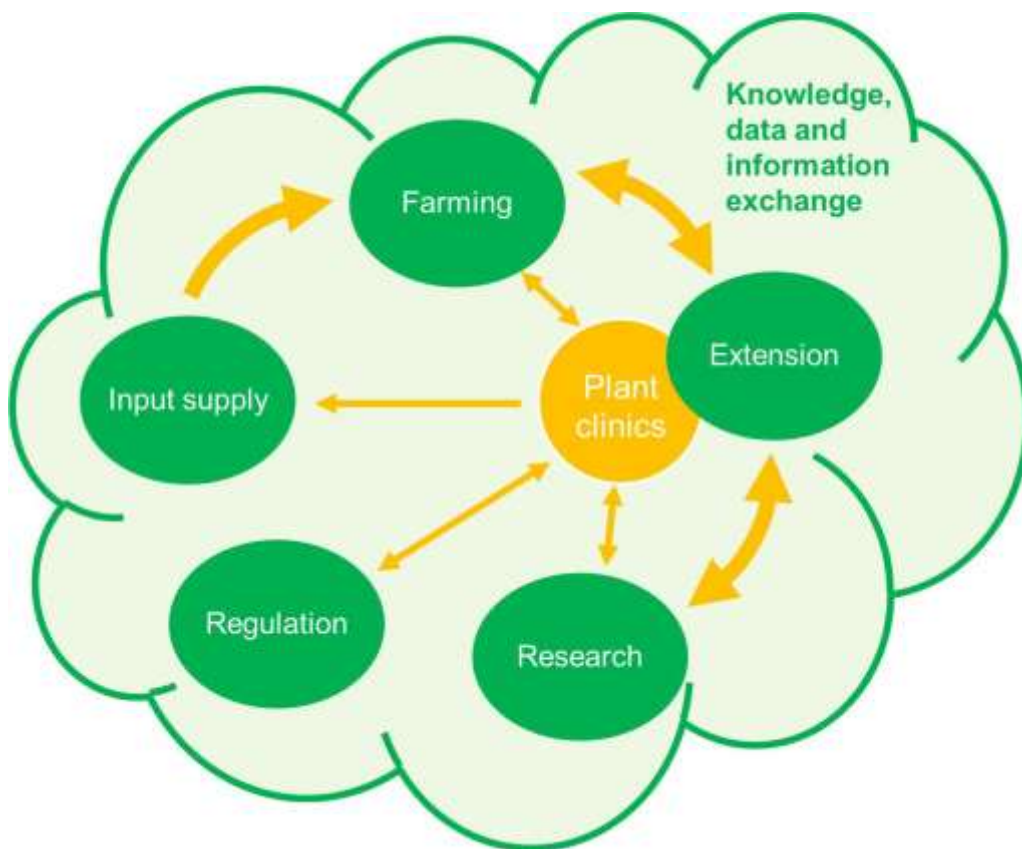


Figure 1 Plant clinics as the entry point for the plant health system development approach

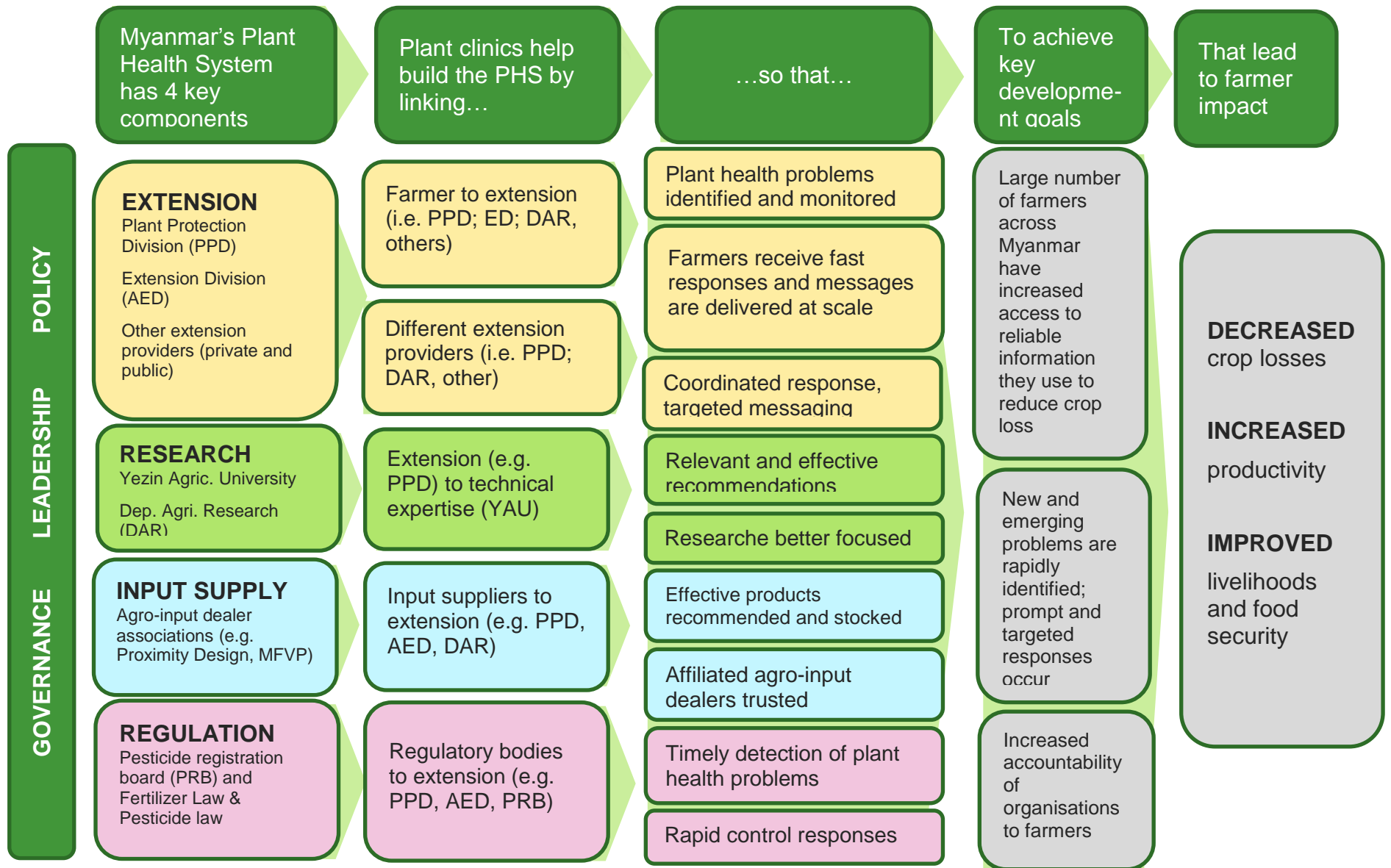


Figure 2: Theory of change of the Myanmar Plant Health System Strategy using the Plantwise framework of action



4. Reaching farmers with information

The number of farmers reached largely depends on the type of approach to extension promoted through the MPHSS activities. The choice of the latter depends on the complexity of the extension messages, the target population and its geographical spread, and the available technology. With a combination of three complementary extension approaches (plant clinic, plant health rallies, and mass extension campaigns) as promoted by the MPHSS, both high impact and high reach can be ensured. While plant clinics can provide demand driven technical advice and are the frontline contact point between the extension system and farmers, mass extension approaches (plant health rallies, mass extension campaigns) can be used for awareness raising and informing millions of farmers about specific plant health problems. The activities outline in this document will lead to three levels of farmer outreach as explained hereafter.

Three levels of farmer outreach

- **Primary Reach:** directly through activities including
 - Farmers receiving information from plant doctors at plant clinics;
 - Farmers receiving information through plant health rallies;
 - Farmers receiving information through mass extension campaigns.
- **Secondary Reach:** indirectly through spill-over effects as a result of
 - Plant doctors using their new skills and networks outside plant clinics to provide advice to farmers;
 - Farmers receiving advice directly and sharing information with neighbours and relatives;
 - Farmers receiving information from advisors who were not directly trained or working as plant doctors but who received knowledge from the knowledge bank
- **Tertiary Reach:** indirectly through improved services resulting from systems change
 - The MPHSSDS aims to strengthen stakeholder linkages, thereby changing the ways in which they interact to deliver plant health services. These plant health system changes can affect research, input provision, regulation and responsiveness to new pest threats, as well as the delivery of advice. A more rapid response to emerging plant health disorders can prevent or reduce the impact of those problems. This systems change would have a broad reach affecting many farmers.

The appropriate, timely and relevant knowledge imparted by plant doctors helps to give farmers access to the information they need to tackle the plant health problems that currently present one of the biggest challenge to food security such as yellow stem borer or bacterial leaf blight in rice, yellow mosaic virus on black gram, aphids and jassid on okra, bacterial wilt, tomato mosaic virus, tomato yellow leaf curl virus (TYLCV), white fly and thrips on tomato, aphid, thrips and pod fly on chilli. Furthermore, it can help smallholders across Myanmar to improve productivity by reducing production costs and it also has the potential to contribute to market access and increased

trade opportunities for commodities (rice) and other export crops (e.g. pulses), and horticultural export crops (e.g. mango) thereby enabling farmers to increase their income. In addition to the promotion of standards of good practices leading to food safety and compliance with export regulation, the plant health system approach in Myanmar also links in with other important initiatives such as the m-nutrition initiatives aiming to reduce hidden-hunger (i.e. micronutrient deficiency) through targeted mobile-messaging.

5. The Myanmar Plant Health System Strategy

Country policy considerations and scope:

As indicated earlier, both national strategies viz. the 'Myanmar Rice Sector Development Strategy' (MRSDS) (launched in May 2015) and the Myanmar Climate Smart Agriculture (CSA) Strategy (launched in February 2016) are aligned and complementary to this Myanmar Plant Health System Strategy (MPHSS). The MRSDS (2015, pp38-70) defines 'weak extension and education system' as one major challenge to be addressed and the MPHSS provides a framework to overcome this challenge. A similar complementarity can be identified between the Myanmar Climate Smart Agriculture Strategy and the MPHSS because the activities listed in this strategy contribute to achieve the triple objective of the CSA strategy (food security, adaptation, mitigation). This because plant clinics contribute to food security (both in terms of physical and economical access to food) when the targeted advice given results in reduced crop losses and increased yield. Increased crop yields resulting from better crop management practices mostly implies an increase in production efficiency due to a better use of available resources (mostly land and inputs such as fertilizers, pesticides and seeds). This therefore contributes to climate change mitigation directly (more carbon sequestration in soils, less nitrous oxide and methane emission per volume of food) and indirectly (higher yield can lead to less conversion from forest or grassland to annual cropland and therefore less CO₂ emission due to land use change). The role of plant clinics in climate change adaptation is two-fold. On the one hand, climate change causes new problems to emerge at an increasing rate and plant clinics provide a mechanism to respond quickly to new problems brought by farmers. For example, drought or salinity resistant varieties, or management responses to new pests, can be promoted via plant clinics, thereby decreasing the vulnerability of farming communities to the effects of climate change. On the other hand, plant clinics can play a key role in terms of surveillance. There is a consensus in literature that developing and rolling out location specific adaptation measures to climate change is difficult, because models cannot project climate change effects precisely, neither in time nor at the local scale needed. Through the data collected systematically at plant clinics, unexpected crop production problems due to climate change can be detected. This enables governments to develop response strategies (via plant clinics or other extension approaches) on how to best cope with problems such as emerging pests, increased temperature, or a shift in the growing season. Plant clinics can also play an important role in building resilience of entire farming systems since their advice focuses on Integrated Pest Management principles. This whole farm approach leads to a decreased dependence on farm inputs (e.g. fertilizers, pesticides), which enables a faster economic recovery for smallholders after price hikes of those inputs.

The plant health strategy encompasses with seed health and will consider a seed component within the framework. With respect to the latter, CABI will use the background information on the Myanmar

seed sector, e.g. the seed sector scoping study (Broek et al. 2015) completed in January 2015 for relevant activities. Some of the options for a seed component could include: linking plant doctors with sources of good quality improved seed that can be recommended to farmers; development of content on seed production for healthy good quality seed; development of Pest Management Decision Guides (PMDGs) and factsheets for major seed borne health problems; link with seed companies where appropriate to develop appropriate factsheets/PMDG that can be distributed in plant clinics. Strengthen coverage of relevance of use/production of good quality seed as a first step in preventative measures in Plant doctor training.

Framework for Delivery and predicted reach

The delivery of the goal and purpose of the overall MOALI mission hinges upon the specific themes, outputs and outcomes as illustrated in the Strategic Results Framework (Figure 3). The current implementation of the Plant Health System Development approach (Plantwise) started in Myanmar in 2014 with a close partnership between the Plant Protection Division under Ministry of Agriculture, Livestock and Irrigation (formerly MoAI) and CABI. In its pilot phase, Plantwise has reached approximately 2,750 farmers (2,050 male and 700 female) by the end of 2015 directly through plant clinics and plant health rallies and 11,000 farmers through secondary reach. The activities proposed by the MPHSS are seeking to reach over 3.6 million women and men farmers directly (primary reach) through plant clinics, plant health rallies and mass extension campaigns by 2020. Further, it is expected that 14.4 million farmers will be reached through spill-over effects, or secondary reach, as farmers share new knowledge with neighbours and family. It is anticipated that the MPHSS will have even broader, but less measurable, impact over the long term through gradual systems change, or tertiary reach, that lead to increased effectiveness of plant health.

The following sections describe the six strategic objectives, themes, and activities of the overall Myanmar Plant Health System Strategy.

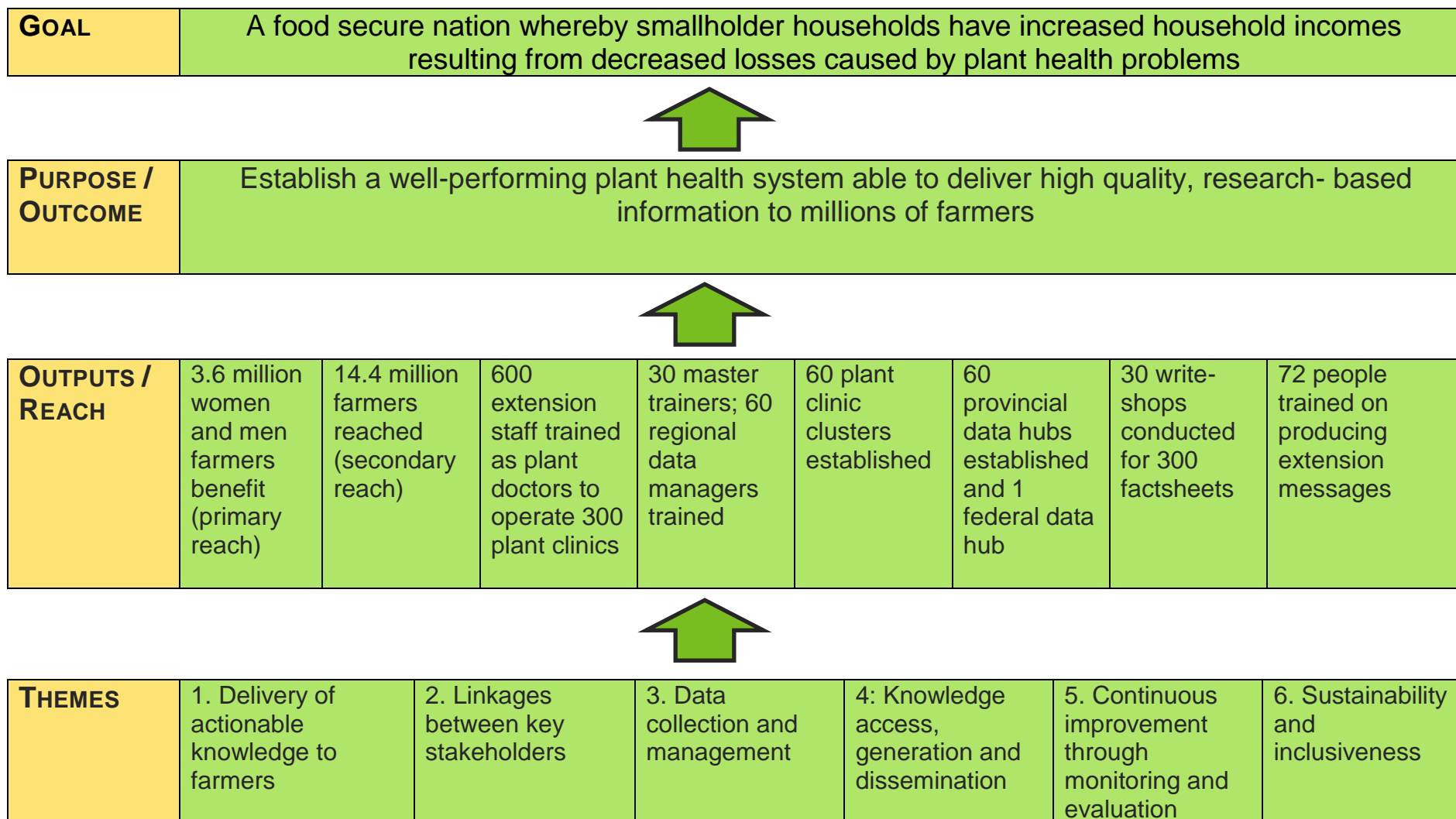


Figure 3: Strategy Results Framework

5.1. Strategic objectives of the Myanmar Plant Health System Strategy

Six (6) strategic objectives guide the key themes and actions to achieve Myanmar's vision of its plant health system by 2020. The following should be noted that these six objectives are:

- (i) Not listed in any specific order of priority as these may change depending on the dynamics of the situation. It is hoped, however, that these broad strategic objectives adequately address the essence of the transformation needed in the current plant health system.
- (ii) Not independent of each other and there are interlinkages that result in complementarities and create synergies.

Objective 1: Increase reach and impact of the existing extension system

A weak extension system has been identified by MOALI as a critical challenge hindering development of agriculture. The national agricultural extension system is the synopsis that brings information from research to the end users, namely farmers. But the service suffers from chronic understaffing, limited operational funds, and weak linkages to other players such as research. Through a combination of complementary approaches to extension, namely the plant clinic approach and mass extension approaches, the activities under the MPHSS will achieve the level of reach and impact of extension which are needed to overcome current plant health problems and prevent new problems.

Objective 2: Strengthen linkages amongst key stakeholders of the plant health system

A plant health system consists of the organisations, people and actions concerned with promoting, restoring and maintaining plant health, in order to reduce crop losses and increase crop quality. A strong plant health system requires the organised efforts and informed decisions of research, extension, input supply and regulation, which all serve to benefit farmers. The interactions among stakeholders in this system are underpinned by knowledge, data and information exchange. Plant health system components (i.e. Extension, Input supply, Regulation, Research) already exist in Myanmar but operate in disparate ways. The activities under the MPHSS act as a catalyst to stimulate the interaction and integration of these parts into a stronger and more effective system, where the plant clinic approach to extension plays a pivotal role.

Objective 3: Establish a systematic and reliable real time plant health data collection system for strategic use

Collection, analysis, and sharing of data are key activities for a well performing plant health system. The plant clinic data can be used to

inform plant health services in various ways. For instance, aggregated observations from the plant clinic data can help to identify new and emerging plant health problems and act as an early warning system to the regulatory bodies responsible for surveillance and response. Data can also be used to inform topics for mass extension campaigns that reach a wider audience with targeted messages or data can be used to inform research about relevant research topics. In addition, considering that climate change is a main threat to Myanmar, systematic collection of farm level data has a huge potential to detect climate change induced pest spread and therefore increase resilience and decrease vulnerability to climate change of farming households.

Objective 4: Establish and populate knowledge platforms to share relevant local and global information on plant health

Lacking availability of high quality extension documents has been identified by MOALI as one critical challenge. Providing access to a wide range of information, from international scientific literature to simple extension materials in local language for farmers, is central to success in managing plant health problems. Therefore, activities under MPHSS will ensure that an on-line and offline knowledge bank, populated with locally relevant and actionable information to help farmers on the ground, will be made available to plant doctors and other extension workers. A strong ICT component will be built into this objective as ICTs have a huge transformational power in the area of information access and data collections.

Objective 5: Develop and implement a systematic monitoring and evaluation system

Monitoring and evaluation (M&E) is carried out at a local and national level. At a local level, M&E focuses more closely on plant clinic operations so that the organisations running the clinics can improve their performance in terms of quality of advice, geographic coverage, farmer satisfaction, productivity. This is called process-monitoring. At a national level, questions of interest to government policy are more relevant, for example how plant clinics contribute to delivering national objectives of supporting agriculture and managing plant disorders resulting from biotic and abiotic factors, and the implications, including cost of clinics and associated activities and capacity development (this is called progress and impact monitoring).

Objective 6: Strengthen the national commitment through governance and policy advocacy

A national forum provides a platform to link national plant health stakeholders in support of farmers. Certain members of this national forum form a steering committee and are key to the development of annual work plans and for taking on responsibilities for implementation of the agreed activities. In this steering committee,

one organisation is designated as the 'national responsible organisation' (NRO), responsible for steering the implementation of all planned in-country activities.

5.2 Implementation strategy, funding of key themes and activities

The MPHSS identifies 6 key themes which contribute to achieving the specific objectives in the earlier section and the overall goal of increased food security through improved national plant health system able to deliver timely and locally relevant information.

This section will discuss the key themes and activities and how these can contribute to achievements of the objectives identified in earlier section. Essentially, this section of the strategy includes action points, i.e. answering key questions such as What? Why? How? Where? When?. The stakeholders involved and their roles and responsibilities are given in Annex 1, Table 2 and 3; the financing aspects in Annex 2, and the Roadmap for implementation in Annex 3.

Theme 1: Delivery of actionable knowledge to farmers

Plant clinics are a valuable channel for facilitating the face-to-face exchange and two-way flow of knowledge and information between plant doctors and farmers. They respond to the immediate needs of farmers, offering advice on demand. Plant clinics, owned and run by national and local bodies (e.g. PPD, AED) should take place on a regular basis, at least once every two weeks, in public places that are best suited to meeting farmers. These locations should be readily accessible and already visited as a regular part of the farmer's normal routine. The farmer brings a sample of the affected crop, discusses the problem with a plant doctor and receives a diagnosis of the problem affecting his or her crop, together with a written and verbal recommendations for managing it (Figure 4). Throughout this interaction at a plant clinic, the plant doctor completes a standard form, either in printed form or by using a hand-held tablet device, to record information about the plant health problem and the advice given. Data about each farmer's visit are held within a central repository and can be analysed to assess suitability of the advice given and enhance the accountability of the advisory service in a country. Plant clinics are complementary to other two extension tools promoted in this strategy, plant health rallies and mass extension campaigns. A plant health rally is an extension method for providing validated advice to farmers on a single plant health topic of known importance (e.g. detecting and/or managing an emerging plant health problem). Plant health rallies are held in public spaces and are of relatively short duration to reach dozens or even hundreds of people within a given target area where the subject is important (Figure 4). Multiple plant health rallies on the same topic at different locations within a short period make up a 'plant health campaign'. In contrast, mass extension campaigns are major events to deliver targeted plant

health messages to thousands/millions of farmers through relevant media, such as radio, television, mobile phones, etc.



Figure 4: Knowledge transfer approaches at Plant Clinics (left) or Plant Health Rallies (right)

- **Activity 1.1: Assessing the interest of extension providers to incorporate plant clinics into their existing systems, identify areas where the plant clinic concept can be piloted and identify manpower to be trained as plant doctor.**

The plant clinic approach to extension, promoted by Plantwise, has been recognised by over 30 countries around the world to be an interesting, innovative, and farmer friendly approach to extension with high uptake potential, limited costs, high impact and reach. The PPD was considered as ideal entry point for the Plantwise approach in Myanmar because PPD has the mandate of providing technical advice for farmers related to pest management and provide diagnostic support for both farmers and private sector stakeholders. PPD is currently piloting plant clinics in 8 regions (Yangon, Bago, Ayarwaddy, Naypyidaw, **Siggaing, Mandalay, Mon, Shan**) and 34 PPD staff were identified and trained as plant doctors. The identification of additional public and private extension provider is crucial for the approach to be implemented on a country-wide scale. During the scale-up phase, focus will be on key townships based on national and regional priorities. Piloting of plant clinics has been expanded to addition States/Division in 2016 (Shan State and Mandalay Division as the yare key rice production areas) and to many more State/Division between 2017-2020.

Target:

More extension providers (from public and private sector) identified as Local Implementing Organisations (LIO) to embed clinic operation and operate on a country wide scale. Extension staff identified to run plant clinics.

Activity 1.2: Training of extension staff on relevant modules to become plant doctors and operating plant clinics

Until 2016, 20 PPD staff were identified and trained as plant doctors to run 23 plant clinics in 8 Divisions/States. To achieve the required country-wide coverage, there is a need to train more extension workers to become plant doctors. Plant doctors are usually trained extension workers and remain employed by their current

organisations. They participate in custom-made training courses designed by CABI. Two plant doctor training modules are needed for aspirant plant doctors to be able to operate plant clinics: Module 1 (*'Field Diagnosis and Plant Clinic Operation'*) and Module 2 (*'Giving Good Recommendations'*). These courses build on the plant doctors' existing knowledge and show them how to use their skills to maximum effect when diagnosing problems and giving recommendations.

Target:

Six-hundred (600) extension staff from different LIOs trained as plant doctors to operate 300 clinics in various Divisions/States based on national priorities.

- **Activity 1.3: Training of master trainers to up- and out-scale plant doctor training and form plant clinic cluster**

The goal of the Training of Trainers (TOT) process is to give trainers the background knowledge, skills and practical experience to provide Module 1 and Module 2 training to aspirant plant doctors. The NRO and LIOs, together with CABI, will select a pool of master trainers to be trained by CABI. After that, CABI trainers will mentor these master trainers when implementing Module 1 and Module 2 plant doctors' trainings.

A 'clinic cluster' refers to grouping of plant clinics based on geographical proximity to facilitate better coordination and provision of supports. It should cover an area within which the plant doctors have the ability to meet with one another from time to time, ideally on some sort of regular basis. Organising plant clinics into clusters facilitates better coordination, management, interactions and support for the plant clinics. As the number of plant clinics improves, it becomes more difficult for the NRO to maintain direct linkages to all the plant clinics for feedback and backstopping. Having clinic cluster coordinators (these will typically be the plant doctor supervisors), who can more easily access the plant doctors in their areas, streamlines the communication process.

Target:

A total of 30 master trainers trained and 60 plant clinic clusters established, each cluster with its responsible cluster coordinator.

Theme 2: Linkages between key stakeholders

An effective plant health system is dependent on strong interactions among the system stakeholders. Key stakeholders are brought together in a national forum that meets regularly to plan activities and guide progress. This is also a key mechanism to explore ways of embedding successful activities into organisational working practices. Plantwise consolidates links between stakeholders using the network of plant clinics and the data they generate as a catalyst to stimulate additional interactions between farmers, extension, research, input supply, regulation at local and national levels (Figure 5). Understanding their current mandates, institutional set-up and ways of working enables to encourage and facilitate engagement between

plant health stakeholders. In this context, to avoid duplication of activities and to create synergies, linkages will be established between the activities under the MPHSS and two (2) other on-going projects, viz., (i) the newly launched IFAD programme which has developed 55 knowledge centres (KC) with skills development for farmers as main project output and (ii) the Saemaul Undong Project in which main project objectives are capacity building and income generation – to be achieved through micro-financing (provided by KOICA) for agricultural inputs (seeds, fertiliser, chemicals). Pilot activities for Saemaul Udong Project have taken place in 100 pilot villages in 9 regions/states around the county. Plant clinics could provide technical support to ensure micro-finance is used to buy



Figure 5: Linkages between plant health system stakeholders such as agro-input suppliers (left) or research (right) are key to a well function plant health system.

appropriate inputs which are environmentally safe and cost-effective.

- **Activity 2.1: Identify actors involved in delivering plant health system functions and identifying their influence and interest to delivery, and develop a communication plan**

The approach followed by the MPHSS works with range of stakeholders at the local, national and global levels. It has been recognised that, to further strengthen linkages within a plant health system, a more rigorous stakeholder analysis should be conducted to ensure that the project engages with relevant stakeholders according to their levels of influence on and interest in the country's Plant Health System (PHS) functions. County-level stakeholder analysis is necessary so that interventions can be planned and integrated into existing system. In 2014, such stakeholder analysis was conducted in Yangon, Myanmar and its report presents findings in a way that serves as a benchmark understanding of the PHS and its functions in Myanmar (Table 1).

Target:

Action plan for cross-sectorial engagement to strengthen extension system will be drawn. It is known that DoA is primarily responsible for extension in the country but following the stakeholder analysis of plant health system in the country, efforts will be made to engage with other critical and important actors beside PPD (e.g. AED, private sector organisations, etc.) identified and work on strengths to overcome the constraints in collaboration.

Stakeholder	Critical to engage in PHS Functions (shown as x)					
	Agri Information	Advice to Farmers	Diagnos tics	New Product / Tech	Input supply	Reg & control
Plant Protection Division	X	X	X	X	X	X
Land use Division		X	X	X	X	X
Regional Plant Protection Division	X	X	X			X
Seed Division		X	X	X	X	
Dep of Agricultural Research		X	X	X		
Yezin Agricultural University		X	X			X
Agrochemical private companies				X	X	
Myanmar Agricultural Private Bank					X	X
Pesticide Registration Board				X	X	
Dep of Agricultural Planning						X

Table 1: Various stakeholder as identified critical for certain important functions of the plant health system of Myanmar

- **Activity 2.2: Capacity building of in-country diagnostic capabilities**

It is seen that the plant doctors are in need of external consultations when they face certain difficult diagnostic challenges. To address this issue it is preferred that further engagement of plant clinics is required with the existing diagnostic laboratories in the country. It is envisaged that through more formal channels to provide free access for plant doctors to professional diagnostic support a network of experts is made. It is also needed that the capacity of those diagnostic experts in the laboratory is increased by further training. Few diagnostic experts are available in key areas to support extension. A national expert is being trained by CABI UK on major diagnostic techniques and she in turn is expected to be master trainer to train a battery of experts from different institutions at both national and regional levels. It is expected that this will build capacity of the country and especially of the remotely located laboratories which are linked to the plant clinics. In addition, efforts will be made to link plant doctors with diagnostic experts via ICT channels, such as Pest Point, which has successfully be piloted in Myanmar in 2016.

Target:

Hence, pool of trained experts identified beyond plant protection to support plant clinic operation is envisaged by 2020. The ratio of clinics to institutes depends largely upon the locations but should not

be less than 1:10. In addition, every plant doctor shall be connected to national and international diagnostic support service through Pest Point.

- **Activity 2.3: Strengthening linkages between plant health system stakeholders, especially between plant clinics and diagnostic services**

Plantwise promotes mechanisms that enable plant clinics to receive technical support for identification or diagnosis of plant health problems from national diagnostic laboratories, backed up as necessary by the Plantwise Diagnostic and Advisory service (DAS) in the United Kingdom (UK) or other international services. Identifying the laboratories belonging to organisations which are important stakeholders in the PHS is important. Sometimes there is underutilisation of existing facilities and hence locals are deprived of necessary services. Hence a directory of diagnostic services is made in order to link such support near the clinics. Currently institutes like DoA and DAR have been actively consulted for the existing facilities and human resources.

Target:

Establish new links at regional and national level and establish feedback system. Various laboratories of DAR, DoA and YAU have regional presence hence they can be considered as most accessible resort for the plant doctor to get sample analysed in case it is required. DoA can lead the building of this kind of support network and manage the system.

- **Activity 2.4 Create linkages between plant health system stakeholders, especially between plant clinics and the agro-input sector**

It is generally observed that linkages between public sector stakeholders and other stakeholders such as those involved in agro-input supply (Figure 6), as well as their associations, and education institutions are not significantly considered. More attention should be given to assessing ways to strengthen links between plant clinics and agro-input dealers to ensure that plant doctors are more familiar with the inputs available locally and to improve the availability of IPM-compatible crop protection products on the market. Situational analysis for agro input suppliers is conducted for understanding the scenario in Myanmar better.

Target:

All clinics are effectively connected to registered agro-input dealers and agro-input dealers are aware of plant clinics. There is a dire need to understand how the whole system functions. Seed, fertiliser and pesticide association have to be roped in for facilitating the linkage.



Figure 6: A local agro dealer in Bago region connecting to the plant doctor through mobile for accessing information on popular recommendations (left) and local agro dealer in Yangon region informs deputy national coordinator of Plantwise on stock availability (right)

- **Activity 2.5: Linking the plant clinic approach to extension complementary approaches such as mass extension campaigns, plant health rallies, or farmer field schools**

Plantwise executes its efforts to get agricultural messages across to farmers in a format, language and style that they can easily access, so that they can put the information into use in their fields. This can be in form of conducting mass campaigns and plant health rallies or integrating its approach with existing farmer field schools. The ‘campaigns’ focus on tailoring science-based recommendations so that it can be fed through existing mass communication channels (e.g. mobile, radio) and are understandable and practical for farmers. Plant Health Rallies (one form of mass communication) have been organised to address major endemic issues like for “overuse of Carbofuran in rice stem borer” in the region of Aayerwaddy, Yangon and Bago (Figure 7).

Target:

In a first step, the most effective communication channels reaching large audiences will be identified and synergies and complementarities to plant clinics articulated. This will be accompanied by the establishment of an M&E system to measure the impact of those novel extension approaches. After piloting and adaptation of the process, mass extension approaches will be incorporated in the daily work of extension providers and significantly contribute to the reach and impact targets stated in this strategy. Possible synergies to other on-going extension approaches will also be explored, such as FFS.



Figure 7: Plant doctors addressing farmers' needs in the plant health rally (left) and farmer referring to brochures distributed during the plant health rally (right)

Theme 3: Data collection and management

The information collected through the plant clinics on current plant health problems is a valuable resource that can be used to inform plant health stakeholders and other knowledge delivery systems to strengthen the plant health system. Roundtable discussions are held with representatives of organizations or initiatives involved in sharing plant health data to identify information gaps and ways in which it could feed into and inform their activities. A number of in-country personnel must be trained in data management procedures including the collection, processing, analysis, sharing, and use of information from plant clinics. These national data management systems are linked to and supported by the Plantwise Knowledge Bank.

These plant clinic data can be used to inform plant health services in various ways. For instance, aggregated observations from the plant clinic data can help to identify new and emerging plant health problems and act as an early warning system to the regulatory bodies responsible for surveillance and response (Figure 8). Data can also be used to inform topics for plant health rallies and mass extension campaigns that reach a wider audience with targeted, relevant messages about current plant health problems. In addition, plant clinic data are an imperative component for quality assurance, which is currently rather weak in Myanmar. Clinic data allow, though validation process, to monitor quality and validity of the services delivered by the extension works (plant doctors).

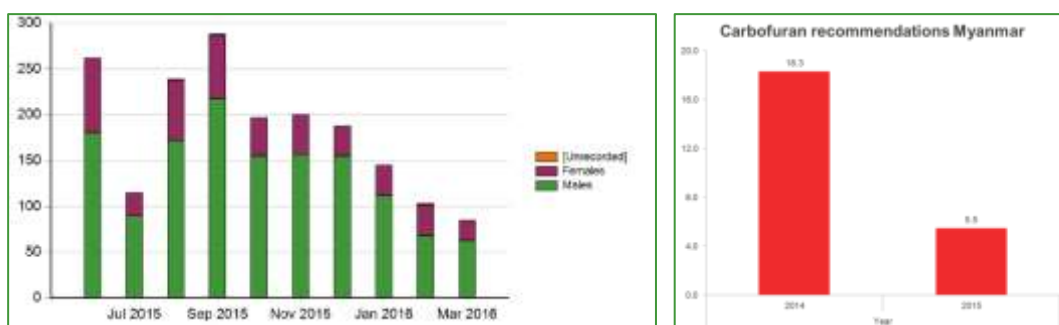


Figure 8: Uses of plant clinic data to monitor plant clinic queries over time (left) and monitor pesticide recommendations at clinics (right)

- **3.1. Complete an assessment of the ways through which Myanmar operates to procure, store, access, and analyses real time agriculturally relevant data (e.g. pest data)**

During inception phase, the need to systematically collect and analyse pest related data was identified as critical because such a system does not currently exist in Myanmar. Through the data collected during the pilot phase of plant clinics, a total of 3,776 queries had been collected by end of 2016 which have already been used in a number of occasions such as: monitoring performance of plant doctors; information for plant health rally topics, identification of hazardous-pesticides related issues, validation of recommendations, identification of regional pest issues.

Target

During plant clinic sale-up, what can lead to involvement of several LIOs (public and private), it is important to assess the existing data management systems (if available) of these organisations. Following this assessment, possible harmonisations steps (e.g. between existing databased) need to be prioritised before any new data management system is introduced to avoid duplication of efforts or parallel systems. The final goal will be to have an unified and harmonised data collection system across the country.

- **Activity 3.2: Establishing a data management system, signing data sharing agreements with all relevant extension providers (including NPPO), and provide and train data managers to support plant clinic data collection systems and digitalisation**

The National Plant Protection Organisation (NPPO) has signed a data sharing agreement with CABI allowing an open use of the plant clinic data. Until 2016, 6 regionals and one national data manager have been trained in data entry, data harmonisation, data analysis and basic data validation. Also, the Plantwise Online Management System (POMS) was successfully integrated within PPD in the year 2014 and plant clinic data have started populating the database in June of the same year. POMS is an access-controlled section within the Knowledge Bank and a central resource for managing plant clinic data as well as programme monitoring. Information on training, people, partners, clinics and activities are held here for easy retrieval. By end of 2016, a total of 3,776 plant clinic queries have been entered into POMS (2,796 from male farmers and 865 from female farmers).

Between the years 2017-2020, particular attention will need to be given on the data management system. On the one hand, data collection will need to be streamlined (e.g. with use of digital devices such as hand-held tablets for plant doctors) to enable the NRO to manage the increasing data volume. On the other hand, necessary human capacity will need to be made available from NROs and LIOs, especially from the data validation process.

Target:

To have a functioning data management system which is useful and used for: Identify major crops, pests and diseases seen at clinics, and their locations; Identify new and emerging pests and diseases

(vigilance); Understand farmers' problems, perceptions, and knowledge; Identify needs for further research, and setting priorities for extension, pest management, and other plant health activities; Document work of the clinics; Monitor quality of advice and improving service to farmers. For this, there is a need to train 60 regional data managers, ensure that data flows continuously from the clinics to the national data hub, sign Data Sharing Agreement with all Local Implementing Organisations (LIOs). By end of 2020, final target is to have over 100,000 data entries what would also allow for more complex analysis and research. In addition, a functioning in-country data validation team will need to be established and validate clinic data on a regular basis.

- **Activity 3.3: Increasing the network of data collection hubs and decentralisation of its management**

In the inception phase, 4 regional data hubs and one central federal hub had been created to allow data flow from field to the central repository (i.e. POMS). While the number of plant clinics will grow linearly until 2020, it will be necessary to increase the number of regional data hubs. These regional data hubs must be staffed and equipped to enter, harmonise and validate the plant clinic data.

Target:

A total 60 regional data hubs established and one federal data hub fully functional and staffed with trained people.

Theme 4: Knowledge access, generation and dissemination

Providing access to a wide range of information, from international scientific literature to simple extension materials in local language for farmers, is central to success in managing plant health problems. This MPHSS is underpinned with a web-based knowledge bank (Figure 9), developed and hosted by CABI, but managed by the NRO (i.e. PPD). This acts as a central information source, providing a searchable database containing factsheets, pest management decision guides and other information sources on all aspects of plant health. Plant doctors and extension workers are encouraged to use the knowledge bank products to access comprehensive, locally relevant, and actionable information to help farmers on the ground. Contents of the knowledge bank are available both online (through web application) and offline through mobile phone application (Plantwise Factsheet Library App) or pen drives.

In addition to information from the plant clinics and CABI's own scientific resources, the knowledge bank provides access to data and information from a wide range of partner organisations and initiatives, for example, the Consultative Group on International Agricultural Research (CGIAR) (e.g. International Center for Tropical Agriculture (CIAT) and the International Rice Research Institute (IRRI), the US Department of Agriculture (USDA) and the UK Food and Environment Research Agency (FERA)). This gives researchers and extension workers instant access to a network of free and open-

access plant health information. New content is also generated in collaboration with in-country experts, for example through writing or modifying extension materials (e.g. pest management decision guides and related factsheets). In this respect, links with the Director of Agricultural Extension will be strengthened to seek opportunities to collaborate and develop high quality extension material.

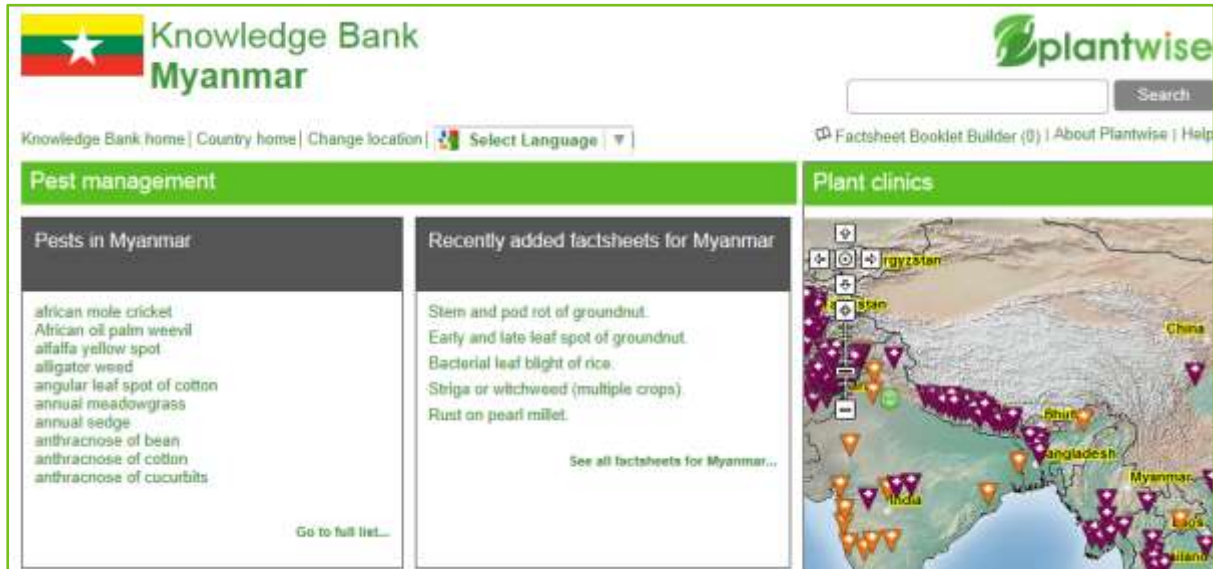


Figure 9: Myanmar specific knowledge bank with both open access domain for extension materials for plant doctors and restricted access domain for plant clinic information and pest data

- **Activity 4.1: Assessment of organisations involved in information exchange and existing national system for storing and sharing information**

During the assessment of stakeholders generating and disseminating information it is seen that the primary activities under Agriculture Information function in Myanmar include; Farmer TV Channel, Websites, Media (Journal/Broadcast) particularly newspaper, pamphlets/leaflets, early warning on pests and diseases, and intellectual talks on issues related to agriculture. The Plant Protection Division and Regional Plant Protection Division are the most critical stakeholders due to their high level of interest and influence on agriculture information activities in Myanmar.

Target:

Establishment of integrated knowledge bank system, i.e. only one single repository for all the information related to plant health like rice knowledge bank from IRRI.

- **Activity 4.2: Capacity building for producing validated extension documents adapted to local context and according to Integrated Pest Management principles**

This strategy promotes sustainable plant health management advice for farmers following the principles of Integrated Pest Management (IPM). IPM is defined as ‘an ecosystem approach to crop production

and protection that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides'. To support the practical implementation of IPM, there is a need to produce extension material following IPM principles. Up to date, CABI has trained a pool of 25 participants in a so called 'Extension Messages' module training. During these trainings, trainees are taught in development of PMDGs ('green and yellow list') and Factsheets for Farmers (FFF). Based on a traffic light system, PMDGs are comprehensive selections of the most appropriate preventive and curative control methods for specific pest-crop combinations. These information tools act as step-by-step guides for plant doctors and other extension staff to make recommendations for pest management, i.e. Prevention; Monitoring; Intervention. PMDGs do not exclude chemical pesticides, but promote their rational use and safer, effective alternatives when possible. As such, they are very useful tools for advisors to give sound pest management advice to farmers. The PMDGs are developed taking into account the pesticides that are nationally registered and other control measures that are appropriate for the country where they are developed. All WHO class 1a and 1b pesticides, as well as those that are internationally restricted or banned, are excluded from the PMDGs. PMDGs and FFFs must be produced in an interactive way, involving different stakeholder groups and must go through a formal technical and review and validation process, before they are released for wider use. Up to date, 10 PMDGs and 10 FFFs have been produced, technically reviewed and validated. Many more of these extension documents are need to fill the knowledge gap and to enable Plant Doctors to give advice following IPM principles and therefore contribute to production of safe and environmental friendly food.

Target

By end of 2020, 30 writeshops for PMDGs and FFFs shall be conducted involving key stakeholders such as PPD, AED, YAU, DAR and others to produce 300 of these factsheets. It is estimated that roughly 72 people from these organisations will need to be trained on the 'Extension Messages' Module training.

- **Activity 4.3: Establishing linkage between plant doctors and integrated information repositories such as the Myanmar specific Knowledge Bank and other nationally existing systems**

The extension messages in form of factsheets and PMDGs provide technical knowledge to the plant doctors. It is imperative to make them easily accessible to the plant doctors during the clinic sessions. Hence mobile phone application developed for access of extension documents and country package for Myanmar are made available. Also, for the locations where telecommunication signals can be limitations, offline knowledge bank (through offline applications) are available and are distributed to plant doctors

Target

Plant doctors are linked with information repositories through online and offline tools. Unified electronic knowledge hub available where extension staff can access high quality, locally relevant information.

Extension officers are equipped with digital device which can let them access the information irrespective of locations. Information and applications will be in local language and an identified Department would be responsible for all necessary translations. An external IT-technician will be hired for this specific task.

- **Activity 4.4: Utilisation of information from integrated knowledge repositories through information and communication technology (ICT) and mass media**

Pilot activities are on-going using extension information for mass-messaging (m-nutrition initiative). The activities under the MPHSS will need to be linked with other ICT initiatives like Pest Point which is a remote diagnostic system to enhance pest and disease identification and diagnostic services for domestic extension staff in targeted crops and locations.

Target:

Knowledge being disseminate through mass-communication channels to increase cost-effective outreach at country wide scale. The farmer channels and call centres, early warning systems from DAR will be extended.

Theme 5: Continuous improvement through monitoring and evaluation

Monitoring and evaluation (M&E) is carried out at a two different levels: local and national. At a local level, M&E focuses more closely on plant clinic operations so that the organisations running the clinics can improve their performance in terms of quality of advice, geographic coverage, farmer satisfaction etc. At a national level, questions of interest to government policy are more relevant, for example how plant clinics contribute to delivering national objectives of supporting agriculture and managing plant disorders resulting from biotic and abiotic factors, and the implications, including cost of government ownership of clinics and capacity development. Training to build capacity at local level should be organised (Figure 10) and implemented as regular routine.

Monitoring and evaluation outputs include information on best practices, lessons learned, successes and challenges. Monitoring and evaluation is a continuous process within the intervention and must be deeply embedded in the management approach. This facilitates adjustments in response to emerging insights into needs, relative effectiveness of programme activities etc. Additional research into plant health systems, such as short studies and large-scale impact assessments are being used to further develop specific intervention approaches.

It is mandatory that special attention should be paid to gender, monitoring the number of male and female plant doctors trained. In addition, the implementing teams should seek to understand the different needs of male and female farmers, both young and old, in accessing plant health information, and to evaluate the effectiveness of Plantwise in reaching different types of farmers. All plant clinic data collected are already disaggregated by gender in order to facilitate detailed analysis of gender differences in access to clinics, changes in farming practices, and livelihood impacts.



Figure 10: Monitoring Plant Clinic Performance Module training (left) and PPD monitoring visit (right)

- **Activity 5.1: Assessment of extension based organisations for accountability and monitoring of outreach programs**

Monitoring and Evaluation is a key element in the MPHSS. In order to avoid creating a parallel M&E structure, it is essential that on-going M&E activities in the area of plant health related extension are understood and aligned with the activities of the MPHSS.

Target

Assessment report with recommendations available and M&E taskforce established to own and guide all M&E related activities in the country.

- **Activity 5.2: Building of teams and plans for monitoring plant clinics performance**

The primary purpose is to strengthen the capacity of the plant clinic organisations and support networks to monitor and document plant clinic performance. This will enable organisations that run and support plant clinics to design a simple monitoring system (with the support of CABI as needed), which will allow them to make qualitative and quantitative assessments of progress and quality on an on-going basis, and make decisions on further actions . Building M&E capacity is a key part of institutional strengthening. 18 extension staff have been trained on monitoring plant clinic performance and monitoring plans have been developed for piloted clinics.

Target

53 monitors trained and monitoring plans developed and implemented to assure quality of 300 plant clinics. The team members will be represented from the entire concerned department.

- **Activity 5.3: Implementing evaluation schemes for continuous learning, improving processes and quantifying outcomes and impact of activities**

Impact and outcome monitoring will need to be performed on a continuous basis to guarantee relevance of the intervention. Under the MPHSS, impact and outcome monitoring will be performed using different tools and methodologies answering the following key questions: Are the interventions having a positive impact of productivity food security? Are the interventions leading to adoption of new technologies? Are the interventions leading to a reduced use of (hazardous) pesticides? Methodologies use range from simple case studies to more complex and inclusive assessments such as baselines or on-farm impact studies as well as assessment of systems changes.

Target

Published evidence of outcomes and impact of activities undertaken and of lessons learned. Demonstration of serious commitment to gender where more needs to be done to embed this in field operations to ensure that women are able to access advisory services. Facilitating this and monitor change, gender analysis is undertaken at the outset. Partnering with organisations with the necessary expertise to implement randomised control trials (RCT). This will address assessing the impact of new approach of extension on farm productivity, income and food security.

Theme 6: Sustainability and inclusiveness

In each country, a national forum provides a platform to link national plant health stakeholders in support of farmers. Certain members of this national forum could form a steering committee and be key to the development of annual work plans and for taking on responsibilities for implementation of the agreed activities. In this steering committee, one organisation is designated as the 'national responsible organisation' (NRO), responsible for steering the implementation of all planned in-country activities. A National Coordinator, employed within the NRO, is appointed by the partner to actually carry out this task, with CABI providing equipment, travel and support costs for an agreed period of time during the initial stages. One or more organisations are designated as 'local implementing organisations' (LIO), meaning that they are responsible for plant clinic operation and the associated data management. In some cases, the LIO may be the same organisation as the NRO.



Figure 11: High level senior officials of MOALI together with MPHSS drafting team (left) and opening speech of Dr. Tin Htut (Permanent Secretary) during writeshop

- **Activity 6.1: Identify key organisation(s) responsible for coordination and operation for scale-up**

Country partners, both at national and sub-national level, have committed to engage in implementation of this approach to their current system for bringing reform in the current advisory system. CABI will assist in organising the meetings where concepts can be introduced and the programme discussed and steered. This includes understanding on the concept of plant clinics and potential use of data. Currently this approach has achieved the national buy in and the logical entry point is considered the Plant Protection Division (as NRO) which has piloted this concept in Myanmar and the program is in early consolidation stage.

Target

Local levels of government (e.g. district, county) are engaged more directly to increase awareness and ownership of this approach. Since Myanmar has a decentralised governance system, the target will be to increasingly involve district and county level partners. Broad base of implementing organisation from public and private sector and civil society as potential partners.

- **Activity 6.2: Establishing national steering committee and regularly holding national forum**

The value of a national steering committee, or a similar national forum, is recognised as a key mechanism for linking plant health stakeholders, strengthening national ownership and guiding the national programme implementation. Currently there is no national forum nor steering committee established in Myanmar.

Target

National steering committee and national forum meeting on regular basis. These meetings can be initially facilitated by CABI and should result in sharing result and feedback from the improved plant health system resulting from the implementation of the MPHSS. The committee is to critically review progress and adapt the implementation strategy based on lessons learned.

- **Activity 6.3: Internalise and embed Myanmar Plant Health System Strategy in national development plans**

The Ministry of Agriculture, Livestock and Irrigation is aware of the opportunity to adapt national policy based on the lessons learned through the piloted Plantwise approach and are discussing inclusion of plant clinics and data management in policy on extension and crop protection. Hence, a high level meeting is organised with CABI staff to draft the Myanmar Plant Health System Strategy. This document is to be presented by Director, PPD to Permanent Secretary in September 2016 for his approval for inclusion in five year plan.

Target

MPHSS fully embedded and aligned with long-term agricultural development plans of Myanmar , and enjoying considerable financial investment to achieve its targets.



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Annex 1: Roles and responsibilities of different stakeholders in the Myanmar plant health system

National Institution/Agency	Key Roles/Responsibilities
MOALI (office of the Permanent Secretary)	Overall governance and supervision; chair National Steering Committee (NSC); assist to procure funding for implementing and managing the Plan
DoP	Overall M&E and assist planning and implementation; Secretariat to the NSC
DoA	Lead implementer of the strategy; extension/ToT and socio-economic components
DAR	Lead R&D (technical) and diagnostics components
YAU	Lead capacity development and support technical/I database information, socio-economic and gender aspects

Table 2: Roles and responsibilities of National Organisations in the Myanmar Plant Health System Strategy

International Agencies	Roles/Responsibilities
CABI	In pilot phase, CABI works closely with Myanmar partners to pilot plant clinics and provide required capacity building, set up data management system and start to embed monitoring and evaluation. In consolidation phase, CABI mentors national partners to ensure quality assurance and that data management systems are in place. CABI also focuses increasingly on more effective and dynamic linkages between stakeholders. In scale-up, CABI focuses on prompting the institutional change needed to manage activities at a large scale. Support from CABI includes training of trainers, as well as aspects such as planning, management, and budgeting. After full integration of the promoted models, CABI continues to support national institutions for quality assurance. CABI also continues to engage with nation steering committee and/or national stakeholder forum to explore potential for new activities and partnerships that support CABI membership.
KOICA	Work together with national agencies in community-based projects to share knowledge and resources for capacity building and income generation – to be achieved through micro-financing (provided by KOICA) for agricultural inputs (seeds, fertiliser, chemicals). Technical support by Plant clinics to ensure micro-finance is used to buy appropriate inputs which are environmentally safe and cost-effective

IFAD	Work together with national agencies in community-based projects to share knowledge and resources; IFAD knowledge centres (KC) with skills development for farmers as main project output could be linked with plant clinics to achieve common objectives.
LIFT	Monitoring and evaluation and governance
FAO	Work together with national agencies in pesticide-use and management related projects; share knowledge and resources
Others (e.g IRRI; Proximity Design, Myanmar rice Federation; ACIAR; ADB, World Bank; private sector digital service providers e.g Oreedoo	<p>Link with IRRI for improving access of plant doctors to rice related research based knowledge on plant protection Myanmar Rice Federation provide support to plant doctors at plant clinics ACIAR to conduct needs assessment on farmers requirement from the plant doctors</p> <p>Asia Development Bank and World Bank as potential funding source</p> <p>PSDSP to work as interface between plant doctors and farmers to improve access of information using ICT</p>

Table 3: Roles and responsibilities of International Institutions/agencies in the Myanmar Plant Health System Strategy

Annex 2: Financing

Themes/activities	Funds required (USD)	Potential sources of funding	Notes on Strategy/mechanism
Theme 1: Delivery of actionable knowledge to farmers	1,875,000		
1.1 Assessing the interest of extension providers to incorporate plant clinics into their existing systems, identify areas where the plant clinic concept can be piloted and identify manpower to be trained as plant doctor	45,000	CABI	
1.2: Training of extension staff on relevant modules to become plant doctors and operating plant clinics	1,800,000	CABI PPD AED	
1.3: Training of master trainers to up- and out-scale plant doctor training and form plant clinic cluster	30,000	CABI DAR PPD AED	CABI to train pool of national trainers supported by contributions from local organisations
Theme 2: Linkages between key stakeholders;	1,125,000		
2.1 Identify actors involved in delivering plant health system functions and identifying their influence and interest to delivery, and develop a communication plan	45,000	CABI	
2.2: Capacity building of in-country diagnostic capabilities	540,000	CABI and others	
2.3: Strengthening linkages between plant health system stakeholders, especially between plant clinics and diagnostic services	270,000	CABI and others	
2.4 Create linkages between plant health system stakeholders, especially between plant clinics and the agro-input sector	270,000	CABI and others	

Themes/activities	Funds required (USD)	Potential sources of funding	Notes on Strategy/mechanism
Theme 3: Data collection and management;	1,080,000		
3.1. Complete an assessment of the ways through which Myanmar operates to procure, store, access, and analyses real time agriculturally relevant data (e.g. pest data)	45,000	CABI	
3.2: Establishing a data management system, signing data sharing agreements with all relevant extension providers (including NPPO), and provide and train data managers to support plant clinic data collection systems and digitalisation	90,000	CABI and others	
3.3: Increasing the network of data collection hubs and decentralisation of its management	945,000	CABI and others	
Theme 4: Knowledge access, generation and dissemination;	273,000		
4.1: Assessment of organisations involved in information exchange and existing national system for storing and sharing information	24,000	CABI	
4.2: Capacity building for producing validated extension documents adapted to local context and document production	204,000	CABI and others	
4.3: Establishing linkage between plant doctors and integrated information repositories such as the Myanmar specific Knowledge Bank and other nationally existing systems	45,000	CABI and others	
4.4: Utilisation of information from integrated knowledge repositories through	n/a	n/a	

information and communication			
Themes/activities	Funds required (USD)	Potential sources of funding	Notes on Strategy/mechanism
Theme 5: Continuous improvement through monitoring and evaluation;	162,000		
5.1: Assessment of extension based organisations for accountability and monitoring of outreach programs	24,000	CABI	
5.2: Building of teams and plans for monitoring plant clinics performance	24,000	CABI and others	
5.3: Implementing evaluation schemes for continuous learning, improving processes and quantifying outcomes and impact of activities	114,000	CABI and others	
Theme 6: Sustainability and inclusiveness;	48,000		
6.1: Identify key organisation(s) responsible for coordination and operation for scale-up	24,000	CABI	
6.2: Establishing national steering committee and regularly holding national forum	24,000	CABI and others	
6.3: Internalise and embed Myanmar Plant Health System Development Strategy in national development plan	n/a	n/a	
Total Budget 2016-2020	4,563,000		

These are just indicative figures and the final numbers will be revised by country

Table 4: Indicative financial requirements (in USD) for various activities of the Myanmar Plant Health System Strategy

Annex 3: Roadmap for implementation

	2016	2017	2018	2019	2020
Theme 1: Delivery of actionable knowledge to farmers					
1.1 Assessing the interest of extension providers to incorporate plant clinics into their existing systems, identify areas where the plant clinic concept can be piloted and identify manpower to be trained as plant doctor	Pre 2016				
1.2: Training of extension staff on relevant modules to become plant doctors and operating plant clinics					
1.3: Training of master trainers to up- and out-scale plant doctor training and form plant clinic cluster					
Theme 2: Linkages between key stakeholders;					
2.1 Identify actors involved in delivering plant health system functions and identifying their influence and interest to delivery, and develop a communication plan	Pre 2016				
2.2: Capacity building of in-country diagnostic capabilities					
2.3: Strengthening linkages between plant health system stakeholders, especially between plant clinics and diagnostic services					
2.4 Create linkages between plant health system stakeholders, especially between plant clinics and the agro-input sector					
Theme 3: Data collection and management;					
3.1. Complete an assessment of the ways through which Myanmar operates to procure, store, access, and analyses real time agriculturally relevant data (e.g. pest data)					

3.2: Establishing a data management system, signing data sharing agreements with all relevant extension providers (including NPPO), and provide and train data managers to support plant clinic data collection systems and digitalisation					
3.3: Increasing the network of data collection hubs and decentralisation of its management					
Theme 4: Knowledge access, generation and dissemination;					
4.1: Assessment of organisations involved in information exchange and existing national system for storing and sharing information	Pre 2016				
4.2: Capacity building for producing validated extension documents adapted to local context and document production					
4.3: Establishing linkage between plant doctors and integrated information repositories such as the Myanmar specific Knowledge Bank and other nationally existing systems					
4.4: Utilisation of information from integrated knowledge repositories through information and communication					
Theme 5: Continuous improvement through monitoring and evaluation;					
5.1: Assessment of extension based organisations for accountability and monitoring of outreach programs					
5.2: Building of teams and plans for monitoring plant clinics performance					
5.3: Implementing evaluation schemes for continuous learning, improving processes and quantifying outcomes and impact of activities					

Theme 6: Sustainability and inclusiveness;					
6.1: Identify key organisation(s) responsible for coordination and operation for scale-up					
6.2: Establishing national steering committee and regularly holding national forum					
6.3: Internalise and embed Myanmar Plant Health System Strategy in national development plan					

Table 5: Roadmap to the MPHSS for the time period 2016-2020



 plantwise