LOWER MEKONG INITIATIVE SEED SECTOR ASSESSMENT OF NEEDS/PRIORITIES FOR CAPACITY BUILDING:
REPORT OF SCOPING MISSION
Laos, Burma (Myanmar), Thailand, Cambodia, Vietnam
DRAFT

Executive Summary

This report summarizes the findings of the scoping mission team visits to Laos, Myanmar, and Thailand from March 1 through March 15, 2019 and to Cambodia and Vietnam on May 8 through 16, 2019, as envisioned in the first phase of this project in the Scope of Work (SOW). The scoping mission team consisted of Program Manager Indalecio Vallejos and Program Manager Mr. Alex Chinh from the USDA Foreign Agricultural Service Office of Capacity Building (USDA-FAS-OCBD) and Dr. Steve Malone, CCA/CPAg. Dr. Malone is the U.S. OECD Seed Schemes Program Manager, USDA Agricultural Marketing Service, Science & Technology Program, Seed Regulatory & Testing Division (USDA-AMS-S&T-SRTD). The comments reflected are based primarily on the feedback from interested parties interviewed during the visits to the five countries. There are capacity building opportunities in most of the key seed sector factors that would benefit the seed trade in each country. However, since as each of the countries is at a different stage of development, the level of a training on any particular topic will need to be tailored differently in each country needs.

Introduction

The scoping mission team held discussions with government officials, agricultural university faculty, private-sector seed company representatives, seed trade associations, and aid organizations in Laos, Myanmar, Thailand, Cambodia, and Vietnam. The purpose was to solicit opinions from the perspective of varied stakeholders as to the needs and priorities for future capacity building activities in the region. The intent of these capacity building activities should be to promote better access to quality seed of well-adapted improved varieties for farmers in those countries, promote fair competition among seed companies within each country and the region, and to promote and facilitate seed trade within the region and from the region to other international markets. In most cases within a given country, there was consistency regarding perception of the state of the seed trade between the various stakeholder groups. There are significant differences in the capabilities of the seed trade between countries, as well as the ability of the government agencies to monitor and facilitate seed trade operations. The General Overview by Country summarizes the opinions and perspectives of each country, not necessarily whether the comments came from any specific stakeholder. The Brief Synopsis of the Key Seed Sector Factors table describes the seed factors status in each country. A final report will be submitted after the November, 2019stakeholder meeting takes place with representatives from each country. The meeting planned will be a venue where the assessment findings will be presented, and where discussions among the country representatives will be held. This discussion will likely result in additional information and conclusions for capacity building activities.

General Overview by Country

Lao People's Democratic Republic

The seed trade in Laos is underdeveloped compared to the rest of the region. A new seed law is at the Ministers office awaiting approval. Food and Agriculture Organization (FAO) has been providing some technical assistance. The private sector is not engaged with the government and there seemed to be no other stakeholders aiding Laos. There is virtually no functioning private seed trade association in the country. There seems to be confusion as to who should approve seed law, as well as who should have created this document (Minister of Agriculture or Prime Minister's Office). At the Department level (technical level), all are eager to learn and discover ways to improve the seed sector, however, the departments await more clarification on roles and responsibilities. There is also a disconnect between the National University of Laos- Faculty of Agriculture with the Ministry of Agriculture, the university is seen as strictly an undergraduate educational institution under the Ministry of Education and not seen as a resource in the agriculture sector as far as research or extension activities. The university is eager to have a greater role in the agricultural development of Laos.

Seed estimates provided by various interviewees varied, but generally indicated that 80-90% of seed planted by Laos farmers was farmer-saved seed. However, these are estimates without statistical evidence to support them. Most of the new seed that is used by Lao farmers is purchased by the government and distributed, making the government the primary seed customer in the country. The Laos production region is the South, because the topography is mostly flat, there is more rain, and the flooding of the Mekong River brings in much needed nutrients and water. The Northern part of Laos is mountainous which makes it difficult for farming; water scarcity for irrigation is a problem. The private sector seed trade in the country primarily consists of seed companies from neighboring countries who move seed across the border. These seem to be primarily companies from Thailand, China, and Vietnam. Unfortunately, not all seed comes across the border under regulated channels. Laos has a need for capacity building in all the Seed Factors mentioned later in this report and Laos Ministry of Agriculture as well as the private sector has expressed interest in improving the seed industry.

Republic of the Union of Myanmar

The seed law is on a second round of revision after various stakeholders (private) noticed that the first law was weak. The Ministry of Agriculture revised the law with the help of the stakeholders and are now awaiting parliamentary approval. We have since learned that the revision has passed one chamber of Parliament and is awaiting consideration in the other. Myanmar assistance mostly comes from United States Agency for International Development (USAID), Netherlands Development Cooperation, Japan International Cooperation Agency (JICA), and Food and Agriculture Organization (FAO). These organizations are mostly focusing on increasing production and less on the Seed Factors (mentioned below). There is a national seed association which is new, but so far it hasn't been able to a gain a significant following.

In general, the status of the private-sector seed industry in Myanmar is more advanced than Laos, but still far behind that of Thailand. There are some Myanmar based seed companies, and some presence of international seed companies operating in the country. As with Laos, there is a significant problem with unregulated seed transfer over the border, particularly with China.

Myanmar has recently launched a Seed Portal. It is a well-designed web presence that allows access to a wide range of seed topics. There are some specific areas that still need work such as some of the search tools and online forms, but it has the potential to be a very valuable tool for the various stakeholders connected to the seed trade. Myanmar's departments within the ministry seemed to be engaged in the seed sector and are willing to improve the seed sector. They are doing their best with the limited resources and human resources available.

Kingdom of Thailand

Of the three countries visited, Thailand clearly has the most mature seed sector and supplies seed throughout the region. The main players in assisting the ministry are the private sector through associations- Thailand Seed Trade Association (THASTA) and Asia and Pacific Seed Association (APSA). THASTA is a local association that works with the ministry behind the scenes providing advice and resources to advance assist the government officials in updating seed regulations and policies to better support exports of seed produced in Thailand. THASTA also provides technical assistance ranging from production to policy. Their limited resources prevent them from expanding their assistance. APSA is a regional organization based in Thailand, with legal headquarters in Singapore. APSA has been through several changes in leadership in the past; however, recently they have improved their organizational structure and have been gaining traction in the region. New management has managed to re-engage their membership and are now looking to expand and work more heavily in the region. American Seed Trade Association (ASTA) is an associate member of APSA and are working closely. Both are members of the International Seed Federation (ISF).

There are several key areas where improvements are needed to elevate Thailand's seed industry to a level where they can be a major part of the international seed trade. For example, Thailand's seed law does not include a provision for variety labelling- a fundamental piece of information. Similarly, changes are needed to their PVP law to bring it into compliance with UPOV guidelines. The Department of Agriculture has proposed changes to both laws to address deficiencies, but it is unclear when, or if, Parliament will act, or what any final legislation might include. Social influence is prohibiting the government to pass new seed laws as they are anti GMO and any policy and regulations that they perceive that is bad to health and environment. To counteract this, the

Department of Agriculture is planning additional outreach to Thai farmers on the benefits of the new proposed seed law.

Thailand has good capabilities for seed quality testing. There are 3 ISTA (International Seed Testing Association) accredited laboratories in Thailand, including one at the Department of Agriculture and two private company labs. Having an official government laboratory accredited by an international accreditation body is advantageous for dealing in the global market. Even though they are ISTA accredited, the private sector would like to see more capacity building for the ministry to improve laboratory testing, as the ministry is often perceived to be inconsistent with its results. Ministry did acknowledge the lack of consistent training for laboratory personnel.

Kingdom of Cambodia

Several situations in Cambodia contribute to significant frustration for the private seed sector, which consists primarily of seed companies from other countries importing seed from Thailand, Vietnam, and elsewhere. There seems to be no seed association in Cambodia. However, the few seed companies operating there, are interested in creating an association. A new seed law was passed in Cambodia in 2008 in response to obligations of participation in the World Trade Organization (WTO). Additionally, a Seed Policy has been created and this policy has established a new Department of Crop Seed. This department was developed from existing seed offices in the areas of Rice Crop, Industrial Crops, Horticulture and Subsidiary Crops, and Plant Protection. This new Department of Crop Seed documentation is at the Minister's office waiting for approval. In addition, the policy provides for a National Seed Council and National Seed Varietal Review Committee was signed in 2018. The latter two bodies would be responsible for variety registration and approval, as well as intellectual property for plant varieties. However, none of this has been implemented to any significant degree.

There is not an official seed laboratory in Cambodia. Seed laboratory equipment was purchased for the Ministry of Agriculture several years go, but so far has not been put to use. The Royal University of Agriculture (RUA) has a small lab that does seed testing as part of their limited crop production research. However, by law, they can't test for commercial use. The size of the laboratory would also not be able to accommodate a high volume of testing. There is a small seed laboratory at the Cambodia Agricultural Research and Development Institute (CARDI) which is used to support plant breeding and agronomy research projects.

Cambodia does have a Foundation Seed program that is managed by CARDI. CARDI plant breeders are the primary source of new rice varieties and maintain foundation seedstocks of those. CARDI does face difficulties in estimating the demand. There are also some new varieties developed elsewhere and released in Cambodia by IRRI. However, the distribution system beyond that is not well organized so that varietal identity is not well controlled and maintained. This leads to seeds coming into Cambodia illegally through the Vietnam and Thailand border.

Corruption is seen as a major challenge to the establishment of a private sector seed trade and agricultural inputs business. Processes are shortened depending on who you know and how much you pay. This can potentially decrease the quality and safety of seeds in the country and is a major frustration to agricultural input suppliers including seed companies. Cambodia heavily relies on donor partners to assist them in the development of their agricultural sector. USAID, through their Innovation Labs programs and the creation of Center of Excellence on Sustainable Agriculture Intensification and Nutrition, housed in the Cambodia Royal Agriculture University, is providing the much-needed coordination and support in agriculture research and education.

Socialist Republic of Vietnam

In some respects, the state of the seed trade in Vietnam is very positive. They do have a functioning national seed trade association. The Viet Seed Trade Association (VSTA), which has been involved in policy development for seed regulation and intellectual property protection. However, some companies expressed the opinion feel that VSTA needed to improve in its representation across some seed sectors, particularly in vegetable seed. Some seed companies have expressed that companies headquartered outside Vietnam are not well represented by VSTA. Seed companies have expressed their desire to create a new seed association. A seed association that would be a pathway to channel their complaints to the government without being individually singled out, which could have a negative repercussion from the government. There are several Vietnam-based companies that seem to be doing well, and growing operations of several Asian and global seed companies.

An issue that came up in several conversations was the reinforcement of Intellectual Property. There seems to be multiple offices that have the authority to hear complaints and investigate. This causes confusion and weakens enforcement. Enforcement officials are not well-trained and may interpret the protocol or regulations differently. Another issue arises when companies must file for registration at the federal and provincial levels. By the time the seed has gone through approval, it has already become irrelevant. To make things more complicated Vietnam has 7 agroecological zones which requires a new seed to go through the approval, testing certification and other processes for each zone. New varieties may be required to be tested by regional authorities even after national DUS and VCU testing. This can add as much as 2 additional years to the registration process. Finding a logical and scientific approach to the required stipulations and streamlining those requirements would be beneficial to the companies. Under the current system a new variety may be obsolete by the time it is finally approved.

Vietnam has a strong network of government agricultural research centers that are part of the Vietnam Academy of Agricultural Sciences (VAAS). VAAS is an interesting combination of an agency that is similar in some ways to our Agriculture Research Service but, at some locations, can also provide graduate education. Vietnam grants scholarship to Laos and has brought Laos officials for training in the past. However, because of historical political issues, Vietnam cannot do the same with Cambodia. VAAS has several locations staffed with plant breeders as well as a varietal certification program. But, most of these efforts seem to be limited to rice, corn, and sweet potato, with limited resources devoted to vegetables.

Key Seed Sector Factors

The purpose of this section is to provide an assessment of several key factors that should be part of an effective seed trade sector. Key seed sector factors in this section were identified by USDA-AMS technical expert. The sector should be able to reliably provide high quality seed of improved varieties to farmers within the country, encourage establishment of private-sector seed companies, and/or attract international seed companies to establish permanent operations, encourage in-country development of improved varieties, and facilitate trust in a country's seed companies, so that the country can export seed to neighboring countries and on a broader international scale. Countries visited are very aware and would like a strong seed sector that would meet the international standards. The main constraints they face is the know-how and resources (financial and human capital). They are aware that by having the best seeds in the country it would help them meet their food security priorities and that with it they would be able to increase export.

Seed Production, Conditioning, and Packaging

This is the most fundamental competency area for any country's seed sector. Seed companies may produce seed on their own land using company personnel to conduct field operations from planting and preparation to harvest, or they may use contract growers (farmers). It is imperative to be able to produce seed in a manner that maintains the varietal purity and identity in sufficient quantities and quality to supply the demand from farmers, or export market, for whichever is the intended use. Producing quality seed requires greater skill and expertise on the part of the farmer than simply producing a grain crop. In addition to the field preparation, pest control, fertilization, and other in-season management needed to produce good yields, for a seed crop the farmer must also maintain proper isolation distances from other plantings of other varieties of the same species and maintain hygiene of equipment (especially planting and harvesting equipment) to avoid cross-contamination with other varieties. Seed companies, or possibly government agencies if they are in control of seed production, must provide the necessary education, training, and monitoring of seed producers to ensure the proper practices are in place.

Market Support Services			
	Private Seed Companies		
	Low	Mid	High
Laos	■		
Myanmar		■	
Thailand			■
Cambodia	■		
Vietnam			■

Table 1:
- Low: Little to no presence
- Mid: Local and Regional Presence
- High: Local, Regional, and International Presence

Seed conditioning includes the post-harvest steps to prepare the seed crop for packaging, storage until the next growing season, and transportation to customers. This usually involves cleaning the seed to remove inert matter

and weed seed, as well as underdeveloped immature seed of the variety being produced. Additional steps such as sizing, coating, pelleting, etc. may also occur depending on the species and customer needs.

Thailand appears to have the most modern private sector production, conditioning and packaging facilities. These facilities are operated by a wide range of Thai and multi-national companies. In Vietnam, there are several operated by Vietnam based companies and fewer foreign based companies. Myanmar has some private sector operations, and there is reported interest by some regional and international companies to establish operations in Myanmar, in some cases as an extension of their operations in Thailand. In Cambodia and Laos, private sector seed company presence is limited to sales offices dealing in seed produced and processed elsewhere.

Seed Regulation

While the performance of a seed company ultimately rests on its reputation with customers, an effective government regulatory scheme is vital to ensure that the honest companies can continue to provide quality seed at reasonable cost free from unfair competition from less reputable companies. While it may be impossible to eliminate unscrupulous competitors, an effective seed regulatory framework will expose and marginalize those companies. This is a challenge even in countries around the world with strong seed laws and enforcement agencies. However, effective enforcement of applicable regulations is key to making the other factors work to the good of farmers and seed companies within any country.

All the countries have challenges in this area. Four of the countries have at least some ongoing efforts to address the content of their seed laws. The Ministries of Agriculture are suggesting changes and have input from the private sector. However, in all cases, there are political uncertainties regarding if or when these statutory and policy changes could be enacted. In addition, Laos and Myanmar have significant challenges in enforcing seed laws currently on the books for two main reasons: (1) limited adequately trained staff to conduct field inspections, and (2) official sampling and labelling checks on seed being offered for sale to farmers, especially to seed coming across their borders. A term heard often was "informal" seed movement. This is seed that is moved across borders from neighboring countries that is not adequately, or in many cases, apparently not at all inspected for compliance with labelling regulations, identification of variety or phytosanitary documentation. Even with a good seed law, lack of adequate enforcement undermines the otherwise good intentions. Cambodia, in particular, has a critical challenge whereby offices are all scattered within the ministry making enforcement and application of regulations and policy very weak because of the lack of coordination, staff, and the know-how. Cambodia is addressing this by creating a Department of Crop Seeds which would bring to together the seed offices currently housed in the Rice, Horticulture, and Industrial Crops Departments. This is at the Minister's office waiting for approval, which seems likely. This could be a very positive step; however, it may take several years for the transition to actually occur and have an impact on the seed trade.

Law and Policy Levels			
	Seed Regulation		
	Low	Mid	High
Laos	■		
Myanmar		■	
Thailand		■	
Cambodia	■		
Vietnam		■	

Table 2:
- Low: New law or established law with no implementation
- Mid: New law under revision and updates
- High: Established law in need of updates or recently enacted law

Intellectual Property Protection

Plant breeding to develop new varieties for the farmers in a given region is a commitment of significant resources for a seed company, or an agricultural university or government agricultural research agency involved in this critical work. Improved varieties are important to farmers to be able to increase yield and quality, or to be able to supply a specific market need. This may be through increasing the efficiency of the plant to increase one or more of the basic yield components as well as improving resistance to common or emerging diseases or insect pest threats. In some cases, there may be opportunities for plant breeders to take on these challenges for transgenic methods, through use of gene-editing or other novel plant breeding methods. However, there are plenty of crop improvement efforts to be addressed through conventional plant breeding methods. Even with the use of modern

techniques, new varieties are developed through a combination of both contemporary and conventional plant breeding work.

For seed companies, the ability to recoup the costs of the time and money spent on developing new varieties is critical to their willingness establish a presence, or even to sell seed into a given country. Companies are naturally reluctant to sell new varieties in a country where they are essentially giving away their intellectual property to competitors or dealers from whom they cannot collect royalty payments. For university or government plant breeding programs, royalties collected on sales of their varieties is a source of revenue to maintain those breeding programs. This is a trend even in highly developed countries, including the U.S. Therefore, the establishment and enforcement of an effective system of intellectual property protection for new plant varieties is critical.

Law and Policy Levels			
	Intellectual Property Protection		
	Low	Mid	High
Laos	■		
Myanmar	■		
Thailand		■	
Cambodia	■		
Vietnam		■	

Table 3:
- Low: No protections in place or new law with no implementation
- Mid: Established law in need of updates for UPOV or only system for certain crops/weak enforcement
- High: Established and implemented law

To make it possible for a country to be a significant trader globally, the intellectual property law should, at minimum, adhere to the standards of International Union for the Protection of New Varieties of Plants (UPOV) – 1991 revision. The importance of adhering to UPOV guidelines is that those standards provide a level of recognition that gives public and private plant breeders confidence in a country's IP protection for new varieties that may be developed in, produced in, or shipped into a country. The granting of Plant Variety Protection (PVP) or Plant Breeders Rights (PBR) in one country does not automatically transfer to another country; rather, a company must apply for protected status in each country they wish to sell a variety in. However, in order to be involved in international seed trade, a country's standards must meet UPOV-1991.

As reported in both Thailand, Vietnam, and Myanmar, Plant Variety Protection laws passed within the last decade are better than what they had previously but did not meet the UPOV-1991 guidelines. However, UPOV has worked with all three countries to bring their PVP laws up to standard. Vietnam is in the process of re-working their procedures in line with their new law, and Myanmar recently passed new legislation that they will then need to implement. Unfortunately, the wherewithal to pass new legislation to include those upgrades has been difficult due to various political and social pressures. It is unclear if Cambodia and Laos' new laws and regulations will be enough to meet UPOV-1991 guidelines. It was clear that Cambodia official didn't know about UPOV adherence and International Seed Testing Association (ISTA) accreditation.

<u>New Variety Registration</u>

Many countries around the world have some sort of variety registration system to regulate the introduction of new varieties. These range from very simple systems whereby a company or new variety developer submits the name of the new variety, a variety description and pays a fee to have the variety added to the country registry. Others require more rigorous verification of the variety description, Distinctiveness Uniformity and Stability (DUS) and Value for Cultivation and Use (VSU) testing for 1-2 years, as well as expensive (at least in the opinion of companies) fees.

All five countries have some sort of variety registration system either in place or under development. There are some significant differences that are clearly frustrating to the seed industry, for those interested in selling into multiple countries. The system in Laos appears to be of the simpler structure: most estimates indicate that about a month is required to register a new variety, which would be consistent with a system primarily involving the handling of paper. Myanmar is still developing its registration system, and particularly for vegetable seed appears to be modeled after the Netherlands system, which involves DUS and VCU testing to be conducted by a government authorized agency. While this is a well-respected system, the fees

Market Support Services			
	Variety Registration		
	Low	Mid	High
Laos	■		
Myanmar		■	
Thailand			■
Cambodia	■		
Vietnam			■

Table 4:
- Low: Minimal or non-functional system for companies
- Mid: Registration varies by crop/complexity with higher costs
- High: Companies are satisfied with the system in place

involved are a major concern to the seed companies. Thailand's system seems to be somewhere in between the two extremes, and while companies may not be entirely satisfied with the cost, it doesn't seem to be a major hurdle for them, perhaps because it has been in place long enough they've simply become accustomed to the routine. Cambodia has a registration process, but it is unclear and difficult to track documents, which allows corruption to prevail. Cambodia has outlined a process and councils that would be in-charge of approving documents, but it is unclear when it will come into effect. Vietnam on the other-hand the registration process is clear and easy to do if a company is dealing with major crops such as rice or corn but seems to be less straightforward for the vegetable sector. Further, some companies complain about differential treatment between Vietnam based vs. foreign based companies.

A system for registration of new varieties is important. If it were similar across all countries in the region, it would be of benefit and make for smooth transitions between countries, even perhaps facilitate multi-country recognition of registrations. Further, variety registration is a good starting point in the process of intellectual property protection. However, even if each country develops its own unique system this can be extremely challenging for companies that operate in multiple countries. However, if a country has predictable, consistent, and efficient process in terms of costs and requirements, seed companies will find a way to work within the system in each country as need be.

Seed Certification

Varietal seed certification is a system whereby the genetic identity and purity is maintained and verified by a certification agency through several generations. Seed certification is a key companion tool to the Intellectual Property protection. At least through the several generations that are for certification, the varietal identity is preserved and traceable back to the original source, i.e. Breeder Seed. Varietal purity is maintained by a systematic approach to field inspection for the presence of off-types or other contaminants according to standards for purity that must be met for each class of certified seed. There are two main certification schemes as related to the generations involved, though the primary difference between the two is terminology of the generations.

Market Support Services						
	Quality Certification			Seed Varietal Certification		
	Low	Mid	High	Low	Mid	High
Laos	■			■		
Myanmar		■		■		
Thailand			■		■	
Cambodia	■			■		
Vietnam			■			■

Table 5:

- Low: Limited certification systems
- Mid: Programs are well recognized but lack standard operating procedures
- High: Well established program

- Low: No certification process in place
- Mid: Limited certification capabilities
- High: Process for some crops and distributed through extension services

Breeder Seed is seed that is produced and maintained under the direct control of the plant breeder and is the source of all subsequent generations. Foundation Seed is the progeny of Breeder (Pre-Basic) Seed. It is usually maintained by the plant breeder's company, university, or a designated Foundation Seed program. The standards for Foundation Seed are rigorous to maintain sufficient quantities of seedstock for distribution. In some cases, Foundation Seed may be produced by select farmers who have demonstrated the ability to adhere to the production standards necessary. Registered Seed is the progeny of Foundation or Breeder Seed. The standards for registered seeds are slightly less rigorous than that of Foundation Seed and may be produced by a wider range of farmers, but still under the oversight of the seed certifying agency. In OECD and EU terminology, the Basic Seed class is recognized, and can be applied to either Foundation or Registered, but is most often considered equivalent to Foundation. Certified Seed is the progeny of one of the higher classes of certified seed and is produced by farmers who are provided with Foundation or Registered Seed. Production is subject to inspection and final approval of certification by the seed certifying agency. Certified Seed is generally the class that is sold to farmers for grain production. In OECD or EU terminology, this is often referred to as 1st Generation Certified Seed because both systems allow for production of subsequent generations of Certified Seed from Certified Seed, known as 2nd or "n" generation Certified Seed. This practice is generally not permitted in the U.S. except under emergency or special situations.

The concept of varietal seed certification does not seem to be well understood in the region. For most interviewees, when asked about their concept of Certified Seed, they are usually referring to a government certification of the quality of the seed, i.e. seed that meets or exceeds a minimum standard for pure seed (lack of other crop seed, weed seed, and inert matter) and germination. This is more of a Quality Assurance certification. This kind of QA certification is available in Myanmar, but the government office that issues these has limited field staff who are adequately trained to make this as widely available to all the seed producers who might otherwise qualify. In Laos, even the QA certification seems to be rarely done, and limited to some lots that are distributed to farmers by the government.

In Thailand, several interviewees mentioned a desire for Thailand to join the OECD Seed Schemes. However, to join the Seed Schemes, the seed certification system in Thailand will need to be re-oriented to a varietal certification approach. Even when a varietal certification system is established, OECD would require at least 2 years of acceptable post-control plot results. The capabilities in seed testing make the QA certification in Thailand more commonly encountered, understood, and expected by farmers. Cambodia has a Foundation Seed program managed by CARDI, but it has two major limitations: (1) at this time, it seems that it is only used for rice varieties that were released by CARDI plant breeders, and some possible IRRI varieties, and (2) once the Foundation Seed is distributed, there is no apparent follow through on certified production of the Registered or Certified classes of seed. Vietnam appears to have a strong varietal seed certification program for rice and corn, but it is unclear how well it extends to other agronomic or vegetable crops.

Seed Health

Besides PVP/IP protection, the ability to ensure freedom from seed-borne and seed transmitted diseases is critical to the international seed trade. This comes down to whether importing countries trust a phytosanitary certificate issued by the producing country. As with other factors, Thailand appears to be the closest to having phytosanitary standards that can be widely accepted by other countries. The most important international body for this is the International Plant Protection Convention (IPPC). IPPC sets common standards for documentation, inspection and laboratory testing for pests, facilitates exchange of information on emerging pest threats, and has recently launched a system for electronic transmittal for phytosanitary documentation. Underneath the IPPC is the regional plant protection organization, the Asia and Pacific Plant Protection Convention (APPPC) Thailand, Myanmar and Vietnam are participants IPPC and APPPC points of contact which indicates their willingness to adhere to or move toward adherence to these important international standards. However, the Myanmar Plant Protection Division (PPD) reported many challenges, particularly with their ability to check incoming seed. Among these were that seed is only visually checked on arrival into Myanmar and there is a limited ability to quarantine or perform laboratory tests for internal pathogens. Furthermore, visual checks are only done on seed arriving through official points of entry, so seed that is coming across open border regions is not checked at all. Even for the seed that is checked, there is concern about the adequacy of training for customs inspectors. There is even less of a functioning phytosanitary system in Cambodia and Laos, which even if improved would be thwarted by the significant "informal" seed movement into those countries.

Phytosanitary and Border Control						
	Seed Health (Export)			Seed Health (Import)		
	Low	Mid	High	Low	Mid	High
Laos	■			■		
Myanmar	■			■		
Thailand			■			■
Cambodia	■			■		
Vietnam			■			■

Table 6:

- Low: Little to no export
- Mid: Have limitations in export capabilities
- High: Mature System of export and member of IPPC

- Low: Limited ability to test and manage seed imports or lack seed import control
- Mid: System in place but inconsistent standards
- High: Mature system of import and member of IPPC

One parallel in all countries had to do with number and expertise of government inspectors to support the seed trade. Field inspections are an integral part of seed certification, be that varietal or quality certification as well as the ability to issue phytosanitary certificates. The basics for field inspection involve the routine for field-wide observations and documentation in the fields. Certification vs. phytosanitary requirements involve specialized training depending on what inspectors are looking for. Inspection of seed lots coming into a country is critical in enforcing phytosanitary and labeling requirements. Frequently, we were told that the number of inspectors limited the ability of appropriate government agencies to issue phytosanitary or quality certification documents. Additionally, there was a strong message regarding the need for additional initial and ongoing training for the inspectors that were available. Especially with phytosanitary inspections, the specific requirements may change as other countries update their requirements or as new scientific information becomes available as to the best timing and symptom appearance. As with most of the other factors encountered, inspection systems are most advanced (but could still use improvement) in Thailand and Vietnam, but are significant issues in Myanmar, Laos, and Cambodia. At the ports of entry, in Myanmar, Laos, and Cambodia, there was a significant concern that port inspectors are not currently sufficiently trained and equipped to make proper decisions on quarantines or sampling for additional laboratory testing to allow entry into the country.

Phytosanitary and Border Control			
	Seed Testing		
	Low	Mid	High
Laos	■		
Myanmar		■	
Thailand			■
Cambodia	■		
Vietnam			■

Table 7:
- Low: Few labs or limited capabilities
- Mid: Small labs at research locations or private companies
- High: ISTA accredited labs and more available around the country

Finally, as mentioned earlier, all countries have a significant challenge regarding "informal" movement of seed across their borders. This is in part due to lack of resources and qualified personnel at those borders to intercept and inspect seed coming across, that has been mentioned several times previously.

Farmer Education

Market Support Services			
	Farmer's Expectations		
	Low	Mid	High
Laos	■		
Myanmar		■	
Thailand			■
Cambodia	■		
Vietnam			■

Table 8:
- Low: Using government-issued seeds and saving their own seed
- Mid: Some traditional seed saving but, many looking for improved varieties
- High: Expect good quality seed and improved varieties

It is important that farmers understand the benefits of newer improved varieties and high-quality seed. Plant breeders are continually developing new varieties that are well adapted, and there is often significant emphasis on tolerance or resistance to disease and insect pests as well as drought or temperature extremes. New plant breeding techniques offer plant breeders additional tools to develop varieties for small geographies, microclimates, and pest pressures, but even through conventional breeding there are many opportunities for progress. Farmer demand for new varieties is one of the key incentives for plant breeders to take on these challenges. Some farmers in all these countries see these potential benefits not only as they apply to yield potential, but also to nutritional benefits for their own families and local markets, and to potential markets nationally and internationally.

Even in those situations where farmer saved seed is the norm, and may be somewhat effective, there are still challenges with poor storage conditions. Because of this, the benefits of refreshing their stocks of current varieties is beneficial. Over time, the selection that occurs may begin to cause a yield drag to occur due to genetic drift away from the original characteristics of the variety.

In either case, increasing farmer demand for improved varieties and maintenance of pure sources of existing varieties creates a pull for improvements throughout the seed supply chain and those government services that support and regulate those processes.

Agricultural Universities

Each country visited has public universities dedicated to agriculture. The role of these universities in relation to the seed sector varies, but generally is a potential source of improvement. For example, in Laos, the National Agricultural University of Laos educates students in crop and livestock production. Most of the graduates in recent years are employed by the national Ministry of Agriculture. However, the university faculty have only a small role in research or extension activities, and most of that seems to be done on their own time. Part of the disconnect in Laos is that the universities are part of the Ministry of Education. As in many countries, there is an unfortunate lack of communication and coordination between agencies in different Ministries. In Myanmar and Thailand, the general idea is that universities do only basic agricultural research but there could be more coordination with the government for more applied research. Vietnam seems to understand the importance of agriculture universities in research and training, they provide scholarships to students and to mid-level career official from Laos. In addition, their agricultural research agency, VAAS, provides graduate level educational opportunities in agricultural sciences. Similarly, Cambodia recognized the importance of their Royal Agriculture University in the development of their agriculture sector and is engaging them in conservations, but the lack of technical and experienced staff and resources hinders their progress. Perhaps, these universities would be capable of an expanded role in providing continuing education, or even initial training of inspectors, extension agents, etc. in support of agriculture in general, and the seed sector in particular.

Potential Capacity Building

The assessment of the Lower Mekong and its seed sector began with desk research. That initial research eventually led to the formulation of interview questions for the in-country scoping mission. Key stakeholders from each of the five countries were identified. Government officials, sales and production professional from the private sector, university faculty and development partners from other countries were interviewed. From the interviews, there was a summary of the responses were organized into factors that are critical to promote a thriving domestic, regional, and international seed trade. These findings identified possible strengths and weakness of each country. Low, middle, or high-level needs are essentially inverses of the current capacity in corresponding factors in each country. In other words, a low level of current capability indicates a high need for capacity building. In the table below, the needs of each country are derived from combining the specific factors discussed previously into the three broad areas. Law and Policy refers to the status of the legal framework governing intellectual property protection, requirements for seed selling, import/export requirements, and the ability of the country to enforce those legalities on seed moving within or into their borders. Phytosanitary and Border Control refers more specifically to the ability of countries to control seed movement across their border, particularly the ability to control the movement of seed that may be infested with pests. Market Support Services refers to the effectiveness of the variety registration process and the capacity to provide meaningful certification services to protect the purity and identity of varieties within in the seed distribution channels as well as what expectations the farmers have in regard to the seed.

Lower Mekong Countries Capacity Building									
	Law and Policy			Phytosanitary and Border Control			Market Support Services		
	Low	Mid	High	Low	Mid	High	Low	Mid	High
Laos			■			■			■
Myanmar		■			■			■	
Thailand	■			■			■		
Cambodia			■			■			■
Vietnam		■			■			■	

The next steps of this project have led to a planned conference with stakeholders to create a workplan on potential capacity building. Those discussions will provide better resolution on the level of interest in cooperation across borders. At this point, countries will indicate an interest in most any type of free capacity building that is offered, so if we were to make a similar table for interest based on the interviews, everything would be at the high level. Interest levels for each topic will undoubtedly change as the stakeholder's conference reviews the findings and each country are given the opportunity to discuss further individually and collectively. An important part of that will be understanding their own commitment to whatever the eventual capacity building program becomes.