

Opportunities for Myanmar's Vegetable Sector

Aligning farmers to changing markets and the role of seed industry

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Executive Summary

Myanmar's Vegetable Sector: Opportunities and Challenges for Smallholder Farmers

- More than any other subsector in agriculture, vegetables bring abundant economic and social benefits, including as the best resource for overcoming micronutrient deficiencies, providing smallholder farmers with higher incomes as well as creating more jobs per hectare than staple crops.

- Vegetables, which are an important source of income for up to an estimated 750,000 smallholder farmers in Myanmar, create a total value of around USD 1.2 billion at farm gate prices.

- With rising population and increasing wealth domestically, and with close proximity to potential export markets in China, India, Bangladesh, and Thailand, it is expected that excellent opportunities will be created for increased productivity and improving qualities in order to meet future market demands.

- However, the poor performance of many smallholder farmers are a major bottleneck for growth of the vegetable sector, and can largely be attributed to the exceptionally limited access to both technical knowledge and high quality seed bred for specific markets and agronomic conditions.

- Additionally, though local farmers currently supply most of the country's fresh vegetables, liberalization of border trade in the ASEAN Economic Community will likely result in smallholder farmers facing increasing competition from abroad as demand for quality and quantity grows. Large-scale commercial operations investing into Myanmar may also create significant competition on the local markets.



Executive Summary

The Value of a Healthy Seed Sector

- Hybrid vegetables were first commercially introduced into Asia in the 1980s. Pioneered by East-West Seed, private seed companies focused on market-oriented plant breeding, starting in Thailand and the Philippines, and later in India, Indonesia and Vietnam.

- The demand for commercial hybrids and improved cultivars is growing as farmers achieve significantly higher incomes through their cultivation, tripling revenue in some markets due to the superior yield and quality of produce. The increasing demand for better qualities and out of season vegetables is expected to have a significant impact on seed requirement in Myanmar.

- However, unlike other agro-inputs which can be used in a wide range of environments, vegetable varieties need to be adapted to suit the agronomic and marketing needs of specific areas. The vast majority of commercial vegetable seeds available on the market in Myanmar are imported and as of the moment there is no variety development or country-adapted breeding programs taking place within the private sector.

- Private sector expertise and resources are needed to develop locally-focused breeding programs which can assure smallholder's better alignment to the changing and specific needs of Myanmar's farmers and their domestic and export markets. With years of experience, companies such as East-West Seed have accumulated a wealth of knowledge on plant breeding, seed production and systems of quality assurance. Transferring such knowledge into Myanmar could act as a benchmark for higher quality and innovation in the future.



Executive Summary

The Need for Knowledge Transfer and Linking Education to Industry

- In Myanmar a lack of awareness of the benefits of using improved varieties, poor cultivation techniques and weak market linkages are all major barriers to the adoption of high quality seed. In such a challenging environment, where the majority of farmers have little or no access to information, private companies can take a lead role promoting the adoption of improved seed varieties and better farm practices through supporting extension.
- With markets being the primary driver for agricultural development, there is an urgent need for agricultural education to embrace closer links to industry. Through enabling practical experience in improved production technologies, East-West Seed contributes to the development of a dynamic learning environment in Yezin Agricultural University. By bridging the gap between education and the realities of the markets it is expected that graduates will be more aligned to the needs of the industry.
- Knowledge transferred to the public sector within the framework of public-private partnerships can also assure public interest in the seed sector; for example traits which have not been recognized for commercialization can be developed through public breeding programs.



Executive Summary

Opportunities for Variety Development and Seed Production

- Commercially seed is produced both on intensive company managed farms as well as through contractual arrangements with farmers. East-West Seed for example, produce a large percentage of seed under contract arrangements. More than 12,000 smallholder growers across SE Asia have been trained and receive regular advice from the company. In addition to benefiting farmers under contact arrangements, local economies are boosted through high demand for skilled labour (mainly women) during pollination.
- With the core of the seed business being R&D and breeding material, conducive investment and intellectual property laws are needed to provide the necessary security or incentives for large scale investments into research and development. The introduction of plant variety protection regulations and investment laws which secure core investments into research and development through full company ownership will be a major factor towards encouraging multinational seed companies to establish in Myanmar.
- With long-term commitment needed to enable a transformation to better farm practices and with the unusually high costs attached to disseminating essentially “public goods” information, private companies clearly needs to collaborate with government and NGOs who can reduce the investment risks to a more acceptable level and complement activities with professional expertise.
- The establishment of a Myanmar seed association would also facilitate dialogue between the industry, the government and international organizations such as AVRDC and APSA, and would encourage both international and domestic companies to recognize the significant opportunities within the Myanmar vegetable sector.



1. Background to agriculture in Myanmar

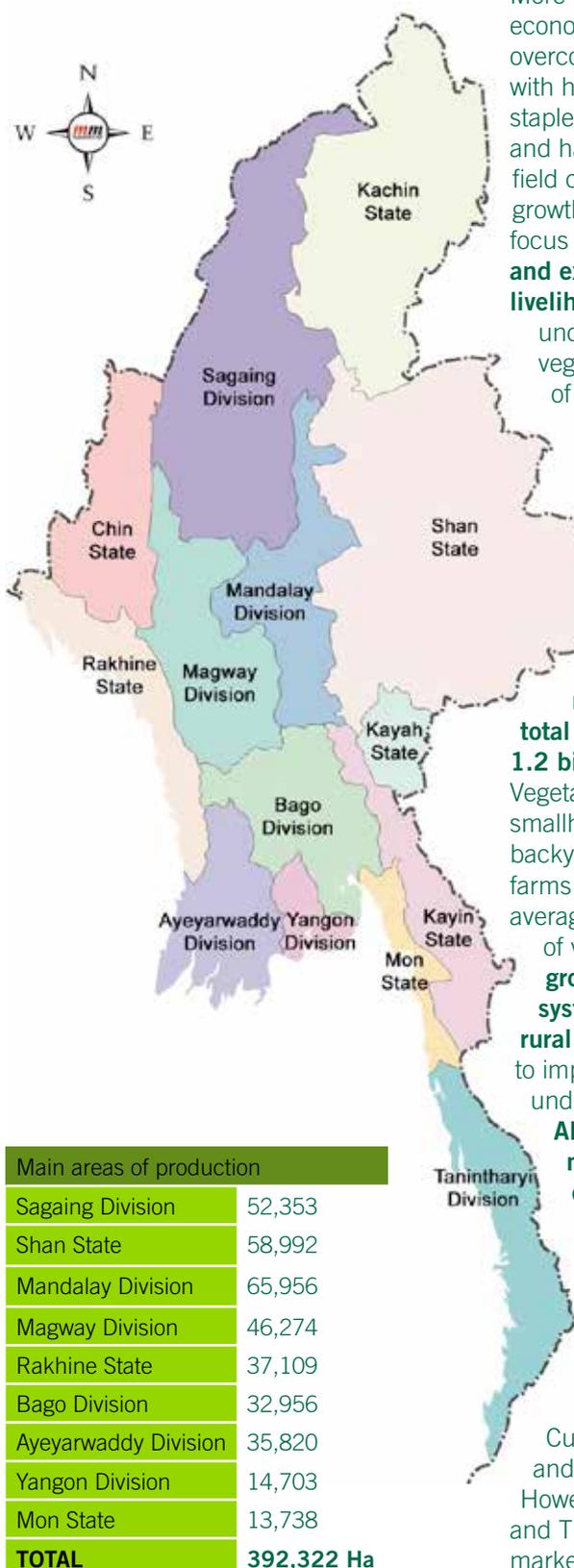
Covering an area of 676,593 sq km, Myanmar is one of the largest developing countries in SE Asia. Agriculture, which provides a living for more than 70 percent of the population, remains the backbone of the economy and is estimated to make up nearly 40 percent of the country's GDP (ADB 2012). Major policy reforms resulted in a 5 percent growth of GDP between 2010 and 2012 (IMF). With continued growth to the economy expected, Myanmar is thought to have the potential to triple per capita income by 2030 (ADB 2012). Being located between South and South East Asia, its position is considered by many to be strategic for trade and growth in the region, and with excellent agro-climatic conditions and potentially better resources than many other countries in the region, **Myanmar is ideal for the cultivation of fresh vegetables and seed production.**

	Population	Land area km ²	Population density	Land use in agriculture	Renewable water/capita (m ³)
Myanmar	60.6m	653,290	80	19%	23,972
Thailand	66.8m	510,890	130	41.2%	6,275
Vietnam	88.8m	325,490	283	35%	9,853
Philippines	96.7m	298,260	313	40.5%	4,965
Bangladesh	154.7m	130,170	1,160	70%	8,051

Source: World Bank and FAO AQUASTAT



2. Overview of the vegetable sector



More than any other subsector in agriculture, vegetables bring abundant economic and social benefits. Vegetables are the best resource for overcoming micronutrient deficiencies, providing smallholder farmers with higher incomes as well as creating more jobs per hectare than staple crops. However, despite being an important source of nutrition, and having the potential to generate considerably higher incomes than field crops, the significance of vegetables as an engine for economic growth in rural areas has long been overshadowed by a predominant focus on staple field crops. **But with potential for growth in domestic and export markets, vegetables can take a major role in improving the livelihood of Myanmar's farming families,** 26 percent of which still live under the poverty line. Nevertheless, profitability for many smallholder vegetable farmers in Myanmar continues to be challenged as a result of a principally supply-driven approach to production, and with less attention from donors and government, the sector has so far remained relatively undeveloped.

Vegetables, which are produced on 400,000 hectares, currently offer an important source of income for up to an estimated 750,000 smallholder farmers in Myanmar.

For more than 35 percent of these farmers, vegetables are thought to represent their primary source of family income. Although lacking in accurate data, backyard production is assumed to remain an important source of nutrition and supplementary income for many rural households. **The total value of vegetable sales at farm gate level is estimated to be USD 1.2 billion.**

Vegetable cultivation can be divided into three distinct groups: 1) smallholders who are the main suppliers of vegetables to the markets, 2) backyard farmers who are numerous in number, and 3) large commercial farms which are currently limited to only a few enterprises. Although average landholdings in Myanmar are in the region of 2.5 ha, the majority of vegetables are produced on smaller plots only about 0.25 ha. **With growing markets and limited land requirements, smallholder farming systems offer good potential for pro-poor growth and the reduction of rural poverty in Myanmar.** However, with limited knowledge and access to improved technologies, the profitability for many smallholders remains underexploited.

Although there are excellent opportunities for exports, the vast majority of vegetable production is presently geared towards domestic markets, which so far has faced little or no competition from imports. It is estimated that approximately 5 million tonnes of vegetables are produced every year. With post harvest losses in excess of 30 percent, per capita availability is probably less than 60 kg per year, falling well below the WHO recommendation of 98 kg per year. **With rising population and increasing wealth, excellent opportunities for increasing productivity and improving qualities are expected in order to meet future market demands.**

Current exports are presently mainly focused on melon, hot pepper and onion, the value of which is not thought to exceed 50 million USD. However with close proximity to markets in China, India, Bangladesh, and Thailand there are immense opportunities to develop a thriving export market.

3. Challenges towards market integration of smallholder farmers

To benefit from a market-driven approach, significant adaptations are needed to the traditional systems commonly practiced by many smallholders in the less developed areas of Myanmar. However, multiple factors challenge the adoption of practices which are needed to bring their products in line with consumer requirements and ensure their competitive position on the markets.

Alongside institutional and policy constraints, the poor performance of many smallholder farmers can be largely attributed to the exceptionally limited access to both technical knowledge and high quality seed.

With virtually no external source of advice, most vegetable farmers in Myanmar depend on their neighbours and inputs dealers for technical information. Although this creates potential opportunities, without objective advice from external sources, farmer to farmer knowledge transfer is often perpetuating poor practices. Advice from agro-input dealers, acknowledged by many farmers as the second most important source of information, is generally orientated towards maximised sales and consequently rarely objective. Government policy is predominantly focused on rice, and despite being one of the main employers within the

Ministry of Agriculture and Irrigation, with a lack of resources, outreach of public extension in the field of vegetables is wholly inadequate. With a focus on food security, promoting vegetable production as an income generating activity has not been high on the agenda of many development agencies, and the few that do support activities tend to focus on home consumption in marginalized areas.

Government policy is predominantly focused on rice, and despite being one of the main employers within the Ministry of Agriculture and Irrigation, with a lack of resources, outreach of public extension in the field of vegetables is wholly inadequate. With a focus on food security, promoting vegetable production as an income generating activity has not been high on the agenda of many development agencies, and the few that do support activities tend to focus on home consumption in marginalized areas.

With the greater part of production under traditional practices and the widespread use of farmer saved seed, qualities on the Myanmar's markets remain relatively poor. Common problems encountered by farmers include, low germination, incidence of disease, non-uniformity, poor year round performance as well as poor transportability and storage. **While self-saved seed may be appropriate for home consumption, farmers producing vegetables as their main livelihood are expected to face increasing difficulties to compete with the shifting demands on Myanmar's developing markets. As such the lack of good quality vegetable seeds, bred for specific markets and agronomic conditions, is considered a major bottleneck for growth of the sector.**

Few farmers have taken the opportunity to organize into groups and the low level of trust between farmers and collectors hinders the flow of market information. This fragmented flow of information results in farmers pushing products onto markets with little regard for the actual demands of the consumers. Other major constraints include the lack of formal financial services which compels the majority of producers to borrow money from input suppliers and output market actors, limited access to irrigation and high post harvest losses.



4. Aligning smallholders to changing markets



As in other neighbouring countries, **rapid changes to the economy are expected to lead to significant shifts towards higher quality and safer to eat vegetables.** Although local farmers currently supply most of the country's fresh vegetables, with liberalization of border trade in the ASEAN Economic Community, smallholders will most probably face increasing competition from abroad if they are unable to supply sufficient qualities as demanded by markets. In addition, large scale commercial operations investing into Myanmar may also create significant competition on the local markets. Accordingly, there is an **urgent need to upgrade qualities, targeting both existing domestic markets and potential future export markets.**

With minimal involvement of the private sector, end users have so far not been the foremost consideration for public sector programs in Myanmar. However, with markets being the primary driver for agricultural development, there is a clear need for both customers and farmers to be at the centre of variety improvement. The private sector, with expertise, resources and commercial incentives, can assure the development of varieties more aligned to the changing demands of consumers, as well as the agronomic needs of the farmers.

The use of improved varieties alongside better farm practices, which are widely recognized as contributing towards food security, reducing poverty and bettering the livelihoods of smallholder farmers are expected to be major factors in defining the future position of smallholder farmers on Myanmar's transforming markets.

5. The value of a healthy seed sector

The first hybrid vegetable seeds commercially introduced in Southeast Asia were imports from Japan, Taiwan and Korea. With a focus on brassicas and chili, there remained a huge void in the development of other crops. In the 1980s, East-West Seed initiated market-oriented breeding programs for local vegetable varieties, starting in Thailand and the Philippines, and later in India, Indonesia and Vietnam. Spectacular increases in yield and fruit quality were achieved in cucurbit crops within the first 5-10 years. In Vietnam for example, with the introduction of hybrid bitter melon from East-West Seed, farmers were able to double their yields. Despite the seed being more expensive, higher prices paid on the markets for the superior quality assured that farmers were able to triple their revenue.

The value of commercial hybrids and improved cultivars is affirmed by the increasing demand from a growing number of farmers who have achieved significantly higher incomes through their cultivation. Worldwide, the share of hybrid vegetable seed has increased at a rapid pace, contributing to food security as well playing a significant role towards reducing poverty. Reasons for adoption are generally linked to improved ability to meet market demands, high productivity, uniformity, resistance or tolerance to pests and diseases, better response to fertilizers as well as improved post harvest handling and storage qualities.

The increasing demand for better quality vegetables regardless of season is expected to have a significant impact on seed requirement in Myanmar. Making a wider range of improved seed available empowers farmers with more choice and enables them to select varieties according to specific markets requirements or family needs. However, unlike other agro-inputs which can be used in a wide range of environments, vegetable varieties need to be developed for particular production areas and specific markets.



5. The value of a healthy seed sector



Experience from a public private partnership in Cambodia

A study of the vegetable value chain in Siem Reap identified a lack of awareness in the benefits of high quality seed as the main reason for widespread use of self-saved or low quality commercial seed. Common problems which farmers encountered were low germination, poor uniformity and unsuitability for year-round production. Local produce could not compete with imported vegetables from Vietnam.

The adoption of better seed alongside improved techniques was a key factor towards substantial increases in farmer income. Peer managed demonstrations were used to educate farmers in the benefits of using better quality seed alongside improved techniques. Farmers were quick to recognize the economic benefits of high quality commercial seed and the need to upgrade their on-farm practices once success was evident with their peers. An independent survey commissioned by GIZ (2012) reports that 70 percent of smallholder farmers trained within the project were able to more than double their income.

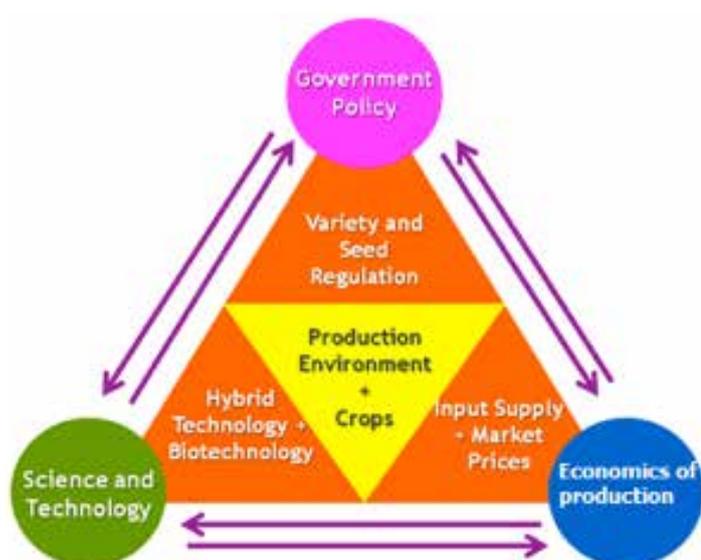
This shift towards high quality commercial seed and better farm practices was the result of a joint project between East-West Seed and GIZ. Though East-West Seed was the main driving force behind these changes, the resulting increased demand for better quality seeds created marketing opportunities for competitive seed companies. Now, improved cultivars and hybrids are widely available and are being used by most smallholder vegetable farmers across the province. In addition to developing seed markets, practices promoted on demonstration farms have also led agro-input dealers to stock other new products such as trellis netting, plastic mulch, seedling trays as well as better quality and less hazardous pesticides.

Comparing profitability of local and hybrid cucumber in Cambodia

	Local cucumber	Hybrid cucumber
Seed Cost/ha	U\$25	U\$131
Other inputs/ha	U\$750	U\$1662
Marketable Yield /ha	16,000kg	26,000kg
Farm gate price/kg	U\$0.13	U\$0.163
Total gross income/ha	U\$2,080	U\$4,225
Total net profit	U\$1,225	U\$2,431

5. The value of a healthy seed sector

Competition between commercial seed companies to supply the most suitable varieties is the key driving force towards the development of a more vibrant vegetable sector. Many of the most successful seed sectors have emerged in countries where local companies have been in healthy competition with multinationals and an exchange of best practices has taken place. Thailand is a good example where a seed sector has developed with no dominating multinational player and still retains more than 60 prospering local companies. **Healthy competition on the seed market assures a wide range of up to date products and enables improved responsiveness to market demands.**



A study on the role of national seed policy identifies three major factors influencing the seed industry.

A good balance of these three major factors is necessary to sustain a strong and viable national seed industry.

From Michael Turner, "The Role of National Seed Policies in Re-structuring the Seed Sector in CEEC, CIS and Other Countries in Transition"

At present only an estimated 12 percent of vegetables are produced from hybrid seed and it is likely that more than half of the total production area is still using farmer saved seeds. **The vast majority of commercial vegetable seeds available on the market are imported and as of the moment there is no private sector variety development or country adapted breeding programs taking place.** The market for commercial vegetable seed, which is currently estimated at USD 6.5 Million, is expected to grow to at least USD 25 Million within the next 5 to 10 years. However, as illustrated in the table below, **the investment into commercial vegetable seed by Myanmar farmers is currently lagging far behind regional peers.**

Investment into vegetable seed by country (2012)

	Population 2012 (Million)	Production Area (1000ha)	Total present value of commercial seed market (million U\$)	Value of vegetable seed used per ha (U\$)	Seed used per capita (U\$)
Thailand	67	520	60	115	0.9
Indonesia	247	1,060	80	75	0.32
Vietnam	89	848	50	59	0.66
India	1,236	7,500	400	53	0.32
Philippines	97	726	35	48	0.36
Cambodia	15	96	2	21	0.13
Myanmar	60	400	6.5	16	0.1

6. The need for knowledge transfer



In Myanmar, where high rates of rural poverty, a lack of awareness of the benefits of using improved varieties, poor cultivation techniques and weak market linkages are all major barriers to the adoption of high quality seed, **extension is without doubt a precondition for developing vibrant vegetable industry.** In such a challenging environment, where the majority of farmers have little or no access to information, **private companies can take a lead role promoting the adoption of improved seed varieties and better farm practices.** Through knowledge transfer, companies are able to assure that farmers are able to get the full benefits of their varieties. In doing so, companies create the foundations for more effective, sustainable, and innovative marketing strategies.

East-West Seed's experience in extension, which started 13 years ago in the Philippines, show that the income of farmers and that of the company are fundamentally linked and can only effectively develop hand-in-hand. A similar approach and similar lessons were learned in Cambodia, where a local team was capacitated to support farmers with improved vegetable production techniques. Drawing on lessons from both countries, these experiences were

introduced into Myanmar as an integral part of the company's strategy in 2012.

With many smallholders in Myanmar living in marginalized areas with poor connections to the markets, there is an urgent need to identify the most appropriate and sustainable forms of extension. Rather than engaging directly with implementation, effectiveness of public extension can be improved, where possible, through facilitating market-based services from qualified service providers such as East-West Seed. In such cases the governments regulatory functions assure that services provided remain in public interest. In areas where there is no commercial incentive, or where the risks cannot be sufficiently reduced to justify private sector engagement, there are clear needs for public extension to make services more accessible to vegetable farmers.

With no simple correlation between training and the adoption of new skills, company extension services are not enough to change the deep-set perceptions of the farming community. **Change in practices and higher on-farm profits are as much dependent on improved functioning of value chains as they are on technical innovation.** To improve the effectiveness of extension and foster market development there is a clear need to define the roles of the private sector, the public sector and civil society in Myanmar's vegetable sector. **Pluralistic systems which leverage market-based services such as those of East-West Seed are seen as one way of the improving both efficiency and outreach of extension.** Private sector inclusion in advisory services has several advantages including; improving financial sustainability, providing incentive for higher quality services through return on investment and assuring alignment of products to market requirements.

7. Linking education and industry

For a country where agriculture provides livelihoods for 70 percent of the population, the lack of skilled personnel in the sector is regarded as a major challenge. If insufficient numbers of trained people are available in Myanmar, scaling-up knowledge transfer initiatives will be stopped dead in their tracks. **With markets being the primary driver for agricultural development, there is an urgent need for agricultural education to embrace closer links to industry.**

As well as being pools of future knowledge, universities also provide a potential venue for practical research and outreach programs. Through enabling practical experience in improved production technologies, East-West Seed is contributing to the development of a dynamic learning environment in Yezin Agricultural University. **By bridging the gap between education and the realities of the markets it is expected that graduates will be more aligned to the needs of the industry.** In the long term it is hoped that through these activities, as well as practical internship/scholarship programs, more skilled graduates will seek opportunities in the vegetable sector. As well as developing a pool of future knowledge, activities which contribute to the long-term development of a more vibrant vegetable sector will benefit the companies through a more conducive environment where business operations can be more successful.



8. Opportunities for variety development and seed production



Private sector expertise and resources are needed to develop locally focused breeding programs which can assure better alignment of smallholders to the changing needs of Myanmar's domestic and export markets. Bringing in the latest know-how on research and development through seed companies would assure the availability of vegetable varieties that are aligned to the specific needs of Myanmar farmers and markets. This wider choice of appropriate varieties would create new market opportunities, both within the country as well as for export.

Private sector investment into seed production and processing facilities would assure better seed health through rigorous quality assurance systems and guarantee purity through genotyping labs. Commercial processes assure good shelf life as well as adding value to seeds through coating technologies. Improving the availability of appropriately packaged and priced seed will be critical to enable widespread benefit of farmers within the growing vegetable sector. Packing seeds in small, appropriately priced pouches, which can also be used by the poorest of backyard farmers can have widespread impact on local economic development. Annually East-West Seed sells more than 16 million such pouches to backyard farmers across SE Asia.

With years of experience, companies such as East-West Seed have accumulated a wealth of knowledge on plant breeding, seed production and systems of quality assurance. **Transferring such knowledge could act as a benchmark for higher quality and greater innovation in Myanmar in the future.** Knowledge transferred to the public sector within the framework of public private partnerships, assures that a public interest is maintained in the development of the seed sector; for example traits not valued for commercialization can be developed through public breeding programs.

However, with the core of the seed business being breeding material, conducive investment policies and intellectual property laws are needed to provide the necessary security and incentives for large scale investments into research and development. The introduction of Plant Variety Protection into Vietnam (one of the first countries in SE Asia to protect breeding rights) resulted in significant interest and investment from foreign multinationals which stimulated further innovation in the field of research and development.

Seed production offers multiple opportunities for the rural economy of Myanmar, a country with diverse agro-climatic conditions and excellent resources. Vegetable seed produced within the country not only reduces costs for the end user, it also offers excellent income generation opportunities for smallholder farmers and has significant potential as an export commodity to supply the rapidly growing demand from international seed markets.

Commercial companies produce seed both on self managed farms as well as through contractual arrangements with farmers. East-West Seed for example, produce a large percentage of seed under contract arrangements. **More than 12,000 smallholder growers across SE Asia have been trained in seed production and receive regular advice from the company.** As vegetable seeds need to be produced away from fresh markets, many of the farmers benefiting from seed production live in marginalized communities, which otherwise lack viable options for employment. In addition to contact arrangements, local economies are also boosted through the high demand for skilled labour (mainly women) during pollination.

9. Addressing the challenges

Despite obvious opportunities, the framework conditions in which private seed companies need to operate remain challenging. A lack of clarity with decision-making, poor infrastructure, unpredictable trade policies as well as undeveloped human resources are some of the major hurdles that companies need to overcome for their investments into the sector to be a success.

The public sector has a critical role in facilitating an enabling environment in which companies can operate and offer more effective services to their clients. In order to nurture development in the vegetable sector, seed laws should focus towards protecting the end user (the vegetable farmer) through traceability. Farmers would have more confidence to invest in seeds that meet specified qualities and the private sector would have greater encouragement to become pro-active in the sector. Developing a system to protect the interest of farmers by monitoring variables such as purity, germination and expiry date would create more opportunities within the sector. Traceability would put more pressure on companies to assure that their seeds meet specified qualities.

Widespread transfer of technical knowledge on plant breeding, seed production and cultivation techniques is needed to enable the development of a more vibrant vegetable sector. However, with the core of seed companies business being R&D, the protection of breeding material through variety protection and company ownership is of utmost importance. **The introduction of PVP and the development of conducive laws which secure investments into research and development through full company ownership will be a major factor towards encouraging multinational seed companies to establish in Myanmar.**

Promoting commercial varieties and improving farm practices is an important component towards developing a market driven approach which enables farmers to be more responsive to consumer demands. However it is a slow process which requires long-term commitment. Private sector investment into extension which primarily disseminates technical information on improved cultivation techniques is not without risks; public goods information promoted through planting guides, demonstrations, field days or training events, can be used by farmers with any variety. This creates opportunities for other seed companies as well as companies selling non-competitive agro-inputs. Though clearly contributing to the development of a more vibrant and competitive vegetable sector, it does not lead to direct financial gain for the company. **With long term commitment needed to enable a transformation to better farm practices and with the unusually high costs attached to disseminating essentially “public goods” information, private companies clearly needs to collaborate with government and NGOs** who can reduce the investment risks to a more acceptable level and complement activities with professional expertise.

With the establishment of more companies it is expected that there will be increasing competition for Myanmar's limited pool of skilled human resources on the labour market. Linkages between the seed industry and education can address some of these challenges in the long term. However, there is an **urgent need for the government to take a lead in promoting agriculture as a world class profession**; with changes to the economy and society it can be expected that many of the young people with best potential may turn away from agriculture in favour of more 'upmarket' careers.

The **establishment of a Myanmar seed association would facilitate dialogue between the industry, the government and international organizations** like AVRDC and APSA, and would encourage both international and domestic companies to recognize the significant opportunities within the Myanmar vegetable sector.



10. Conclusion

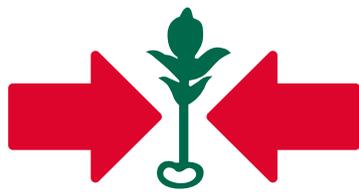
With recent political and economic changes, Myanmar's vegetable markets are likely to undergo significant changes. In order to remain competitive in the face of these changes, serious consideration should be given to upgrading qualities of smallholder farmers; targeting both existing domestic markets and potential export markets. **Promoting commercial varieties alongside the use of better farm practices is an important component towards developing a market driven approach and through enabling farmers to be more responsive to consumer demands will define the future position of smallholder farmers on Myanmar's transforming markets.**

Private sector engagement in extension will be central in accelerating smallholder's access to knowledge and technology in Myanmar. Commercial incentives can improve financial sustainability and accountability as well as assuring closer alignment to market demands. However, with returns on investment being an essential incentive for commercial companies, greater public-private collaboration is needed to reduce the high risks of disseminating "public goods" information. With closer attention to market signals, pluralistic systems of knowledge transfer could help overcome issues of sustainability and market integration inherent in many public extension systems.

Horticulture is progressive and most successful when the markets are allowed to shape the development of the sector. Unlike low margin field crops, public sector protection is not necessary for profitable horticulture. **Private sector expertise in product development through screening and breeding will enable farmers to access seeds adapted to local conditions and markets. However, without the security of intellectual property legislation and a more business friendly environment, international companies are unlikely to bring their knowledge to Myanmar.**

Technology transfer from lead companies can have a snowball effect as other companies seek to gain a place on the market. Innovation will assure up to date products and information, enabling farmers to become more responsive to market trends and thereby maintaining and increasing their competitive advantage.





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